
1. **How will new and emerging telecommunications/ICTs impact both the internet and sustainable development, including the digital economy?**

   The digital economy is characterized by “Economic output derived solely or primarily from digital technologies with a business model based on digital goods or services”. According to UNCTAD’s 2019 Digital Economy Report, in 2018, digitally deliverable service exports amounted to $2.9 trillion or 50 per cent of global services exports. In LDCs, such services accounted for an estimated 16 per cent of total services exports, which reflects a triple growth when compared to valuations in 2005. The most promising feature of ICT’s and Telecommunications is its ability to offer all stakeholders a platform to traverse different boundaries and gain access to new opportunities that were not previously possible. For example, E-commerce is a digital platform that employs ICT effectively to connect manufacturers and consumers without regard for geographical constraints while simultaneously facilitating global trade activities.

   At the same time, new and emerging telecommunications are also changing the traditional industry models. Emerging technologies such as digital design and 3D printing, which are based on the development of ICT, are constantly increasing the attention to the needs of consumers or users, thus promoting the transformation of traditional manufacturing to customized production.

   Aided by Big Data and Artificial Intelligence (AI), companies can now reach their customers with highly individualized communications across both, digital and analogue channels. An increasing number of business activities are been progressively digitalized. For example, marketing, sales and customer services, are rapidly shifting towards digital platforms, mobile apps and social networks. This has two-sided implications. On the one hand, its effects on how business reach their customers. On the other, it affects the customers’ decision-making process.

   The new digital technologies capacity to collect, process and to convert customer behavioural data into digital profiles is also allowing companies to go beyond personalized advertisement and to offer products and services tailored to individual customer needs.

   International organizations should play a more participatory role for leveraging from the wide range of digital technologies. In this sense, it is the convergence and growing integration of digital technologies what is promoting a paradigm shift with enormous economic, social and environmental
impacts to the economy at large. UNIDO, for example, has made important strategic alliances to develop joint initiatives related to supporting countries digitalization efforts.

2. What are the opportunities and challenges for the adoption and growth of the new and emerging telecommunications/ICTs and internet?

In the world of ICT and telecommunications, it is crucial to recognize that data has become the new economic tool for creating value. In every value chain, the ability to collect, store, analyse and transform data brings added power and competitive advantages. Digital data are core to all fast-emerging digital technologies, such as data analytics, AI, blockchain, IoT, cloud computing and all Internet-based services. Further, data-centric business models are witnessing an ever-increasing adoption by companies across various sectors.

On the contrary, it is very likely that developing countries in the global “data value chain”, will find themselves in subordinate positions, with value and data being concentrated in a few global platforms and other leading enterprises. Countries at all levels of development risk becoming mere providers of raw data to those digital platforms while having to pay for the digital intelligence produced with those data by the platform owners. Safety & Security issues brought by informatization are also worthy of attention.

Another prominent challenge will involve the adaptation of existing policies, laws and regulations, and/or the adoption of new ones in many areas. In many countries, the digital economy and its implication are unchartered territory. It is evident that current policies and regulations have not kept up with the rapid digital transformations taking place in economies and societies.

Particularly, the dissemination and adoption of new digital technologies could be stopped or boosted by the quality infrastructure (QI) system and regulations in place. With regard to QI, this transformation is demanding systemic changes; in not only developing new capabilities, new standards, and new techniques to deal with accelerated technological evolution, but a change of mindset. Artificial intelligence and machine learning, for example, have introduced important challenges for both authorities and businesses. Specifically, how could a product that is constantly changing be certified, a product that continues to learn throughout its useful life? What are the most appropriate units of measure to quantify and calibrate artificial intelligence products and services?

