

# Exponential Technological Change and the SDGs

## *Cambio tecnológico exponencial y los ODS*

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### **Abstract:**

In this article, the author reflects on exponential technological change and its impact on SDGs compliance, emphasizes its importance and describes it as profound and universal. He points out that the future of humanity and its well-being depends on his orderly conduct. The author speaks of technology as the engine of sustainable development, offering extraordinary opportunities to increase well-being and achieve the SDGs. According to him, this achievement will depend on adapting the governance and regulatory framework to these accelerated changes, as well as investing (including emerging countries) in the sectors that promote compliance with the SDGs.



### **Resumen:**

El autor de este artículo reflexiona sobre el cambio tecnológico exponencial y su impacto en el cumplimiento de los ODS, hace hincapié en su importancia y lo califica como profundo y universal. Señala que de su conducción ordenada depende el futuro de la humanidad y su bienestar. Habla de la tecnología como el motor del desarrollo sostenible, que ofrece extraordinarias oportunidades para aumentar el bienestar y alcanzar los ODS. Su logro dependerá de la adaptación de la gobernanza y del marco regulatorio a estos cambios acelerados, así como de invertir (países emergentes incluidos) en los sectores que impulsen el cumplimiento de los ODS.



### **Key Words:**

Exponential technological change, sustainable development, technology, SDGs.



### **Palabras clave:**

Cambio tecnológico exponencial, desarrollo sostenible, tecnología, ODS.

# Exponential Technological Change and the SDGs

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The Sustainable Development Goals (SDGs) of the 2030 Agenda are an ideal vision of what humanity can aspire to achieve in the decade to come. Five years have already passed since this set of interdependent political, economic, social, cultural and environmental goals were adopted, backed by 169 targets and 232 indicators. Yet for the most part, the Agenda is poorly defined and quantified in terms of methodology, data and metrics, which constitutes a weakness in the broad consensus reached.

The United Nations (UN) is concerned because the global averages of these indicators are inevitably biased towards developed countries, because this is where the major higher education institutes and research and innovation centers are located. It is in these countries that most of our information, documents and studies are generated and then extrapolated to the rest of the world, making it difficult to discern which paths are effectively open to each nation as they strive to progress toward the SDGs, and which are untenable or could even be counterproductive.

While synergetic progress is the basis of the 2030 Agenda, concreting it internationally and nationally is a major challenge and a lot more complex than might appear, because the national interests and conditions of each country have historically taken precedence. Progress will not depend primarily either on the “goodness” of the SDGs or warnings of imminent catastrophic risks, but on what each country, region, city or industry perceives as “best” and “viable” for them at a given moment. In other words, the sustainability

of any strategy vis-à-vis the SDGs must necessarily go hand-in-hand with its immediate economic, social and political viability. Likewise, its benefits must be constantly assessed, interpreted and defended. The upshot is no one wants to or can progress in unison toward all the SDGs.

Even more difficult to keep track of is the scope of the SDGs, because the 2030 Agenda overlooked the impact, increasingly greater and decisive, of the exponential advances made by cutting-edge technologies; it neither understood nor explicitly recognized that these were changing, radically, rapidly and in the most unexpected of ways, the landscape of challenges and opportunities as regarded the SDGs, reason why Mexico has spearheaded a diplomatic movement to institute the universal need to gather relevant information on scientific and technological progress, study and correlate its preeminence for the achievement of the SDGs, widely divulge its potential and probable socio-economic impact, both positive and negative, and translate its implications into public policy. The Mexican initiative materialized in the form of the UN resolution on “Impact of Rapid Technological Change on the Achievement of the Sustainable Development Goals”,<sup>1</sup> and in the establishment of a science and innovation diplomacy.

## The Importance of Exponential Technological Change

The world has been slow to understand that it is up against an era of radical, exponential and universal technological change, on whose orderly harnessing the future and wellbeing of humanity hinge. This change comes on top of other highly disruptive global dynamics, such as global warming, the destruction of the environment, extreme inequalities, an aging population, cybersecurity, bioterrorism and nuclear war, to name just a few.

