



Science, Technology and Innovation for Development: Concepts and Challenges

Outcomes of GDN's Global Development Conference 2018

8th June 2018



Figure 1: Finalists of the Global Development Awards Competition, with the President of GDN and chairs of the competition juries. From left to right: François Bourguignon, Pierre Jacquet, Abraham Bunguac, Georges Onyango, Yadeta Bekele, Dipayan Dey, Merve Sancak, Naohiro Kitano, Rishikeshan Parthiban, Helena Y. Nkole.

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1. Science, Technology and Innovation for Development

1.1. A global academic conference for Southern voices

This report brings together the results and main findings of GDN’s 18th Global Development Conference, organized on 22-23 March 2018 in New Delhi on the topic of ‘Science, Technology and Innovation for Development’. Science, technology and innovation (STI) are already shaping new practices and policies aimed at supporting the 2030 development agenda. The conference was organized by GDN with the Campbell Collaboration, the Institute for Studies on Industrial Development (ISID) and the United Nations Industrial Development Organization (UNIDO). As with other Global Development Conferences, the 2018 edition aimed to infuse into global debates on development policy the perspective of social scientists from developed and developing countries gathered together.

The conference attracted 211 participants from 30 different countries, with a significant participation from India, and saw 68 international experts contribute in four plenary and twelve parallel sessions over the two days of discussions. It also hosted GDN’s flagship competition, the Global Development Awards, which rewards promising researchers and NGOs working on the theme of the conference.

The conference objective was to identify pathways for progress in STI systems building, to promote the achievement of SDGs for the direct benefit of people in developing countries, in a conversation between Northern and Southern academics and policy actors. The plenary sessions structured the conference along 4 conversations (see below), while the parallel sessions gathered contributions on three sub-themes: global health challenges, sustainable agriculture or industrial transition. The conference agenda is available in Annex 2.

Plenary 1: Sustainable Development Goals and the Potential of STI

Discussions focused on the possible STI pathways to inform and enable the SDGs. The session identified the fundamentals of STI systems with a development lens, and inputs from policy, science and practice.

Plenary 3: Digital Transformations and Applications to Development

With a practical approach to technological change and its application to development, practitioners offered their responses to anticipated change such as big data, artificial intelligence, internet safety and privacy.

Plenary 2: Innovation in the Global South

The session delved into the nature of innovation and issues of scale, replicability and risk. With perspectives from doers and funders, it offered an impact-oriented discussion acknowledging the diverse, sometimes opposite aspects of innovation.

Plenary 4: Policy Frameworks for STI and SDGs

The STI-SDG integration was discussed by a panel of policymakers and academics. STI’s multi-dimensional aspect was notably matched by a call for multi-stakeholder institutions to combine both agendas.

1.2. Acknowledgments

Anindya Chaudhuri and Nyasha Musandu who took detailed notes during the sessions, and to them and others at the Global Development Network (GDN) who helped frame the analysis. The GDN Conference Team who organized the 18th Global Development Conference. Clément Gévaudan and Ramona Angelescu Naqvi, the conference Co-Directors,

who conceptualized the need for this document and guided the process.

It is worth noting that not all sessions contributed equally to this document: all had a focus on Science, Technology and Innovation for Development (STI4D), but some of the parallel sessions dealt more peripherally with the 'knowledge and opportunity' gaps that are relevant for improved actions on STI capacity-building. As a result, we have covered all sessions, but not in the same depth.

2. Purpose of the Outcomes Document

The purpose of this document is to capture and organize the key headlines from presentations and discussions held during the two-day conference, *Science, Technology and Innovation for Development* held in Delhi on 22nd and 23rd March 2018, and to inform an integrated approach to broader STI policy conversations and development applications.

By drawing on the main conversations and talking points of the conference, and reflecting on recurrent themes, identified gaps, emerging issues and challenges, we hope to answer the question of how the international development community may make a meaningful contribution to the ongoing debate. Following this, we hope to present a small number of defined activities, which would both add interesting insights to global conversations, and thereby advance the debate on innovation for development.

The brief was set by CommsConsult based on conversations held with Clément Gévaudan, Francesco Obino and Pierre Jacquet to optimise the usefulness of the document and ensure any recommendations complemented ongoing strategic thinking at GDN.



Keynote address: Jobs, the informal sector and livelihoods for the poor in the digital age. Stefan Dercon, Academic Director, Pathways for Prosperity (left) and Cecila Ugaz Estrada, Director, Policy Research and Statistics, UNIDO (right).

3. The Global Development Awards Competition

The Global Development Awards Competition is an annual award scheme that identifies talents, supports the career advancement of researchers in developing countries, and funds innovative social development projects implemented by NGOs that benefit marginalized groups in the developing world. Initiated in 2001, it is GDN's largest and longest-running program, and brings together a rich community of researchers and development practitioners. The Global Development Awards Competition is generously supported by the Ministry of Finance, Government of Japan.

With three different categories of awards: Japanese Award for Outstanding Research on Development (ORD), Japanese Award for Most Innovative Development Project (MIDP), and Japan Social Development Fund Award (JSDF), it includes a great variety of activities. The competition is organized on a yearly basis and receives up to 400 submissions each year. The applicants' proposals go through a multi-stage review process in the ORD and MIDP categories, during which they are given feedback from experienced researchers and development experts. Six candidates reach the final stage of the competition – three in each of these two categories – which traditionally takes place during GDN's Global Development Conference. The final selection is undertaken by a high-level scientific jury who awards the first, second and third prizes in the ORD and MIDP category.

