Leveraging ICT for Sustainable Development Goals: Opportunities and Challenges

Yash Kanunga, Prachi Shahdeo, B Sahil Raghav Subudhi, Manas Khetriwal, Aswin Anand R, Dr.Priya Makhija

Business & Management, JAIN deemed to be University- Centre for Management Studies

Abstract- This paper is aiming at illustrating the potential of ICT for achieving the Sustainable Development Goals which were declared by the United Nations in 2015 as binding for all nations of our planet addressing both developing and developed countries. ICT must play a significant role if the SDGs should be achieved as projected in 2030. The impacts of ICT on sustainability are twofold: On the one hand, there might be negative effects on sustainability such as the generation of electronic waste, on the other hand, ICT is an enabler of more efficient resource usage, education, and business operations which is the critical success factor for achieving the SDGs. This paper's goal is to examine several ways that the information, communication, and technology sector thinks it may help accomplish the SDGs. The article describes the elements of the sustainable development idea and the relationship between ICT and sustainable development.

INTRODUCTION

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" is the most commonly cited definition of sustainable development. But it's true that "different people have different ideas about what sustainable development means" (Aras & Crowther, 2008). There are a number of definitions that are primarily centered on ecological principles, while other definitions emphasize social and economic development in addition to environmental objectives and strive for justice in the satisfaction of human needs. However, there is a difference that is frequently drawn between "strong" and "weak" sustainable development. The former refers to programs and initiatives for sustainability that are created within the current social and economic framework, while the latter Is linked to far more radical changes for both economy and society

A wide word used to refer to all technologies used to modify and transmit Information electronically Is Information and communication technology (ICT). The integration of computing, communications, and audio-visual media into a single system is referred to as convergence. ICT includes the software (applications and programs) and hardware (physical devices) needed to store, transfer, process, and manage data and information.(Alexandre Tourre -2017)

Almost every element of contemporary life has been impacted by ICT, from how we work and communicate to how we get information and enjoyment. Innovating and influencing how we engage with technology and information in the digital age, is still evolving quickly.

A wide term used to describe technologies used to handle and transmit information electronically is "information and communication technology" (ICT). It combines telecommunications and information technology (IT), making it a broad discipline that includes many facets of contemporary technology and communication. Sunghee Kim (Earth Institute-2018)

The Sustainable Development Goals (SDGs), commonly referred to as the Global Goals, are a group of 17 interrelated, all-encompassing objectives that were adopted by the UN in September 2015. These objectives were set up to tackle some of the most important issues facing the world today and to direct global efforts toward a more sustainable, just, and prosperous future for all. The Sustainable Development Goals (SDGs) expand upon the previous Millennium Development Goals (MDGs) by incorporating environmental, social, and economic aspects. (Dr. David Hollow-2013)

This research offers the basis for ICT firms seeking to answer these questions in order to participate in this global endeavor in a quantitative way. Its objective is to provide a framework for mapping IT solutions to

SDs, analyzing their impact, and thereby investigating how ICT enterprises might have a meaningful impact on the attainment of these goals.

While the expansion of the digital economy has the potential to significantly benefit global economies, it has raised concerns regarding the well-being of society and the environment as a result of automation and disruptive technologies in this era of digitalization. (Shiv Bakhshi -2020)

In today's economic landscape, digitalization and sustainability are two of the most powerful influences. Each has spawned a huge body of research into how it affects various aspects of people's lives. Notwithstanding, the effect and crossing point between the two remaining parts to a great extent undiscovered examination region.

This paper aims to audit the effect of ICT on the economic turn of events. It demonstrates how ICT can be used to accomplish each of the seventeen Sustainable Development Goals.

In addition, the paper presents the strong correlation between ICT and sustainable improvement. In addition, it discusses the essential means by which nations can advance toward sustainable development and provides examples of key programs and initiatives through case studies of selected nations. (Elizabeth Zehe-2017)

This paper encourages policymakers to integrate ICT policies addressing social and environmental issues into their national frameworks and strategies to move toward a digital future that is both inclusive and sustainable.