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<sup>1</sup> See UN General Assembly, “Impact of Rapid Technological Change on the Achievement of the Sustainable Development Goals”, A/RES/72/242, January 18, 2018; Economic and Social Council, “Harnessing New Technologies to Achieve the Sustainable Development Goals. Report of the Secretary-General”, E/2018/66, May 21, 2018; SRE, “Impacto del cambio tecnológico exponencial en el desarrollo sostenible y la paz”, A/72/234, October 17, 2017.

We find ourselves at a tipping point. No country can avoid or overcome these challenges alone. The future will be very different to the present and increasingly uncertain, be that for better or for worse. New technologies have colossal advantages, not least the capacity to combat poverty, hunger, ignorance, sickness, violence and clean energy shortages. They have the potential to unleash creative, collaborative forces and create equal opportunities and security for the world population. On the flipside, their irrational, belligerent, abusive or negligent use could result in social tragedies or even global catastrophes.

Our options are accelerated, ongoing technological and economic progress that leads to greater abundance and the achievement of the SDGs or the collapse of human civilization as we know it (with little likelihood of finding any middle ground). The outcome will depend on the orchestrated collaboration of the entire world, on the choices we make today. These matters require urgent attention, because the consequences of not doing anything would be just as or more immediate and devastating as predictions of global warming, which is something else we can only control by means of the rational use of technology.

So far, technology has evolved gradually, but we have now entered a phase of sudden, unpredictable, generalized and highly disruptive progress that is about to come crashing down on us like a tsunami, looming ever larger, ever more powerful and ever more relentless. The attributes of efficiency, speed, reach, capacity and synergy that characterize frontier technologies have followed a logarithmical curve, an exponential path. Their inexorable progress is imbedded in market forces and geopolitics. Every line of technological progress generates hundreds of products, services and procedures, stimulating innovation nodes and technological paradigms in a process of ramification that serves as a catalyst for future technological innovations.

The governments of the world's most powerful countries risk public funds on basic research and development, infrastructure, platforms and opportunities that entrepreneurs and venture capitalists exploit to create new industries, markets and returns, transforming the foundations and the horizons on which increasingly disruptive paradigms emerge at breakneck speed.

This progress is today driven by the digital revolution and artificial intelligence—the most immediate, far-reaching, irreversible, transformative

global forces ever created, affecting as they do every sphere of human life and encompassing the entirety of scientific discoveries, technological development and the innovation process. They bring with them valuable opportunities to improve social wellbeing and guarantee sustainable progress, but they also carry the seeds of major challenges and dangers, especially in light of the race countries and regions have embarked on to attain technological supremacy.

Internet and digitalization lower the cost of every transaction, promote greater efficiency, and grant easier access to users, innovators and the business community. All that can be digitalized can be reproduced accurately, limitlessly and universally. New products, services and markets pop up, accompanied by greater productivity and profits and, more importantly, the marginal cost of new units produced tends to be zero. This results in technological deflation, which, in turn, promotes the hyper-connectivity of the entire world, facilitating safe, efficient and sustainable transportation, and fostering the invention and wider-spread use of clean energies.

The problem is the world is not prepared for the disruptive power of these technologies and artificial intelligence. Our more developed nations are encouraging the rest of the world to adopt and apply the majority of these vanguard innovations, but even in these countries, the dissemination of such practices is highly irregular and, more often than not, controversial. A handful of corporations and economies promote them and benefit from their propagation, while the growing economic and digital gap threatens the most vulnerable, especially in developing countries.

There is a growing imbalance between the use of data, privacy, and the respective human rights on the one hand and geopolitical interests, security and national sovereignty on the other. The digital population is swelling, a prisoner of corporations and governments. In several countries, artificial intelligence has enabled round-the-clock surveillance of citizens, while the use of smart digital instruments to control society, impose self-censorship and manipulate public perception into legitimizing regimes is the most serious of all threats to democracy and freedom. In fact, as several academics have predicted, the dispute between liberal democracy, digital authoritarianism and, eventually, technological totalitarianism will define the twenty-first century and the future of humanity.

## Technology as a Driver of Sustainable Development

Despite the aforementioned challenges, there can be no denying the technological explosion is an extraordinary opportunity to achieve the SDGs and make quantum leaps in all spheres of human wellbeing. That said, it must be understood, adapted and harnessed as effectively as possible so as to minimize its inevitable negative impact, such as loss of jobs, greater inequality and the predominance of a handful of countries, corporations and social groups.