At GDN's 18th Global Development Conference on 'Science, Technology and Innovation for Development', the Awards Competition focused on the general theme of 'Skills Development and Employment Generation'. Finalists went through a multi-stage selection process before the finals took place at the conference, with a total of 271 submissions received from 59 countries for this year's edition.

The finalists of the Japanese Awards for Most Innovative Development Project (MIDP) and for Outstanding Research on Development (ORD) featured their research proposals and development projects at the Conference to compete for the top prizes of the competition. The event was attended by 224 researchers, policymakers and practitioners, and was followed online with a global reach. It provided the finalists with tremendous recognition and exposure through their presentations.

Parallel Session A.3 was dedicated to the finalist development projects submitted under the MIDP category. Dr Abraham Bungkuac (SERMA Africa) presented solutions to fight hunger and poverty in remote areas of South Sudan. In the war-torn country that gained its independence in 2011, SERMA is training soldiers to become farmers in oil production from groundnuts, sesame and sunflower seeds. Mr. George Onyango (DADREG) works with people scavenging in the Dandora slum of Kenya. Spreading on over 30 acres, this is East Africa's largest dumpsite. Through training, farming and business activities, DADREG is empowering women and men living in the slums with skills to become food secure and producer of wealth. Finally, Dr Dipayan Dey (South Asian Forum for Environment – SAFE)

has piloted hydroponic aqua-farming for indigenous smallholders on the island of Majuli in Northeast India. The intervention innovated a floating technology to “grow hope for better future” in Majuli.

Parallel Session B.3 featured the research proposals of three finalists in the ORD category. Mr. Rishikesan Parthiban is a doctoral candidate at the Indian Institute of Management Kolkata. His action research project aims to study the impact of ICT-based mechanism to aid skill development of artisans in the West Bengal region of India. It introduced a Virtual Factory Framework to study the rural Indian crafts industry. Ms. Merve Sancak, PhD candidate at University of Cambridge, presented her research to compare and analyse the cases of Mexico and Turkey for the functioning, determinants and outcomes of their skilling systems. Dr Yadeta Bekele (Lecturer at Jimma University) proposed to estimate the impact of certification and contract farming in Ethiopia’s coffee industry. The study design includes a gender mainstreaming approach and training for smallholders on the impact of coffee certification and contract farming.

The winners of the 2017 Awards Competition were announced by François Bourguignon, Chairperson of the GDN Board of Directors, at the closing ceremony of the conference. “We recognize the best, young talented minds showcasing excellence in development research, thinking and deserving innovation in development”, Bourguignon said. The first prize of the Japanese Award for Most Innovative Development Project was awarded to the South Asian Forum for Environment. The second and third prizes went respectively to SERMA Africa and DADREG. In the category of the Japanese Award for Outstanding Research on Development, the jury decided to award a joint prize to Ms. Merve Sancak and Dr Yadeta Bekele, particularly recognizing the importance of their research for future policy.

Finalist also received a training in communicating research and development prior to the conference. This year’s high-level jury was composed by Sonal Shah of the Beeck Center for Social Impact and Innovation, Alex Ntale of the Rwanda ICT Chamber, Cecilia Ugaz of UNIDO, or Howard White of the Campbell Collaboration, to cite but a few.

4. Key Findings on STI for Development

There is a danger of conflating all three things – Science, Technology, Innovation – into one which is conceptually neat and potentially useful, but overly simplistic, where solutions would be short-lived. We should unpack and explore before looking for synergies and solutions. Broadly speaking, science and technology are global public goods, but innovation is localized and therefore understanding the context for replication is essential and tricky, and understanding the political economy of replication is profound.

We are living through ‘the forth industrial revolution’ but need to learn lessons from the first three about the speed and range of societal impact that is possible, and to optimize the positive development outcomes. The Sustainable Development Goals (SDG) should be used as a universal framing for STI targets to be set and ‘careful’ policies to guide how they can generate positive development outcomes.

This section presents a snapshot of the eight key takeaways from the conference. It is based on the views shared by expert contributors towards the conference objective. We hope that it may be used to guide future programming and research on STI for development.

1. The past is no indication of the future

- There is little evidence for the world that is unfolding. Theories lag behind real time evolution and limits the value of approaches to innovation that worked in the past.
- More knowledge on the political economy of STI adoption and adaptation in developing countries is needed to realize its full potential for positive social outcomes.
- The bottom of the pyramid matters, but not only as a market for high-tech innovation. The poor are primary agents of innovation themselves.

2. STI is multi-dimensional and multifaceted

- There is a danger of conflating science, technology and innovation. We should unpack each of these domains and their respective contribution while looking for solutions.
- Science is a global public good, but its application is localized. Understanding the context for replication is essential and requires strong understanding of local contexts, and social sciences are instrumental to this end.
- Successful development and adaptation of innovation is less about science or technology, and more about ground-level relationships, institutions and policy dialogue.

3. Adaptation to climate change presents unique innovation challenges

- Climate change has a high impact on agriculture, where technological progress shows promise for adaptation, but replication of adaptation efforts and scaling up adaptation outcomes is complex due to contextual factors.
- A common thread to effective innovation for adaptation lies in a diversity of approaches and flexibility to 'learn and adjust' in any intervention.
- Knowledge on risk and localized risk strategies are particularly important for smallholder farmers to embrace innovation and modern farming in the face of a changing climate.

4. Innovation is a diverse concept

- There is a dichotomy between traditional innovation as a developed countries specialty, and process innovation as a developing country specialty, creating a biased hierarchy of knowledge.
- We should explore how innovation works across spaces, particularly in the Global South. This knowledge is essential to redefine innovation theories for development action.
- Risk is integral to innovation; we need to develop innovative financing mechanisms and flexible models of support that will encourage and incubate innovation.