Amidst the new digital technologies, in what way and under which methods can authorities and companies analyze, measure, evaluate, inspect and certify that their products and services comply with international quality standards? How new international standards should be developed? How are countries certification and conformity assessment bodies preparing to meet these new challenges? How can governments guarantee that new products and services are safe for the consumer and the environment of local and global markets? In this sense, these questions force to reflect on how each one of the five pillars of QI (metrology, standardization, accreditation, conformity assessment, and market surveillance) must evolve to continue strengthening market access and the integration into the global value chains.

While conformity with standards is oftentimes voluntary, regulations are by nature mandatory. Therefore, QI can lay solid foundations for both developing and enforcing new regulations highly needed for the adoption of new technologies. In other words, only through standards regulators can introduce new guidelines to encourage innovation. In this connection, countries are compelled to address both themes with equal importance.
ICT infrastructure remains a critical challenge even with the advent of the new promising 5G expansion. The 5G is expected to unleash a massive IoT (Internet of Things) ecosystem where networks can meet the communication needs of billions of connected devices, with the correct compensations between speed, latency and cost. However, for example, mobile network operators will need to operate a new frequency spectrum (6 - 300 GHz), which means also a need of massive investments in the network infrastructure. In addition, it will require improving connectivity base station using optical fibers. Therefore, the dissemination and capacity building tools and approaches for fostering investment promotion and partnerships on required infrastructure acquire special relevance.

In addition, demographic change, the polarization of the work force and changes in FDI are also challenges for developing countries.

However, the adoption and development of new information technologies will also bring unprecedented opportunities for developing countries. One of the most important opportunities is that through capacity building, technical cooperation, appropriate regulatory and policy guidance, and partnership, developing countries will have the opportunity with lower entry barriers to leapfrog into high value-added areas.

2. How can governments and the other stakeholders harness the benefits of new and emerging telecommunications/ICTs?

If not adequately managed, new and emerging technologies adoption could further exacerbate the existent inequalities between and within countries or have only a short-term effect. Hence, countries are compelled to choose a far-reaching, inclusive and constantly changing strategy to adopt and benefit from new technologies.

Governments should support the transition to the digital economy by developing effective national policies that play a vital role in value creation and capture in the digital era. The cross-sectoral nature of digitalization requires governments to select and focus their intervention that will secure benefits for all but also deal with challenges. Key areas where policy gaps need to be fulfilled include data protection and security, cross-border data flows, competition, taxation and trade. Emerging ICT technologies require reliable infrastructure to ensure all stakeholders can harness the benefits offered by these technologies. However, this is currently a major challenge in developing countries (especially in rural and remote areas). Hence, Governments must explore the creation of incentives (such as PPP’s) to attract relevant stakeholders in the establishment of infrastructure that provides access to these technologies in the aforementioned areas. Governments can also employ emerging telecommunications/ICTs to increasing the efficiency of their administrative procedures/services offered - thereby transition to an e-government ecosystem. In addition, reeducation to enhance the capabilities required for the application of new technologies, and establishment of innovation ecosystems at the national and regional levels are effective ways for governments to maximize the advantages of emerging telecommunications/ICT technologies as well.

More specifically, UNIDO considers small and medium-sized enterprises (SMEs) to be the key facilitators of industrial development as they act as economic building blocks for developing countries and create employment and services that directly affect local communities. Combined with ICTs, SMEs can become operational tools for improving the economic globalization process and foster sustainable development. In this context, governments should adopt enabling ICT policies that support investments by SMEs to facilitate industrial development.
UNIDO also signed recently a MoU to collaborate with NEC for deploying ICT solutions to empower SMEs capacities and development. Collaborations and linkages will maximize on synergies to find value on the use of technologies and minimize duplication of work through opportunities for cooperation with relevant international, regional and multilateral organizations.