There is ample evidence of the labor sector's decreasing contribution to global GDP and a greater concentration of income in the wealthiest sectors of society. This can partly be attributed to globalization, financialization, speculation and the emergence of large digital corporations. By the same token, the lower a person's academic qualifications and labor skills, the lower their income. This reflects a failure to adapt human skills to the new jobs that are being created and the situation is worsening, unleashing a battle against obsolescence and redundancy, and resulting in increasingly marked inequalities. Countries and regions run the risk of entering a premature deindustrialization and becoming irrelevant in the global economy of the future.

Many economic models have sought to calculate the probable impact of new technologies on jobs and inequality. Unfortunately, they have not reached a consensus. We are at a loss when it comes to predicting the dynamics of displacement and the creation of new jobs, the continuance of others depending on their value and quality, and the viability of training and reconvertng the population in an effort to keep up with the pace of technological progress. Particularly worrisome is the lack of studies in developing countries—most are conducted in and focus on developed ones.

What is clear, though, is that the labor and emerging technologies markets will not stabilize in any part of the world. Artificial intelligence and digitalization have yet to realize their full potential. They will continue to have a relentless and accelerated disruptive impact in decades to come. Whether or not they benefit or are harmful to society will depend on our ability to rally international cooperation, strengthen multilateralism and introduce public policies that foster responsible and inclusive entrepreneurship.

We have left behind the old globalization and development model, grounded on traditional comparative and competitive advantages, and on stabilizing markets. The digital revolution has altered global value chains and industrialization has ceased to be the path to development and economic wellbeing. The new globalization is driven by the economy of knowledge and intangibles, with less participation by more traditional, manual trades. The current battle resides in absorbing, adapting and channeling artificial intelligence and the digital revolution toward the common good in each country and on a global level.

Reason why it is essential that we jump on the technological bandwagon and be sure to leave no one behind; that we close the gap between political perception of existing problems and the technological solutions we have at our disposal; that we understand, assess, communicate, protect and finance innovation missions to find solutions to specific problems; that we create maximum adaptability and technological response capacity; that we learn to learn and learn to innovate, so we are prepared for the future.

Few countries know how to use digital media to unleash the creative force of individuals and communities and generate positive innovation and technological development, especially among our most vulnerable populations. Likewise, few States understand that the relationship between innovation and growth is critical to all sustained economic development, but that it is not lineal.

There is a high and positive correlation between indicators like public and private spending on research, development and innovation. Good indicators of the strength of a country's scientific, technological and innovation capacities would appear to be the number of patent applications filed by residents and non-residents, the number of scientific articles and reviews it produces, and the number of researchers and technicians and research institutions it has. But these are not sufficient.

There are many international examples that prove the most important determining factors are the level of coordination and communication between the various actors in the innovation ecosystem, the horizontal circulation of knowledge and technological applications in an economy and the robustness of innovative enterprise. This combination of factors is more important than spending on research and development as a percentage of GDP.

Emerging countries like Mexico need to bolster their productive innovation ecosystem with the aid of impact entrepreneurship. This means business models should coincide with both the interests of investors and high levels of positive social and environmental impact, adjusted for risk. This is the response needed to move toward ethical capitalism and sustainable, inclusive development that creates equal opportunities and security, but it will hinge on how effectively governance and the regulatory framework can adapt to accelerated technological change. By way of example there are countries that have successfully taken steps toward the creation of highly innovative business and social ecosystems. In this case, innovation does not necessarily mean inventing cutting-edge technologies and systems, but absorbing existing ones and adapting them to national, local, sectorial and community needs.

## Challenges in the Decade to Come

Five years on from the adoption of the 2030 Agenda, progress has been very different from one country to the next, and from one SDG to the next. The COVID-19 crisis will leave the world economy weakened and globalization and its principles will be put to the test. Production chains and services will be altered, based on a national security logic that looks to commercial efficiency and international financing. The outlook for globalization is changing unpredictably, distorting the strategies deemed viable by each country to achieve the SDGs, hence the need for reliable, ordered data that can be shared by everyone.