5. Scale-up and replication are elusive

- Many things work at small scale, but how to scale up and replicate isn't always known. Focus should be on scaling outcomes, not programs, with a need to conceptualize and measure outcomes at the system level.
- Scale should not be the enemy of sustainability. Innovation systems should be diverse, like natural ecosystems. Existing definitions of scale is an obstacle to leveraging grassroots innovations for development.
- Transfer of concepts, combined with efforts to strengthen capacities to adapt, can prove more useful for development than transfer of technology.

6. Technology is a social construct

- Pro-poor technology often requires new business models. One can bank with just a mobile, but who has the mobile phone in a family define access to mobile services.
- The lives of the poor will likely change because of technology as much as those of the rich, but the dynamics of economic markets will define how they will change.
- The job creation needed to absorb the youth bulge in the South may not materialize if the pace of technological change is faster than skills development in the sector.

7. Digital disruption and data must benefit societies

- Digital transformations need to be open, public and safe. Everyone should be able to benefit from them in an affordable manner, while safeguarding their data privacy. Free flow of technologies is good for countries, but free flow of data is not.
- Politics and institutions must be brought back to the sector to guide the way technology is used for development. We do not know enough about the impact of new technologies, and applied research is lagging behind.
- Digital disruption brings potential to leapfrog more conventional pathways but requires a set of enabling conditions regarding suitable policy, incentives and skills.

8. Multi-stakeholders and strong institutions are needed for the SDGs

- An enabling innovation system must recognize and optimize the roles of multiple stakeholders, set targets and objectives for them.
- A good institutional set-up should help government, industry and academia tackle asymmetric information with different incentives for these three actors. They need "a smooth floor on which to dance".
- Capacity development will be integral to achieve the 2030 development agenda. Deep dives into the SDGs with national roadmaps for STI can enable this progress.

4.1. The past is no indication of the future

There is little evidence for the world that is unfolding. The existing evidence is based on governance models of STI contexts that are in the past and this is rapidly changing. The current pace of change is 'eluding both theory and regulation' e.g. new digital industries like Uber are not adequately regulated but by the time we understand enough about it, the sector has morphed and evolved beyond the new regulation. Our theory about these emerging platforms lags behind their real time evolution and this limits the value we can add (Cecilia Ugaz Estrada, Director, Department of Policy, Research and Statistics, UNIDO).

"We're going to focus largely on communication, digital platforms, types of technologies, things that are beginning to link to artificial intelligence and data management. We talk a lot about it, and lots of people can write exciting articles about it, but the evidence base is still very limited."

Stefan Dercon, Academic Director, Pathways for Prosperity, in his keynote address.

Skill development systems and strategies are also based on forecast models for future skills requirements, that often depend on evidence from the past. Building a complete training and skilling system takes time, and very often the rapidly evolving technology can outpace its evolution, thus aggravating the mismatch between available skills and demand.

Technology on its own will not deliver the outcomes we need. We need to pay attention to the ethics of STI systems, and the political economy and social science of STI adoption and adaptation if we want to realise its **full potential for positive social outcomes for the majority**. There is a risk of looking at technology advances and their social impacts only in terms of the middle classes: the poor should be regarded as more than just potential consumers or the bottom of the economic pyramid. They are **primary agents of innovation**.

Global Development Awards Competition
Merve Sancak, Affiliated Researcher at the University of Cambridge and winner of the Japanese Award for Outstanding Research on Development at the conference, suggests that state commitment and firm involvement are necessary to develop skill systems that can address workers' and firms' needs.

4.2. STI is multi-dimensional and multifaceted

Like a jewel that has been perfectly cut to show a thousand different ways of 'seeing' it, innovation has many forms and facets. Speakers both within panels and across sessions used different definitions and dimensions of innovation as their starting point.

"India's technology needs range from nuclear and space, and ICT, to rural. We need to develop an RDI eco-system which caters to this range of technology needs: excellence in basic research, applied research, technology development, R&D-led innovation, backed by high-

quality manufacturing skills."

R. Chidambaram, Principal Scientific Advisor to the Government of India, in Plenary Session 1.

It was pointed out that we often think of innovation in the north as **'creating new things'** but in many developing countries it is more about **process innovation** – how to use these new things. There is need to distinguish between **breakthrough** and **incremental innovations** and not ignore the more invisible facets of innovation e.g. in the financial sector such as 'YES Money' which has enabled 41m financial transactions to date (Chandan Bhavnani, Executive VP, Responsible Banking, YES Bank).

We need to recognize, analyse, support and leverage different **dimensions of innovation**. For example, in the agriculture sector, technological innovations produce lab-grown meat; policy innovations explore taxing unsustainable food items like beef to support more sustainable food systems; and institutional innovations enable bodies like the National Dairy Development Board in India to support 30m smallholders, one fifth of whom are women. But we need more innovations in development assistance, says Alix Zwane, and this may require us taking more risks. She gave the example of using aid money as venture capital to underwrite risky ventures 'where local entrepreneurs are in the driving seat of innovation'. "Efficiency is great", she says, "but you can take that value too far."

There are different **types of innovation**, for example, **frontier innovation** which is defined as new technologies that use frontier science to create something completely new vs **adaptive innovation** that uses local knowledge to apply existing science and technology to new settings. The latter is more important to the South where they don't have a strong innovation system and the social capital necessary to contribute to new inventions, but where they can find ways of using existing knowledge to address their own problems.