The term "digital economy" refers to "a global network of economic and social activities enabled by information and communication technology (ICT)." In a summit that took place in New York in 2015, 193 nations agreed to the United Nations' agenda for sustainable development by 2030. During the summit, a new framework with 169 targets and 230 indicators was proposed. A comprehensive framework serves as the foundation for the 17 sustainable development goals and the associated targets. These goals aim to address a wide range of environmental, social, and economic issues, such as climate change, energy conservation, food security, gender equality, healthcare, education, and fostering economic growth. (Martin Schaaper-2018)

The well-known Millennium Development Goals (MDGs), which were established in 2000, serve as a foundation for the Sustainable Development Goals (SDGs). The new SDG structure benefits broadly from the past encounters acquired and recognizes holes and deal upgrades.

Even though none of the 17 sustainable development goals specifically mention information and communication technology (ICT), it has been demonstrated that ICT can significantly accelerate the development progress of countries, bridge digital gaps, and build inclusive and knowledge-based economies. For these reasons, leading ICT companies have suggested that their sector can play a crucial role in achieving the SDGs. Ericsson president Hans Vestberg stated, "Information and communication technology offer an incredible platform for achieving SDGs. , (Dr. Silvia Montoya)

To use ICT effectively to achieve SD, many challenges in using ICT need to be addressed.

ICT can lead to a loss of trust through the rise of fake news, hate speech, cyberbullying, and fraud, especially on social media sites with lots of data. Data breaches, uncertainty about how personal data is used, cybercrime and surveillance, and a lack of trust can hinder ICT adoption. Policymakers today face a major challenge to maximize the opportunities presented by the digital revolution while ensuring the safety of their citizens. In particular, the vulnerabilities women face online often lead to offline intimidation, harassment, and. Attitudes toward state surveillance are often culturally determined. In some countries, this is considered an unacceptable personal intrusion, while in others it is accepted as an unavoidable aspect of maintaining law, order, and social stability. Ultimately, it comes down to the legal borders of the states. Either way, the desired transparency is part of the answer. IoT and big data analytics make data protection a serious issue. Data may be collected from sensors and devices on your network without your knowledge or consent. With analytics and AI, data can lead to the classification and re-identification of people, discrimination, exclusion, unfair treatment, and inequality of opportunity. Another major area of concern is cybersecurity. The more people and devices you connect, the greater the risk and impact of a data breach. Many LOT devices lack security features, and if the device is compromised, hackers can eavesdrop on your conversations through the built-in microphone of your smart.

AI, blockchain, 3D printing, and other cutting-edge technologies raise ethical, legal, and accountability challenges. For example, biases in datasets and AI applications can perpetuate existing inequalities and unfairly exclude underrepresented groups. Issues of responsibility for consequences of decisions made by AI systems and how injured parties can seek redress need to be considered. Blockchain needs to consider how to recover damages in the absence of a central authority. ICT, especially AI and LoT, can displace workers and cause unemployment Finally, there are concerns about the uneven growth of ICT, leading to a widening digital divide despite apparent absolute growth. This can exacerbate economic and social inequalities, as ICT is primarily available to people with resources and skills. In short, SD represents a complex problem-solving task, but many challenges in using ICT need to be addressed. These challenges can hinder ICT adoption and undermine efforts to meet SD goals. We need to work together to ensure that the benefits of ICT outweigh the risks and take steps to minimize the risks.

REVIEW OF LITERATURE

ITU's work focuses directly on building the infrastructure (SDG9) upon which the implementation of the other 16 SDGs will rely, in particular SDG 13 (Climate Change) and SDG 11 (Sustainable Cities and Communities). Collaboration, cooperation, and coordination of effort with other organizations are key, both to avoid duplication of effort but also to pool resources and bring our distinct competencies to bear. Consequently, in the context of SDG 11, ITU took the initiative in 2016 to further collaborate with other United Nations agencies and programs through the "United for Smart Sustainable Cities" initiative (U4SSC) which serves as the global platform for smart city discussions and activities. ICT is the most powerful new tool we have for solving the world's major challenges—ending poverty and hunger, ensuring universal access to basic services, and making the transition to a low-carbon economy. Past generations were empowered by steam engines, the telegraph, automobiles, aviation, and mass communications. Ours benefits from the extraordinary surge of information brought by the Internet and the breakthroughs, immediacy, and flexibility enabled by mobile broadband—the main focus of this report. ICT is capable of strengthening the means of implementation for the SDGs by fostering international cooperation and coordination, promoting technology transfer and capacity building, strengthening multi-stakeholder partnerships, and enabling data monitoring and accountability. Information and Communications Technology (ICT) serves as a support structure for all of the 17 Sustainable Development Goals (SDGs), helping bring about their advancement towards meeting targets, especially the universal coverage of basic services in the areas of health, education, finance, and energy. ICTs are able to achieve results at a scale, speed, quality, accuracy, and cost not imaginable just a decade ago. They are meant to deliver quality goods and services in the areas of health care, education, finance, commerce, governance, and agriculture, among others. They help to reduce poverty and hunger, boost health, create new jobs, mitigate climate change, improve energy efficiency, and make cities and communities sustainable.

