The Future of Work and Education in the Digital Age

T20 Recommendations Review

Draft // Work in Progress

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Version: 7 December 2018

Content

1. Overarching Narrative

-- to be completed and revised --

2. TF7: The Future of Work and Education in the Digital Age

Task Force Description

Several major technological transformations (e.g., artificial intelligence or AI, fintech, the Internet of Things, Industry 4.0) are putting the global economy on a new track. They will bring immense economic opportunities, such as new ways of doing business, new industries, new and better jobs, higher GDP growth, and better living standards. At the same time, they will create challenges for individuals, businesses, and governments. They are likely to change business models, patterns of comparative advantage, skill needs, the organization of work, and may further limit the room for maneuver of national policy. Policy actions are needed to harness the opportunities and ensure the benefits are shared by all. This Task Force will make recommendations on how to achieve well-balanced labor markets capable of matching the supply of and demand for skills in an environment of rapidly changing technology while reducing inequalities and promoting economic and social development. It also aims to provide policy advice to develop educational systems that promote equal opportunities, lifelong learning, and financial literacy. Finally, it aims to make recommendations in the areas of data security, so that the digital economy can be harnessed effectively to greatly improve prosperity and inclusiveness.

A. Employment - Implications of Technology Change for Labor Markets and Workplaces

Challenge

This Policy Brief (PB) will highlight a few issues related to the challenges of technical change for labor markets and workplaces.

Several major technological transformations (e.g., artificial intelligence (AI), Fintech, the Internet of Things, advanced manufacturing, and technology-enabled platforms) are putting the global economy on a new track. They will bring immense economic opportunities, such as new ways of doing business, new industries, new and better jobs, higher GDP growth, and better living standards. At the same time, they will create challenges for individuals, businesses, and governments. They are likely to change business models, patterns of comparative advantage, skill needs, the organization of work and may further limit the room of maneuver of national policy. Policy actions are needed to harness the opportunities and ensure the benefits are shared by all.

Working environments will be drastically changed. Many people can work at home which make it easier for women to access the labor market. Technology will make it easier to outsource labor to overseas markets. Competition in labor markets will change the desired quantity and quality of labor supply and wage rates. The PB will make concrete policy recommendations including role of governments.

Can history of development Asian style be repeated in Africa? With background that digitalization is creating monopolies

AI: how do we measure productivity?

AI: winner takes it all nature of that market.

[source: 2019 Japan T20, Description Task Force 7]

Policy Briefs / Literature

Automation / changes in labour-intensive production / global value chains

Antje Uhlig
Martín Rapetti
Ramiro Abrieu
Vikrom Mathur
Urvashi Aneja
Krish Chetty

[Technological Innovation and the Future of Work: A View From the South (T20 Policy Brief)](#)

A global narrative about technological change and the future of work is emerging. It states that technological innovation will be pervasive across the world, and the impacts on labor markets will be deep but largely transitory. Will the future of work look the same everywhere? On the one hand, evidence points to developing countries lagging behind in terms of technological diffusion and the re-skilling of their current and future workers. This could exacerbate development gaps with respect to advanced countries as has happened in

previous technological "revolutions". On the other, structural factors that are country-specific -such as demographics, factor endowments, gender gaps- may cause new technologies to have different impacts on labor markets. We believe that the menu of policy options that the G20 is developing should ideally start with country-specific diagnoses taking into account these structural factors. However, given that this may be unreachable in the short run, we recommend to start monitoring the trends in technological adoption and skills development in each G20 country. For this, more and better data is needed.

Ana Inés Basco
Belisario de Azevedo
Gustavo Belizu

[Harnessing the opportunities of inclusive technologies in a global economy (T20 Policy Brief)](#)

In this policy brief INTAL-IDB proposes that G20 countries endorse and facilitate the creation of a T20 digital platform for Accelerating the Jobs of the Future. In a world driven by a new wave of technological change, the platform would revalue the role of think tanks, research institutions and knowledge hubs to move the global agenda in an issue of central importance for the future of society: the creation of the jobs of the future. Building on and complementing existing experiences, the T20 platform would be a digital hub for producing knowledge, informing policies and connecting potential partners to accelerate the jobs of the future, within the context of an increasing integrated global economy. It would also contribute to the development of consensual views among the research community, allowing to discard extreme visions about the jobs of the future, dispelling both overly optimistic visions with no evidence base and unwarranted fears.