The various **applications of innovation** were explored, e.g. its role in the manufacturing sector specifically and industrialization processes more generally. The pace of change of STIs are changing the ways in which we're thinking about – and what is possible – around economic productivity in the sector and indeed what is the 'industrial sector' anyway. It was argued that successful and effective technological development and adaptation is **less about the technology itself** and more about the ground-level relationships, social institutions and policy dialogue. You can have the best policy papers (instructing how change will happen) but, without institutional arrangements at the ground level, it is unlikely you will realise required behaviour change.

The various **drivers of innovation** were identified e.g. demand as an important stimulant for industrial growth which should be considered as part of a **'healthy ecosystem for industrialisation'** along with supply, policies etc. How to stimulate demand so that the SDGs can be achieved while minimizing environmental fallout is a burning question without an answer.

The different **beneficiaries of innovation** were identified, and attention drawn to the need to clearly distinguish between welfare gains for different categories of audience e.g. the middle classes and the poor, and not oversell them in any strategy.

4.3. Agriculture and climate change present unique innovation challenges

Climate change poses several challenges to sustainable development: it threatens our ability to achieve global food security; to eradicate poverty; and to develop in a sustainable way. The agriculture sector is negatively impacted by climate change consequences and variabilities, especially in South and Southeast Asia which are important players in terms of agricultural production and consumption.

The agriculture sector is being required to improve its performance in response to three sets of factors that intersect to produce a 'perfect storm'. First, it is expected to produce 60% more food to meet rising populations; second this increased production is set in the context of pressure to reduce CO2 emissions; and third the sector is facing real and dramatic climate shifts (extremes and volatility). Seventy percent of farmers are smallholders who must adapt and improve performance to deliver on these expectations.

Technological advancements are showing promise (e.g. rice developed by IRRI that survived a week under water during recent floods in South Asia), but **replication is tricky** because you cannot easily identify and investigate the contextual factors such as financial systems or governance systems that underpinned the initial success. One common thread to effective innovation seems to lie in a diversity of approaches (some call it a 'basket of options') and flexibility of partnership structures that enable all partners to 'learn and adjust' in any intervention. Encouraging innovative, evidence-based and transdisciplinary research can enhance agricultural policy-making and strengthen national agriculture systems. Social learning in particular, holds promise. Rural farmers cannot afford the luxury of failure in innovations. Their practices are based on generations of knowledge and empirical evidence. Social inertia may come about **not because people are unreceptive to innovation**, but because their risk strategy is predicated on watchful waiting.

4.4. Innovation is a diverse concept

There is a dichotomy between **traditional innovation** as a developed countries specialty, and **process innovation** as a developing country specialty which creates a 'false hierarchy' between the two types of innovation and special pleading for investigation of the latter. It is more helpful to view innovation in an inductive way, investigating how innovation works across spaces; acknowledging such spaces; chronicling the experience of developing countries and using this understanding to redefine global innovation theories and their links to development.

"We have to start to figure out how to take relatively risk-averse money, bilateral aid money, and how to adapt that to more venture-style assistance. Venture-style investing that can tolerate smart risks, figure out to get out of things that aren't working, but also how to double down on things that are."

Alix Zwane, CEO, Global Innovation Fund, in Plenary Session 2.

Global Development Awards Competition
2017 Japanese Award for the Most Innovative Development Project (MIDP) First Prize winner Dipayan Dey (Chair, South Asian Forum for Environment) has pointed out that though adaptive innovations exist, the awareness of possible benefits of such practice can be low in the communities from where these innovations come.

The creation, development and diffusion of new innovations and technologies and associated know-how are powerful drivers of economic growth and sustainable development. The social, political and policy processes that are required to maximise the potential of STI for development are hugely important, influenced by context, and an important area of future investigation.

Risk is integral to innovation; we need to 'get better' at both developing innovative financing mechanisms, and flexible models of support that will encourage and incubate innovation wherever it is possible to flourish. Societies don't like change, but the growing fashion for, and attention to innovation may provide a useful entry point for talking about change and mitigating the risks for the most vulnerable populations. The question of how to affect and measure social impact remains unanswered. More collaboration across disciplines and sectors is essential.

4.5. Scale-up and replication are elusive

There was a diversity of opinion about innovation and its potential for scale-up and replicability. On the one hand, there is a groundswell of opinion that the problem lies in not only how to go to scale, but also how to identify technologies and innovations that are worthy of scale-up. We know that many things work at small scale, but we are not clear how to scale up and replicate. Arguments were aired that we should aim to scale **outcomes not programs** (Sonal Shah, Executive Director, Beeck Center for Social Impact and Innovation). This brings methodological challenges of, 'What does success look like?' in this area. The rewards for concrete developments of how to conceptualise and measure outcomes for knowledge management, innovation, and capacity strengthening at the system level will be high (Alix Zwane, CEO Global Innovation Fund).

On the other hand, it was argued that scale should not be the enemy of sustainability. Innovation systems, like natural ecosystems, should be diverse (Anil Gupta, President, SRISTI). Gupta argued that grassroots innovations have not taken off **because of an over-emphasis on scale** and pointed to the potential long tail of innovation for addressing niche problems which has not been exploited to date.

"For big technological innovations, you have huge interventions in the form of venture capital, which is why they have done so well. But for grassroots innovation, this risk capital is not available."

Anil Gupta, President, SRISTI, in Plenary Session 2.

There is no single roadmap for sustainable development in all countries. Instead of focusing on the transfer of technology and innovation, a more suitable approach is to facilitate the **transfer of concepts** followed by local re-innovation and adaptation.