Information and Communication Technologies (ICT) are considered a cross-cutting tool that contributes to meeting the global challenges set out in the Sustainable Development Goals (SDGs). However, in many countries, there is still a significant connectivity gap between cities and rural areas. Technological progress has been instrumental in specifying climate change, as well as finding appropriate ways to deal with it. Advancements in science and technology-enabled great improvements in health, transportation, energy solutions, and connectivity, among others. Technological progress has also been a major enabler of globalization by boosting international trade and financial integration, as well as allowing for better and cheaper long-distance communication and real-time exchanges of data and information, bringing people closer and promoting the sharing of ideas. Technological innovation plays a key role in improving economic development, facilitating social inclusion, and allowing better protection of the environment. ICTs are specifically considered as a means of implementing the Sustainable Development Goals (SDGs), highlighting their transversal transformative potential. The expansion of information and communication technologies and global interconnection have great potential to accelerate human progress, overcome the digital divide, and develop knowledge societies. This has

justified my interest in this research. The emergence of numerous innovations promotes the development of information and communication technology (ICT) in many countries and changes the way government services are delivered to the citizens. By leveraging ICT advancements, the traditional landscape of government services has shifted towards enhancing the well-being of citizens through sustainable development. A strong organization is important to the successful implementation of E-government initiatives and the use of online services that foster sustainable development. An organization must be properly designed to make it function and work across government to transform the bureaucratic processes, break down silos, eliminate dysfunctions and contradictions in existing structures, as well as promoting holistic and innovative thinking. Sustainability and digitalization stand as major trends shaping the economy and society. The nexus amid both domains foreshows outstanding, yet untapped, opportunities to foster a transformation towards sustainable development (Osburg and Lohrmann, 2017). Paradoxically, sustainability challenges remain unanswered (Köhler et al., 2019). Indeed, environmental and social landscapes are hugely worsening, showing a glaring sustainability gap (Seele, 2016a).

RESEARCH GAP

Science and technology will be required to bring about transformative change in the economy and society, as well as to provide new solutions to a specific problem. The use of technology to achieve SDG can boost productivity, improve healthcare and education services, open up new markets, and spur economic growth. In order to take advantage of the socio-economic benefits offered by cutting-edge technologies, the necessary technological infrastructure and research and development capabilities are required.

OBJECTIVE

The use of information and communication technology (ICT) in the Sustainable Development Goals (SDGs) is an important strategy in our rapidly developing world. Information and communication technology has the potential to accelerate progress toward the Sustainable Development Goals by improving communication, data analysis, and access to information.

1. Bridging the digital divide:

One of the most important goals is to reduce the digital divide by ensuring that ICT infrastructure and connections are accessible to all, especially in remote and underserved areas. This means expanding broadband access, promoting affordable internet services, and providing digital literacy programs to give people the skills they need to use information and communication technologies.

2. Improve education:

ICT can revolutionize education and lifelong learning. By integrating technology into classrooms, students can access high-quality educational content, take online courses, and collaborate with others around the world. The aim is to improve the quality of education and promote opportunities for lifelong learning.

3. Promotion of economic growth:

ICT promotes economic growth by facilitating entrepreneurship, innovation, and e-commerce. Governments and organizations can promote digital entrepreneurship by supporting start-ups, creating a favorable regulatory environment, and providing financial incentives to ICT companies.

4. Ensuring environmental sustainability:

The use of information and communication technology in environmental sustainability requires the use of technology to control and manage resources more effectively. Smart grids, sensor networks, and data analytics can help reduce energy consumption, minimize waste, and promote sustainable practices in sectors such as agriculture, transport, and manufacturing.