Jose Florito (CIPPEC)
Margarita Beneke de Sanfeliu (FUSADES)
Urvashi Aneja (Tandem Research)

[A Future of Work that Works for Women (T20 Policy Brief)](#)

Future of Work debate has been more centered on robots than on workers. The excessive focus on automation and technology's potential displacement of jobs has neglected other trends that are also re-shaping the labor market as we know it. Digitalization and the gig economy, demographic changes and the associated care crisis, and the demand of new skills are equally important and will have a major impact on how we understand and carry out work. Critically, evidence suggests that these trends have specific implications for gender equality and women's empowerment. The contribution of this brief is to place a gender lens on the future of work debate, highlighting what is known – as well as remaining data gaps – and make firm policy proposals.

Harald Kayser (PwC Germany)
Michael Ey (PwC Germany)
Peter Gerdemann (PwC Germany)

Naveen Srivatsav(PwC Germany)
Joachim Müller(PwC Germany)
Dr. Sinem Kuz (PwC Germany)
Dr. Frank Navrade(PwC Germany)
Nina Pannewick (PwC Germany)
Mohamed Sayed (Heuro Labs)

[Accelerating Labour Market Transformation (T20 Policy Brief)](#)

Digitization is driving massive labour market transformation across the globe. This policy brief looks at the effects of automation on businesses, current workforces and communities especially in developed nations and suggests interventions to tackle the unprecedented challenges. Even though complexity and exponential developments in the world can be daunting and counter-intuitive, the authors suggest that policymakers resist the urge to tread carefully and instead actively accelerate this transformation, even if partially blindfolded. Immediate and ripple effects, some likely to have negative impact in the short to mid-term, are inevitable. However, the net long-term benefits for society are compelling. Freeing up resources at community and regional levels will be paramount to solving challenges beyond pure technology-driven disruption – i.e. aging populations, climate change and ending poverty, whose windows of opportunity are rapidly closing. If critical velocity can be achieved, digitization and automation can be turned into key drivers for prosperity worldwide instead of being a mere threat.

Peter Buell Hirsch

[The robot in the window seat](#)

The purpose of this paper is to point to some emerging workplace issues relating to the increasing collaboration between human and robot workers. As the number of human workers shrinks and that of robots increases, how will this change the dynamics of the workplace and human worker motivation? The approach of this paper is to examine recent academic, business and media writings on the subject of artificial intelligence and robotics in the workplace to identify gaps in our understanding of the new hybrid work environment. What the author has found is that although there are numerous voices expressing concerns about the replacement of human workers by robots, there has not as yet been a substantive study of the impact on human workers of sharing their work life with robots in this environment.

Erik Brynjolfsson
Andrew McAfee

The Second Machine Age (book)

In recent years, Google's autonomous cars have logged thousands of miles on American highways and IBM's Watson trounced the best human Jeopardy! players. Digital technologies—with hardware, software, and networks at their core—will in the near future diagnose diseases more accurately than doctors can, apply enormous data sets to transform retailing, and accomplish many tasks once considered uniquely human. In The Second

Machine Age MIT's Erik Brynjolfsson and Andrew McAfee—two thinkers at the forefront of their field—reveal the forces driving the reinvention of our lives and our economy. As the full impact of digital technologies is felt, we will realize immense bounty in the form of dazzling personal technology, advanced infrastructure, and near-boundless access to the cultural items that enrich our lives. [...]