4.6. Technology is a social construct

A lot of changes are happening because of digital technologies and this brings both challenges and opportunities for developing countries. In this context, what does it mean to be poor? Dercon in his keynote, proposed that the **lives of the poor will change** because of technological change, but **how their lives change** will depend on how the technological changes affect the costs of engaging in their respective economic markets. Any analysis is made complex by the fact that the technologies themselves may change over time. Dercon presented a new analytical lens through which to view the dynamics of technological changes and their impact on the labour market.

While the promise is great, it is not completely clear how the technological advances will be used to improve our world. In advanced and emerging countries, there is the risk that jobs will be lost through advances in automation and digitization of business processes. In developing countries, the risk that the job creation needed – and promised – to absorb the 'youth bulge' will not materialize if the pace of technological change is faster than skills development in this sector (Stefan Dercon, Academic Director, Pathways for Prosperity). Economists think these concerns will be naturally resolved, and that by looking to the past we will find ways to anticipate the future and mitigate risks. But there are no guarantees, and the transition may be painful and require targeted interventions from public policy institutions.

Technology is not benign and will not, on its own, deliver positive developmental impact in society. There is an important role for public finance (e.g. to enable critical projects to remain in the public domain) and policies (e.g. for open access to research for publicly funded projects) to optimize outcomes.

"Network technologies are supposed to improve the distribution of power. This is what we like to believe about them. ICTs bring two things: efficiency and openness. Efficiencies are good for economics, which are happening, and openness was supposed to take care of the political and redistributive part of it, which actually has been a mirage largely. Has networking really distributed power better?"

Parminder Jeet Singh, Executive Director, IT for Change, in Plenary Session 3.

The examples of pro-poor technologies that clearly benefit the poor, e.g. solar lanterns and mobile clinics **have required new business models** that enable flexible payments for the services (i.e. technology on its own is not enough). Advances of technology without a look

at social dimensions can be completely misleading: one can bank with just a mobile, but **who has control** of the mobile telephone in households makes a huge difference to development. In the main, public discussion of innovations for development, even in development-focused mediums like [The Guardian](#), [Scidev.net](#) etc. pay attention to a narrow band of technologies and 'cutting edge solutions' rather than the social and economic contexts in which they work, or the policies and strategies that lead to successful introduction, adoption and adaptation of the technologies.

4.7. Digital disruption and data must benefit societies

The enormous transformative potential of big data brings with it significant risks and challenges around privacy, security, and exploitation. Nnenna Nwakanma (Senior Policy Manager, World Wide Web Foundation) emphasized that digital transformations need to be open, public and safe - everyone should be able to benefit from them in an affordable manner! Sonal Shah, Executive Director of the Beeck Center for Social Impact and Innovation, Georgetown University, asked how we collect data to learn about innovation that works?

According to the World Wide Web Foundation, by the end of 2018 we will reach the 50-50 threshold where half of the world will be online and the other half not. Digital technologies have enormous potential e.g. for health tracking, banking, cash transfer programmes and many other applications. Health services are leading the way, facilitated by the combination of rising healthcare demand and spend on wellbeing; chronic diseases becoming more prevalent and failure of conventional services to meet people where they live. Numbers are growing fast e.g. World Health Partners have reached 6-7 million people in India; and Results4Development have a database of 1300 programmes that are run by private enterprises. These pilots have valuable lessons for other services e.g. in using 'customer feedback' to build trust and audience for delivery of transport, hotel bookings etc.

But at the same time, there is enormous hype over the potential of the sector, and we need not to lose sight of the facts. There was a call for 'politics and institutions' to be brought back to the sector to guide the way technology is used for development. Alan Gelb, Director of Studies, Center for Global Development, argued that technology cannot be looked at independently of the societies in which they are implemented. We do not know enough about the impact of these technologies, and applied research is lagging behind.

There has been enormous progress in the application of digital technologies for identification systems since 2000 but there three big risks; exclusion especially around nationality where some people become stateless, misuse such as surveillance and fraud (only half developing countries have data protection laws); and waste. The systems are not independent of the political economies in which they are used.

"The problem we have today is that AI is being designed and used without fully understanding low- and middle-income countries, our demands, our realities and our context."

Nnenna Nwakanma, Senior Policy Manager, WWW Foundation, in Plenary Session 3.

The digital divide is growing and technology itself will not be the answer. Without urgent policy action, the SDG target for affordable, universal internet access by 2020 is likely to be missed by over 20 years. Inadequate policies are a big part of the problem: half of the countries reviewed by the Alliance for Affordable Internet 2017 study¹ did not have public access policies in place that are also backed by financial support for implementation.

Digital disruption brings potential for the South to 'leapfrog' more conventional technological pathways but requires a set of conditions to be satisfied first, e.g. suitable policy and financial incentives to be in place. An important red flag at the centre of the entire sector, marked by the recent scandal surrounding Cambridge Analytica's misuse of Facebook data, is the question of who owns data? Free flow of technologies is good for countries, but free flow of data is not that beneficial (Parminder J. Singh, Executive Director, IT for Change).

4.8. Multi-stakeholders and strong institutions are needed for the SDGs

It is important to recognize and optimize the different roles for multiple stakeholders in an **enabling innovation system**.

Knowledge intermediaries, for example, play a crucial role in introducing existing innovations into new contexts to address a new set of problems but this potential and actual role is often invisible.

Innovators themselves need to bridge the gap between what is technologically possible and what is affordable (István Mikola, Minister of State for Security Policy and International Cooperation, Government of Hungary).

Governments need to undertake a wide range of actions, including aggregating demand and setting standards for emerging beneficial technologies. Their role in e.g. product innovation may require capacity building. The question was asked by Sonal Shah, how do we train governments to be adaptable and to nurture and oversee the 'proper policy planning' that is essential for STI to realise its potential at country level?