5. Improve access to health services:

ICT can improve the availability and delivery of health services through telemedicine, health information systems, and remote monitoring. The goal is to use technology to provide health services to underserved populations, improve medical information management, and improve disease surveillance.

FINDINGS AND SUGGESTIONS

ICT encompasses a wide range of technologies and tools, including the Internet, mobile devices, and data analytics, which can be used to address the complex challenges presented by the Sustainable Development Goals. This Paper examined how information and

communication technologies can contribute to the achievement of sustainable development goals, focusing on specific examples and references.

ICTs have nearly completely taken over the world, improving people's lives, careers, and relationships with one another and their governments. ICTs play a part in sustainable development, which drives economies, promotes green growth, enhances health and education, strengthens civic engagement and accountability, and improves readiness for disasters. People from all societal strata are now able to profit from progress thanks to mobile phones and Internet services. Nonetheless, the reports contend that technology can exacerbate the gaps that exist between the affluent and the poor, women and men, and underprivileged populations and the general public. Both of these developments are evident.

ICT for poverty eradication (SDG 1)

The goal of Sustainable Development Goal 1 is to eradicate poverty in all its forms by 2030. ICT can help achieve this goal by providing information, education, and economic opportunities to marginalized communities. For example, mobile banking services have given millions of people in developing countries access to financial services and save money securely. The success of M-Pesa in Kenya is a notable example (Jack and Suri, 2014). In addition, online education platforms such as Khan Academy and Coursera have provided quality education to individuals worldwide, leveling the playing field and increasing economic opportunity (Christensen et al., 2017).

The SDGs clearly pledge to "leave no one behind" and explicitly state that equity is a cross-cutting goal. Unfortunately, a lot of the differences that separate people are concealed because of a little information. This makes it more difficult to identify people who could be left behind. Therefore, policymakers are increasingly using ICTs to enable "big data" solutions in addition to enhancing official statistics. To identify who and why individuals are left behind from the gains of social and economic progress, big data solutions are crucial for reaching the most marginalized.

ICT for hunger and food security (SDG 2)

Agriculture (including farming, fishing, cattle, forestry, etc.) and rural development can be enhanced by applying creative ICT applications in the rural domain. Enhancing the availability of important data and expertise may support agricultural stakeholders in making wise choices and utilizing the resources at hand in the most sustainable and fruitful manner. The Food and Agriculture Organization (FAO) is creating and implementing innovative methods for encapsulating and distributing digitally enhanced services to address hunger and nutritional deficiencies, decrease destitution, enhance food sovereignty, boost earnings, enhance adaptability, and lessen the consequences of global warming.

SDG 2 aims to end hunger, achieve food security, and promote sustainable agriculture. ICT can support this goal through precision farming techniques. Remote sensing technologies such as satellites and drones combined with data analysis can monitor crop health and provide valuable information to farmers (Krupnik et al., 2019). In addition, mobile applications such as FarmCrowdy in Nigeria connect investors with smallholders, facilitating investment in agriculture (Akinboro et al., 2020).

ICT for health and well-being (SDG 3)

SDG 3 aims to ensure healthy lifestyles and promote well-being for all. ICT has played an important role in improving the availability and provision of health services. Telemedicine platforms such as Teladoc and Doctor on Demand allow patients to consult with healthcare professionals remotely (Smith et al., 2015). In response to the COVID-19 pandemic, contact tracing applications such as TraceTogether in Singapore have helped contain the spread of the virus (Ferretti et al., 2020).

ICT for quality education (SDG 4)

ICTs are now cheaper in many nations due to their rising power and decreasing cost, which have sped up the spread of digital gadgets and applications. With ICTs, nations can close a number of gaps. In a "leapfrog" manner. The cost of implementing cutting-edge services across industries is also being greatly decreased by ICTs. In high-income nations, ICT-enabled cost-saving service delivery models are already transforming, if not completely upending, the education sector. In low-income nations, they are also making it possible for creative digital services that are crucial to the operation of educational systems.

The goal of SDG 4 is to ensure inclusive and equal quality education for all. ICT has revolutionized education by providing learning materials online. The One Laptop per child (OLPC) project provided laptops to children in developing countries, improving their access to educational materials (Warschauer et al., 2014). Massive OpenOnline Courses (MOOCs) such

as edX and Udacity have democratized education by offering courses from the world's leading universities (Holland and Tirthali, 2014).