Franceso Carbonero
Ekkehard Ernst
Enzo Weber

[Robots worldwide: The impact of automation on employment and trade](#)

The impact of robots on employment and trade is a highly discussed topic in the academic and public debates. Particularly, there are concerns that automation may threat jobs in emerging countries given the erosion of the labour cost advantage. We provide evidence on the effects of robots on worldwide employment, including emerging economies. To instrument the use of robots, we introduce an index of technical progress, defined as the ability of robots to carry out different tasks. Robots turn out to have a statistically significant negative impact on worldwide employment. While it is small in developed countries, for emerging economies it amounts to -14% between 2005 and 2014. Furthermore, we assess cross-country effects, finding that robots in developed countries decrease off-shoring just as employment in

Artificial Intelligence

Ekkehard Ernst
Rossana Merola
Daniel Samaan

[The economics of artificial intelligence: Implications for the future of work](#)

The current wave of technological change based on advancements in artificial intelligence (AI) has created widespread fear of job losses and further rises in inequality. This paper discusses the rationale for these fears, highlighting the specific nature of AI and comparing previous waves of automation and robotization with the current advancements made possible by a wide-spread adoption of AI. It argues that large opportunities in terms of increases in productivity can ensue, including for developing countries, given the vastly reduced costs of capital that some applications have demonstrated and the potential for productivity increases, especially among the low-skilled. At the same time, risks in the form of further increases in inequality need to be addressed if the benefits from AI-based technological progress are to be broadly shared. For this, skills policy is necessary but not sufficient. In addition, new forms of regulating the digital economy are called for that prevent further rises in market concentration, ensure proper data protection and privacy and help share the benefits of productivity growth through a combination of profit sharing, (digital) capital taxation and a reduction in working time. The paper calls for a moderately optimistic outlook on the opportunities and risks from artificial intelligence, provided policy-makers and social partners take the particular characteristics of these new technologies into account.

Michael Gibbs

How is new technology changing job design? : machines' ability to perform cognitive, physical, and social tasks is accelerating, dramatically changing jobs and labor markets

The information technology revolution has had dramatic effects on jobs and the labor market. Many routine and manual tasks have been automated, replacing workers. By contrast, new technologies complement non-routine, cognitive, and social tasks, making work in such tasks more productive. These effects have polarized labor markets: While low-skill jobs have stagnated, there are fewer and lower paid jobs for middle-skill workers, and higher pay for high-skill workers, increasing wage inequality. Advances in artificial intelligence may be accelerating computers' ability to perform cognitive tasks, heightening concerns about automation of even high-skill jobs.

Erik Brynjolfsson

Artificial intelligence can transform the economy,

After half a century of hype and false starts, artificial intelligence may finally be starting to transform the U.S. economy. An example is machine translation, as we found when analyzing eBay's deployment in 2014 of an AI-based tool that learned to translate by digesting millions of lines of eBay data and data from the Web. The aim is to allow eBay sellers and buyers in different countries to more easily connect with one another. The tool detects the location of an eBay user's Internet Protocol address in, say, a Spanish-speaking country and automatically translates the English title of the eBay offering. After eBay unveiled its English-Spanish translator for search queries and item titles, exports on eBay from the United States to Latin America increased by more than 17 percent. Other language pairs produced similarly significant gains. But the machine-learning tool is imperfect — it doesn't translate the entire description of an eBay offering. Refinements would almost certainly drive even larger increases. [...]

Alternative narratives

Mihir Sharma
Terri Chapman
Samir Saran

A New Social Contract for the Digital Age (T20 Policy Brief)

Digital transformations are rapidly altering the nature of work, models of employment, contracts, regulations and protections. Increasingly, the responsibilities of the state are becoming the obligations of, and a business case for, the private sector. This devolution of 'governance responsibility' is happening at a rapid pace. In many locations, this coincides with the decentralization of political power to local administrations. A new social contract between citizens, consumers, employees, the state, and enterprise is needed to delineate a new

understanding around rights, responsibilities and entitlements. As a step towards defining such a contract, we set out seven norms for defining these relationships in the digital age.