The cross-cutting nature of the SDGs and maximizing their synergies means one has to undertake systems analysis. [...] If we really want to make progress and develop real actions, we need roadmaps at many levels: the global level, the national level, sub-national level, local and city or even institution level. In order to develop the right roadmaps, it's going to require stakeholder engagement, it cannot be top-down. It's also going to require deep dives into each and every SDGs.

William E. Colglazier, Senior Scholar, Center for Science Diplomacy, American Association for the Advancement of Sciences

¹ http://a4ai.org/affordability-report/report/2017/#executive_summary

For effective innovation, **'it takes three to tango'** (Guillermo Perry, Professor at Universidad de Los Andes and former Minister of Finance, Government of Colombia): government, industry and academia. They need to work together with a 'smooth floor on which to dance' which is a good institutional set-up. The challenges include asymmetric information between firms and STI communities; and the different incentives for the three players.

Beyond stating that capacity development will be integral to achieving the post-2015 development agenda, insights about the challenges of how, when, and with whom this should be done, were muted at the conference.

It was noted that it will be important to strengthen our **ethical reflections** on STI and its positives and negatives, particularly as part of research capacity building, to avoid unintended consequences.

5. The challenges ahead

Everyone **defines innovation differently**: this is both a challenge and an opportunity. On the one hand, it makes a global conversation difficult without generating misunderstandings and/or partial appreciation of both problems and potential solutions. On the other hand, it opens up spaces to re-define innovation in a way that is more inclusive, participative, and linked explicitly to development solutions.

An 'artificial ceiling' is imposed on global innovation by two sets of factors: first that much of the research that could underpin and inspire innovation is **'locked away' in universities** especially in the south; and the **everyday innovations of ordinary people** in response to the challenging circumstances in which they live, go unrecognized and un-audited.

We don't understand enough about the **incentives for innovation** and especially whether they are supply or demand-driven. If the latter, who articulates demand, on whose behalf and how is this brought to 'the market of ideas'? We need to nurture and embrace **a range of innovation** if we are to effectively address the diversity of societal challenges, not only 'big new inventions'. What types are best for the outcomes we want?

The question of the political economy of innovation needs large investment. How does the role of governments, the private sector, researchers and communities best combine to innovate? One possible pathway is to identify their - perhaps complementary - contribution in linking innovation and development outcomes.

The demands we're placing on National Innovation Systems are not being effectively met anywhere in the world to date. Finland provides some good examples for incentivizing innovation but there are no universal exemplars. We are far from having a blueprint to guide us on intervention. In addition, the landscape of intervention (of STIs) is moving quickly but research methods (to understand and analyse it) are lagging behind. Drawing on work in more than 70 countries, Bill Colglazier said 'each and every one of them wanted to strengthen their national innovation systems'.

In the final plenary session, Francois Bourguignon pointed out that all the presentations about policy frameworks for STIs and SDGs focused at the national level, but to realise the potential of STI as a public good requires deep understanding of context within a robust analytical framework to understand what worked where and why.

Ajay Mathur, Director General TERI, presented three categories of innovation: those that will work in one place but not in others e.g. malaria drugs; those that need some kind of adaptation, e.g. coal plants; and those that are completely context specific, e.g. computers that will not work without electricity. He said that collaboration is most challenging for the second category because the issue of Intellectual Property arises, and that this issue was not solved in the SDG negotiations.

5.1. Absent from the discussion

There was little meaningful discussion on the role of gender in STI4D² “In many countries, women have unrecognized and invaluable traditional and local knowledge and are major producers of commodities, merchandise, food, energy and water. Using scientific and technological knowledge in a way that complements and refines such knowledge can increase productivity levels and improve monitoring and managing of our ecosystems. The potential of S&T to contribute to national socioeconomic development cannot be realized without making the best use of all sectors of a nation’s population.”³

5.2. Opportunities for intervention

Several opportunities were either explicitly stated or emerged in discussions and conversations over the two-day conference. When these came from more than one source, they are included here.

1. **Create the conditions for STI to catalyse positive development** e.g. by combining finance and policy to create something new. This requires breaking through vested interests, and we don’t know how to do this. Researching both where and how it is being done and how it could be done, and then communicating it in a way that convenes meaningful debate, is a big opportunity (Dr Dirk Willem te Velde, Director of Supporting Economic Transformation and Head of the International Economic Development Group, ODI). The **socio-economics of technology adaptation and adoption** (i.e. innovation) and more broadly the political economy of ‘an enabling environment’ is under researched and needs to be addressed.
2. **Create mechanisms for engagement with stakeholders.** There are a number of existing processes, mechanisms and champions for STI in development, specifically the Technology Facilitation Mechanism led by the United Nations. The momentum generated by ongoing debates is aided by the ‘perfect storm’ of opportunities around

² <http://wisat.org/what-we-do/sti4d>

³ Science, Technology and Gender: An International Report, UNESCO Publishing 2007

rapid digitization and its societal transformation, and issues of open and linked data with its flip sides of threats to security and privacy. Civil society, especially with the latter, is engaged and ready to be mobilized **but the mechanisms for engagement** are often lacking.