ICT to promote gender equality (SDG 5)

SDG 5 focuses on achieving gender equality and empowering all women and girls. TVT can help close the gender gap by providing information, education, and economic opportunities to women. For example, initiatives such as India's Digital Green project use video and mobile technology to train women farmers and increase their agricultural knowledge (Nagawarapu et al., 2016). In addition, organizations such as Women Who Code and Girls Who Code promote the participation of women in the technology industry.

ICT for clean water and sanitation (SDG 6) .

The utilization of technology will be crucial in accomplishing this challenging objective, not only in terms of its application in the construction and upkeep of water and sanitation infrastructure (such as faucets, not just in the more widespread use of ICTs to assist us in managing water itself—the resource that sanitation and hygiene depend on—but also in plumbing and toilets. Reliable information obtained and disseminated through ICTs is the foundation of good governance, which is necessary to manage uncertainty, lower the risks of overuse and pollution of water resources, and expand and maintain sanitation systems that have been shown to significantly limit the spread of illness.

SDG 6 aims to ensure access to clean water and sanitation for all. ICT can play a crucial role in water resource management and sanitation control. Sensor technologies can detect water quality and use, helping governments and organizations make informed decisions (Gude et al., 2015). Smart water meters used in Cape Town, South Africa help manage water resources efficiently (Zhou et al., 2016).

ICT for affordable and clean energy (SDG 7)

SDG 7 aims to ensure that everyone has access to affordable, reliable, sustainable, and modern energy. ICT can support this goal by optimizing energy consumption through smart grids and home automation systems. Smart meters and IoT devices allow consumers to monitor and manage their energy use (Lopes et al., 2011). In addition, data analysis can help facilities anticipate and prevent power outages.

ICT for decent work and economic growth (SDG 8)

SDG 8 aims to promote sustainable, inclusive and sustainable economic growth, full and productive employment, and decent work for all. ICT can boost economic growth by promoting entrepreneurship and facilitating remote work. Platforms such as Upwork and Fiverr connect freelancers with clients worldwide (Brynjolfsson and McAfee, 2014). Cloud-based collaboration tools such as Slack and Zoom enable remote teams to work efficiently (Chesbrough and Appleyard, 2007)

ICT for Industry, Innovation and Infrastructure (SDG 9)

SDG 9 focuses on building sustainable infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation. ICT is an integral part of achieving this goal through the development of smart cities, efficient transport systems, and advanced manufacturing. For example, Barcelona's smart city initiatives use ICT to improve city services and reduce environmental impacts (Rojas et al., 2016). Additive manufacturing, commonly known as 3D printing, has transformed the manufacturing industry by enabling rapid prototyping and reducing waste (Weller, 2018).

Information and communication technology to reduce inequality (SDG 10)

The field of migration and development can benefit greatly from the application of information and communication technologies. The use of information and communication technology can empower immigrants by giving them pertinent information about the immigration process to enhance their employability and enable them to transmit money swiftly and securely back home. Information and communication technology are essential, according to governments, for managing labor migration and facilitating cross-border travel.

SDG 10 aims to reduce inequality within and between countries. ICT can promote social inclusion and reduce the digital divide. Initiatives such as Facebook's Internet.org (now Free Basics) provide free access to essential Internet services in developing regions (Qazi et al., 2017). Governments may also provide grants for Internet access to underserved populations.

Information and Communication Technologies for Sustainable Cities and Communities (11)

SDG 11 aims to make cities and settlements inclusive, safe, resilient, and sustainable. ICT can improve city planning and management, making cities more efficient and livable. Intelligent transport systems,

such as London's Oyster card, streamline commuting and reduce congestion (Ferro and Calegari, 2007). In addition, IoT sensors can monitor air quality and traffic patterns, which contributes to environmental sustainability.

Information and communication technology for responsible consumption and production (SDG 12)

The goal of SDG 12 is to ensure sustainable consumption and production models. ICT can help individuals and businesses make informed consumption choices. Apps like GoodGuide provide information about the sustainability of products and help consumers make ecological choices (Lagö and Rockström, 2018). In addition, supply chain tracking with blockchain technology can increase transparency and reduce waste (Tian et al., 2018).

ICT for climate action (SDG 13)

From data gathering to information distribution, ICTs can significantly improve weather information services. Advanced ICTs could also help the "weather enterprise" along its whole value chain.