The UN has set up an inter-agency task team on science, technology and innovation (STI) and a group of ten independent experts to support the Technological Facilitation Mechanism (TFM), both of which support the STI forum for the SDGs, which is collaborative and includes multiple stakeholders. This mechanism largely depends on the TFM online platform, which is still under construction. The development and use of this platform are a priority, especially for emerging economies and developing countries, and essential if we are to respond to the dynamics of technological change. We need to make sure the necessary resources are channeled into its completion, so we can collect data, information, studies and practices on exponential and traditional technologies and their impact.



Having sufficient, high-quality data on which technologies are being produced and which will be available commercially in the years to come—including their relative costs—will allow us to determine which problems we need to find solutions to and which technologies need to be developed, inhibited, adapted or modified for use, depending on their potential utility and socio-economic benefits or harm. The resulting information would be used to predict, assess and obtain feedback on the effectiveness of the strategies, models and incentives implemented to achieve the SDGs, and the usefulness of directives and roadmaps designed to incorporate STI into national plans and policies and international diplomacy.

Admittedly, the task of drawing up valid, universal directives and roadmaps is extremely difficult for the UN to accomplish. Efforts along these lines need to be conceived as fractal structures, invariant in scale, but developed and adapted by each individual country and region. This requires, firstly, vertical, bidirectional consultation systems, so we can understand the main problems and bottlenecks affecting each region and sector in a given country and prioritize solutions. Secondly, aside from the TFM online platform, the other platforms consulted should offer empirical experience as to the best international practices and visualize the most common bottlenecks and the satisfactory solutions found. Thirdly, we need to source sufficient financing to develop innovation ecosystems and impact entrepreneurship, strengthen education and training, and improve coordination between stakeholders.

The STI community can make a valuable contribution when it comes to addressing these challenges by perfecting a “technological toolbox” that draws on information from the platform and roadmap. An international scientific advisory ecosystem, matched with a national one, could help translate these efforts into regulatory, institutional and public policy adaptations;<sup>2</sup> into systems that foster public-private partnerships; incentives for venture capital to finance priority innovation missions and the promotion of impact entrepreneurship.

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<sup>2</sup> For example, the European Union and EU countries are implementing some of these ideas systematically, via high-level initiatives, an advisory group and a group of experts on the subject. Formed by companies and research, development and innovation experts responsible for decision making, the task of these groups is to come up with ideas and find solutions to specific problems.

## Final Considerations: The Path Forward

While it is true there is no “one size fits all”, it is also clear that in the most successful emerging countries, governments not only correct market deficiencies to provide certainty for the private sector, but play a leading role in basic R&D and the creation of infrastructure and markets for new products, services and procedures. They also concentrate institutional resources, investment and long-term financing in specific, quantifiable innovation missions.

The participation of governments is essential because they are in a unique position to mobilize resources, communicate with all actors in the innovation ecosystem and assume high-risk innovation projects, like the infrastructure and basic research required for technological progress—projects that the private sector would have neither the capacity nor the inclination to undertake. A prime example is the extending and guaranteeing of universal, reliable, accessible and affordable energy and Internet services, and training in the use of digital platforms for one and all.

Although it has been proposed many times, conditions are ripe today for the successful overhaul of flexible, adaptive programs that teach us to “learn to learn and innovate” with a more dynamic, effective business spirit, without leaving anyone behind. Unlike traditional entrepreneurship, impact entrepreneurship fosters the creation of companies whose products, processes, services and marketing methods incorporate ethical innovations. Such companies are scalable and, thanks to their global vision, participate in the creation of new markets and the consolidation of megatrends. They also create a large number of quality jobs and, more importantly, generate value circularly because, aside from creating economic paybacks in their environment, they modify it positively to the benefit of their community, the environment, employees and suppliers and, as you would expect, their investment partners and the industry they operate in.

This should be a key component of every strategy aimed at achieving the SDGs and is one that is within reach of virtually every country on the planet, but for such strategies to be successful, the international community and governments need to create the right financial, institutional, infrastructure, market and taxation conditions. We have another decade in which to implement the 2030 Agenda, reason why it is crucial we channel resources into sectors that promote the achievement of the SDGs more efficiently.