3. **Enable the current SDG framework to receive new STI solutions.** There is growing **frustration over the lack of progress** being made towards delivering SDGs through STI at national scale. Many of the key UN commitments and processes e.g. on topics of biodiversity, climate change, desertification etc. are dependent on STI as inputs and drivers of outcomes, and there are lots of entry points / opportunities for working in this space including advising on challenges, providing indicators for monitoring progress, and searching for new innovative solutions. Action Plans and Roadmaps are needed at every level (national, subnational, international) and deep dives are needed for each SDG (Bill Colglazier, Senior Scholar, Center for Science Diplomacy, American Association for the Advancement of Sciences). Capacity building is essential in every country. National innovations systems and national research systems must be strengthened to allow the coordination to happen at all levels.
4. **Strengthen visibility and curation of indigenous knowledge and innovations.** These hold enormous potential for learning not only about the contexts and conditions under which they flourish, but across the collection of knowledge and innovations. There are opportunities for bringing people together who know about technologies and those who will need to use them to catalyse innovation and support adaptation of technologies; and there are 'key moments' that can be captured for catalysing discussion and debate. 2018 is a key year for the movement e.g. [Pathways to Prosperity](#), with actors who are positioned and mandated to influence both the debate and outcomes.
5. **Recognize that cross-actor collaboration is essential to achieve sustainability** in any arena (e.g. climate change adaptation; resilience of communities experiencing rapid change and innovation; industrialization 'ecosystems' etc.) and acknowledge that we do not know enough about what it looks like, and how to replicate successful interventions. Co-creation is particularly difficult on the ground because no one agency is aware of the other actors working in complementary areas: a repository of state actors would help to first audit, and secondly coordinate interventions *if the necessary incentives are in place and/or created*.
6. **Improve responsible financing for innovation.** Investment in technologies by investors has been rising e.g. asset value estimated at more than \$60 trillion; new funding mechanisms like 'green bonds' have increased tenfold over five years. Front runners are re-framing investment to align with SDGs, but improvements are needed for the sector to continue to attract 'responsible' investors who are interested in social as well as financial returns. Positive principles for investments might include risk sharing; information disclosure on useful and innovative technologies; and requiring impact assessments of innovation.

7. **Question 'how things are done now'**. First, we heard challenges to the 'status quo' around assuming that innovation originates in the north and moves to the south; that it comes from men and benefits women; and that it is always 'somewhere in the future'. Second, linked to the **importance of using 'demand' to stimulate innovation**, we heard that there are rising numbers of local incentives to innovate and this could give rise to innovations which originate in the south and are transferred to the rest of the world. Third, that there is potential to link the STI4D debate to **public procurement reform** (Sonal Shah, Executive Director, Beeck Center for Social Impact and Innovation) to better understand how public procurement works, and how to leverage it to promote and use innovation to scale up development outcomes.
8. **Curate and signpost knowledge repositories**. There are opportunities to focus on the co-creation **not of knowledge but of solutions** made up of different kinds of knowledge - from farmers, from the local agencies (operational), and from policymakers. If you bring them together, you are creating solutions that are based on the knowledge and experiences of multiple stakeholders: this has more chance of being accepted by different groups and any interventions based on the evidence is subsequently likely to be more sustainable in the longer term. A range of panellists agreed that there is 'plenty of knowledge (about innovations) out there', but it is often both invisible and difficult to know 'what is good'. A call was made to **curate the existing knowledge stores** and find a way to 'sort the wheat from the chaff'. Howard White (Chief Executive Officer, the Campbell Collaboration) called for a 'Scalability Index of Innovations' to quickly find innovations that can be scaled up, and Shenggen Fan (Director General of IFPRI) called for a 'Knowledge Clearing House' to weed out fake knowledge.

6. Conclusions

The conference opened the door to new possibilities that have the potential to improve the quality of life for citizens globally through the application of STIs to achieve the Sustainable Development Goals. It heard arguments that helped to identify and positively screen those promoting inclusive and sustainable development paths. It allowed different actor groups, with different and sometimes competing interests, to unpack and explain multiple perspectives on the same set of problems and scenarios, with a view to deepening understanding over what needs to happen, for whom, by whom, and how.

Innovation interacts with highly complex economies, societies and cultures in ways that are anything but simple, and it takes much more than hope and infrastructure to achieve developmental goals. It takes serious understanding, public policy and cooperation between different people and different institutions.

Ajay Mathur, Director, The Energy and Resources Institute

The challenges that lie ahead are not insignificant. The short timeframe in which they need to be addressed and resourced, adds a real sense of urgency. The lack of exemplars on, for example, National Innovation Systems or policy frameworks for innovation scale-up, provide

impetus for renewed efforts at all levels. Taken together, they set the scene for the many actors both already involved in the STI sector and on the periphery, to re-calibrate and amplify their efforts collaboratively to reach the desired goal.

The conference underlined the importance of understanding how context both frames and explains where and how innovation benefits societies; the value of looking beyond technologies as the solution 'on their own' to pressing social problems; the 'chimera' of 'new inventions' vs indigenous innovations; the importance of understanding, incubating and facilitating innovation that happens differently in different sectors; and the criticality of both institutions and context. Institutions matter, and we need to be mindful of specificity of context and the importance of properly understanding and incorporating 'the reality of ordinary lives' when designing solutions.

Meeting the many and varied challenges of STI4D will require an optimal combination of both organisations that provide specialist, singular functions such as funding, research etc. as well as organisations playing multiple roles in different configurations. Investigating knowledge gaps such as: what are the mechanisms to understand innovation demand; what are the most appropriate policies for deployment⁴; what types of collaboration support 'adaptive innovation'⁵; what types of capacity support is needed to enable innovation at scale Investigating these areas to improve the understanding and the use of STI in the Global South will be to science-based and technology-enabled progress on the sustainable development agenda.