In another example, UNIDO, with funding from the Austrian Development Agency (ADA) and in close cooperation with local public and private sector representatives, has developed a network of Business Information Centers (BIC) in eight Districts of Uganda. The main objective of the UNIDO BICs programme is to use ICT and relevant business information for the development of local entrepreneurial skills. The programme aims to promote local private sector competitiveness by increasing productivity, industrial innovation capacities and employment generation. The BICs are usually set-up as a joint venture between public and private sector institutions and provide a central access point for SMEs. They cater, on a demand-driven and self-sustainable basis, to the needs of SMEs. BICs offer entrepreneurial advisory services, access to relevant business information and reliable Internet, technology and ICT training, as well as assistance in establishing linkages to local, regional and international markets.

Energy supply is a basic prerequisite for sustainable development yet most of the rural populations in countries have no access to grid electricity, for example in Kenya an estimation is at 63% by Kenyan Government rural electrification agency. Most of these areas are lightly populated making it extremely inefficient for the development of electricity grid energy thus decentralized (off-grid) ICTs were more suitable. UNIDO in partnership with the Government of Kenya identified the need to harness and enhance the use of these off-the-grid renewable energy technologies to produce power for use in domestic lighting and productive income generating applications.

UNIDO also worked on a project in Morocco with the aim of creating green jobs by promoting clean technology innovations and entrepreneurship through the development of a clean-tech innovation platform and accelerator programme. Through this project, Morocco’s national capacity was reinforced to support and promote clean technology innovations through using advanced ICTs, which were compatible to the innovations and contributed to the success of the project.

UNIDO is supporting Lebanon's gradual shift towards a clean energy transition through a programme for promoting innovation and entrepreneurship (gradual phasing out from fossil fuels by switching to renewable energy sources) and circular economy principle. This project will enhance building of ICT infrastructures for clean energy generation, storage and regulation. Construction of these ICTs promote collaboration amongst ICT experts, researchers, academia, engineers and technical experts through collaborative research, ICT projects, exchange of experiences and knowledge sharing.

3. **What are the best practices for promoting human skills, institutional capacity, innovation and investment for new and emerging telecommunications/ICTs?**

To facilitate human skills and institutional capacity development for new and emerging telecommunications/ICTs it is imperative that foundational knowledge on these technologies be introduced as early as possible within education systems. In some cases there may be strong requirement to revamp outdated pedagogical tools by employing innovative technologies (such as AR and VR) displaying to stakeholders (especially youth and women) the power of ICT and telecommunications.
UNIDO supports the development of entrepreneurial culture and skills through improving the performance of public services for businesses to create an environment where entrepreneurial actions are rewarded. Using a bottom-up growth strategy for poverty reduction, UNIDO introduces practical entrepreneurship curricula at secondary and vocational training institutions in some countries, particularly targeting the development of entrepreneurial skills among young people, both girls and boys, before they enter into the workforce. This is enriched through elements of ICT training, combining the basics of entrepreneurship with practical experiences in the use of new technology and thus preparing young people for key labor market requirements and an increasingly networked information society.

The creation of an innovation incubator network is a novel platform that will offer young start-ups and SMEs to explore their innovation potential; test new ideas; and most importantly attract investors to take their products/services to global markets.

UNIDO is consistently contributing to capacity-building, boosting innovation and investment promotion. For example, there is a project in Shanghai for boosting Intelligent Manufacturing Technology and its Application in SMEs. The project organizes trainings activities through “Training-of-trainers” program on Digital Design / 3D Printing, with the purpose of promoting those advanced manufacturing technologies into Shanghai and then to be scaled up and replicated in other parts of China and developing world.

An essential factor in ICT development understands the environmental context. It is important to engage with the project beneficiaries who will use the technology, and with the community that will be served. Learn their issues and their needs so that you can design a technology solution that fits their problem. For example, UNIDO is working on a project for Belarus leveraging potential of the new technologies for smart manufacturing through the application of digital and convergent technologies for developing intelligent, autonomous and decentralized enterprises and integrated products and services leading to smart products, enterprises, smart manufacturing and smart industry. This project has a widespread impact in all industrial sectors because it seeks to develop ICT infrastructures that are compatible to the transition into the Fourth Industrial Revolution.