1. Connecting the functional seamless global prediction system with a complex decision-making environment.
2. Improving observation and developing new observational systems.
3. Future technologies for a new seamless global prediction system

SDG 13 addresses climate change and its impacts. ICT can help with climate monitoring, modeling, and mitigation

CONCLUSION

There are many aspects of society in which technology diffusion can be accelerated in support of the SDGs, in areas such as healthcare, education, financial services, energy, and combatting climate change. The report states that developed countries need to revisit how ICT investments are supporting their sustainable development goals, while less-developed countries have an opportunity to shape services and policies more conducive to sustainable communities with the help of ICT. Also, policymakers and institutions play a key role in ensuring sustainable development growth and economic development

REFERENCE

[1] Acemoglu, D. and Restrepo, P. (2018) 'The race between man and machine: implications of technology for growth, factor shares, and employment', American Economic Review, Vol. 108, No. 6, pp.1488–1542.

[2] Bloom, D.E., McKenna, M. and Prettner, K. (2018) Demography, Unemployment, Automation, and Digitalisation: Implications for the Creation of (Decent) Jobs, 2010–2030, No. w24835, National Bureau of Economic Research.

[3] Colombo, M.G., Cumming, D.J. and Vismara, S. (2016) 'Governmental venture capital for innovative young firms', The Journal of Technology Transfer, Vol. 41, No. 1, pp.10–24.

[4] UN DESA, "E-Government for Sustainable Development", New York: UN DESA, (2017).

[5] International Institute for Applied Systems Analysis (IIASA), "TWI2050 Report: The Digital Revolution and Sustainable Development: Opportunities and Challenges", Laxenburg: IIASA, (2019).

[6] Shi, H., Chertow, M. and Song, Y. (2010) 'Developing country experience with eco-industrial parks: a case study of the Tianjin economic-technological development area in China', Journal of Cleaner Production, Vol. 18, No. 3, pp.191–199.

[7] https://www.sciencedirect.com/science/article/abs/pii/S2352550920307983

[8] Adeeb A Kutty, Galal M Abdella, Murat Kucukvar, Nuri C Onat, Melih Bulu Sustainable Development 28 (5), 1347-1365, 2020

[9] University libraries-bridging digital gaps and accelerating the achievement of sustainable development goals through information and communication technologies (ISSN: 2042-5945Article publication date: 2 January 2018)

[10] Empowering Shepreneurs to Achieve Sustainable Development Goals: Exploring the Impact of interest-free Start-up Credit, Skill Development and ICT Use on Entrepreneurial Drive Saman Mazhar, Ali Sher, Azhar Abbas, Abdul Ghafoor, Guanghua Lin Journal of Business Research Volume 121, December 2020, Pages 283-314

[11] Unleashing the convergence amid digitalization and sustainability towards pursuing the Sustainable Development Goals (SDGs): A

holistic review Gema Del Río Castro, Maria Camino Gonzalez Fernandez, Angel Uruburu Colsa Journal of Cleaner Production 280, 122204, 2021

[12] Key factors for e-government towards sustainable development goals Mohamed Hairul Othman, Rozilawati Razali, Mohammad Faidzul Nasrudin Int. J. Adv. Sci. Technol 29 (6), 2864-2876, 2020

[13] https://www.researchgate.net/publication/361911725Impactsof information and communication_technologies_on_the_SDGs_the_case_of_Mayu_Telecomunicaciones_in_rural_areas_of_Peru

[14] https://www.researchgate.net/publication/307143490_The_Role_of_ICT_to_Achieve_the_UN_Sustainable_Development_Goals_SDG

[15] https://www.adecesg.com/resources/blog/an-overview-of-the-role-of-information-and-communication-technology-ict-in-each-of-the-sustainable-development-goals-sdg-part-two.

[16] B Frouws, M Phillips, A Hassan and M Twigt, Getting to Europe the 'WhatsApp' way, Danish Refugee Council and Regional Mixed Migration Secretariat, (Nairobi, 2016).

[17] Evidence-Based Infrastructure Development Framework; http://ebidf.org/

[18] http://www.fao.org/asiapacific/resources/e-agriculture/en/

[19] http://www3.weforum.org/docs/WEF_FOJ_Executive_Summary_Jobs.pdf