⁴ Bill Colglazier, Senior Scholar, Center for Science Diplomacy, American Association for the Advancement of Science

⁵ Ajay Mathur – Director General, TERI

ANNEXE

Conference agenda

22 March 2018 – 9:15 AM to 6:00 PM

8:30-9:15	Conference registration		
9:15-10:00	Opening ceremony <i>Auditorium, Ground Floor, Block B</i>		
10:00-11:30	Plenary 1: Sustainable Development Goals and the Potential of Science, Technology & Innovation <i>Auditorium, Ground Floor, Block B</i> Chair: Pierre Jacquet , President, Global Development Network <ul style="list-style-type: none"> - R. Chidambaram, Principal Scientific Adviser to the Government of India - Santosh Mehrotra, Professor of Economics, Centre for Informal Sector and Labour Studies, Jawaharlal Nehru University - Naoki Mori, Executive Coordinator, Director of Knowledge and Communications, Institute for Global Environmental Strategies - Jozsef Pálincás, President, Hungarian National Research Development and Innovation Office - Cecilia Ugaz, Director, Department of Policy Research and Statistics, UNIDO 		
11:30-12:00	Networking break – tea & coffee		
12:00-13:30	Parallel A.1 – <i>Auditorium, Ground Floor, Block B</i> Launch of the Industrial Development Report 2018 <u>UNIDO</u>	Parallel A.2 – <i>Conference Room, Ground Floor, Block A</i> Climate-smart and sustainable agriculture in the face of climate change <u>Global Development Network</u>	Parallel A.3 – <i>Conference Room, Third Floor, Block A</i> Japanese Award for Most Innovative Development Project on ‘Skills Development and Employment Generation’ <u>Global Development Network</u>
13:30-14:30	Conference lunch - <i>Meeting Hall, Ground Floor, Block C</i>		
14:30-16:00	Parallel B.1 - <i>Auditorium, Ground Floor, Block B</i> Getting to scale: Lessons from Digital Health Innovators <u>Center for Health Market Innovations</u>	Parallel B.2 – <i>Conference Room, Ground Floor, Block A</i> Disruptive Innovation in Industry and Agriculture: Impact on labor markets <u>International Management Institute</u>	Parallel B.3 – <i>Conference Room, Third Floor, Block A</i> Japanese Award for Outstanding Research on Development on ‘Skills Development and Employment Generation’ <u>Global Development Network</u>
16:00-16:30	Networking break – tea & coffee		
16:30-18:00	Plenary 2: Innovation in the Global South <i>Auditorium, Ground Floor, Block B</i> Chair: Howard White , CEO, Campbell Collaboration <ul style="list-style-type: none"> - Chandan Bhavnani, Executive Vice President, Responsible Banking, YES BANK - Shenggen Fan, Director General, IFPRI - Anil Gupta, Founder, National Innovation Foundation - Sonal Shah, Executive Director, Beeck Center for Social Impact & Innovation - Alix Zwane, Chief Executive Officer, Global Innovation Fund 		

23 March 2018 – 9:30 AM to 6:30 PM

8:30-9:00	Conference registration		
9:00-9:30	Keynote address: Jobs, the Informal Sector and Livelihoods for the Poor in the Digital Age <i>Auditorium, Ground Floor, Block B</i> Stefan Dercon , Academic Director, Pathways for Prosperity commission		
9:30-11:00	Plenary 3: Digital Transformations and Applications to Development <i>Auditorium, Ground Floor, Block B</i> <u>Chair: Dinesh Abrol</u> , Professor, ISID <ul style="list-style-type: none"> - Alan Gelb, Director of Studies, Center for Global Development - Nnenna Nwakanma, Senior Policy Manager, World Wide Web Foundation - Parminder J. Singh, Executive Director, IT for Change - V. K. Singh, Chief Executive Officer, Innovatiocuris 		
11:00-11:30	Networking break – tea & coffee		
11:30-13:00	Parallel C.1 - <i>Auditorium, Ground Floor, Block B</i> Facilitating STI for the SDGs: Experiences in India, Rwanda and Vietnam <u>JICA Research Institute</u>	Parallel C.2 – <i>Conference Room, Ground Floor, Block A</i> Including the poor in the digital age <u>Pathways for Prosperity: Commission on Technology and Inclusive Development</u>	Parallel C.3 – <i>Conference Room, Third Floor, Block A</i> STI, Industrialization and Employment <u>Institute for Studies in Industrial Development</u>
13:00-14:00	Conference lunch - <i>Meeting Hall, Ground Floor, Block C</i>		
14:00-15:30	Parallel D.1 - <i>Auditorium, Ground Floor, Block B</i> Digitalization and the Future of Manufacturing in Africa <u>Overseas Development Institute</u>	Parallel D.2 – <i>Conference Room, Ground Floor, Block A</i> Evidence for labor market interventions <u>Campbell Collaboration</u>	Parallel D.3 – <i>Conference Room, Third Floor, Block A</i> Ethical perspectives on STI systems <u>Global Development Network</u>
15:30-16:00	Networking break – tea & coffee		
16:00-17:30	Plenary 4: Policy Frameworks for STI and SDGs <i>Auditorium, Ground Floor, Block B</i> <u>Chair: François Bourguignon</u> , Professor, Paris School of Economics <ul style="list-style-type: none"> - Bill Colglazier, Senior Scholar, Center for Science Diplomacy, American Association for the Advancement of Science - Frédéric Jenny, Chairman, OECD Competition Committee - Ajay Mathur, Director General, The Energy & Resources Institute - István Mikola, Minister of State for Security Policy and International Cooperation, Government of Hungary - Guillermo Perry, former Minister of Finance, Government of Colombia 		
17:30-18:30	Conclusion & Japanese Awards Prize Ceremony		