Carl Benedikt Frey

[The Future of Jobs and Growth: Making the Digital Revolution Work for the Many (T20 Policy Brief)](#)

As the pace of automation is picking up, the challenge for governments is to make the digital revolution inclusive by helping workers shift into new and better paid jobs. This report has identified three complementary approaches for achieving this. First, governments must support the reallocation process by providing additional incentives for businesses to invest for new job creation, while reducing existing legal barriers to job mobility. Second, G20 members should help facilitate the relocation process. Because new jobs often emerge in different locations from the ones where jobs are made redundant, and low-skilled workers often do not have the financial means to move, relocation vouchers should be introduced for workers moving from contracting to expanding regions. Finally, education remains critical to ensure that workers have the right skills to take on future jobs. Fortunately, digital technology offers the potential of giving people access to the best education regardless of their location. G20 members should introduce national online learning platforms to be adopted by all schools, allowing all children to have equal access to quality education. To facilitate the learning process, teachers should take on the role of tutors, working with students interactively to achieve their learning objectives. In addition, for workers that see their skills made redundant by technology later in their careers, approaches to lifelong learning must be developed. Together with industry and professional bodies, governments should create modular approaches to education for different career paths, allowing workers to constantly update their skills.

Alexander J. Means

Learning to Save the Future: Rethinking Education and Work in an Era of Digital Capitalism (book)

Mainstream economists and Silicon Valley entrepreneurs claim that unfettered capitalism and digital technology can unlock a future of unbounded prosperity, create endless high paying jobs, and solve the world's vast social and ecological problems. Realizing this future of abundance purportedly rests in the transformation of human potential into innovative human capital through new 21st century forms of education. In this new book Alex Means challenges this view. Stagnating economic growth and runaway inequality have emerged as the 'normal' condition of advanced capitalism. Simultaneously, there has been a worldwide educational expansion and a growing surplus of college-educated workers relative to their demand in the world economy. This surplus is complicated by an emerging digital revolution driven by artificial intelligence and machine learning that generates worker displacing innovations and immaterial forms of labor and valorization. Learning to Save the Future argues that rather than fostering mass intellectuality, educational development is being constrained by a value structure subordinated to 21stcentury capitalism and technology. Human capabilities from

creativity, design, engineering, to communication are conceived narrowly as human capital, valued in terms of economic productivity and growth. Similarly, global problems such as the erosion of employment and climate change are conceived as educational problems to be addressed through business solutions and the digitalization of education.   This thought-provoking account provides a cognitive map of this condition, offering alternatives through critical analyses of education and political economy, technology and labor, creativity and value, power and ecology.

The Emerging Gig Economy

Skills

Welfare system

B. Education - Educational Reforms Needed in the Digital Age

Challenge

This PB will highlight a few issues of reforms of education needed to adapt to rapid technical change in the Digital Age

The pace of job obsolescence is expected to accelerate, putting a premium on the need for appropriate education to equip individuals with higher levels of human capital and the potential to adapt successfully to changing demands for employment, i.e., lifelong learning. It also requires strengthening social protection programs to support retraining by individuals and policies to promote increased flexibility in job markets.

Developments of Fintech will require increasing sophistication on the part of households and firms to make appropriate use of them, which points to the need for greater financial education aimed at different target groups. All of these will require additional fiscal resources.

At the same time, new technology will affect the way education can be delivered. Students can access lectures from top universities in the world, while interactive learning can be implemented with robots. The PB will make concrete policy recommendations including role of governments.

Education stressing human strengths?

Cultural specificities, not only global principles.

[source: 2019 Japan T20, Description Task Force 7]

Policy Briefs / Literature

Life-Long Learning

Eckhardt Bode
Robert Gold

[Adult Training in the Digital Age (T20 Policy Brief)](#)

Digital technologies will both create new jobs and replace existing ones.To cope with increasing labor market dynamics in the digital age, workers will have to become more mobile across jobs, occupations, and industries. The relative importance of their job-specific skills will decrease while that of their general skills applicable to various occupations will increase. The G20 should establish national adult training programs that focus on improving workers' general skills, specifically their theoretical, non-cognitive, and digital skills. These general skills will enable workers to work with technology instead of competing with it, thereby increasing their job mobility and employability.

Mick Fletcher
Paul Grainger

[Evaluating options for funding and financing post-compulsory education (T20 Policy Brief)](#)

Technological change and other challenges have inspired many countries to seek new approaches to funding and financing post-compulsory education and there is a growing body of evidence on the efficacy of specific approaches in particular circumstances. It is not easy for policymakers to learn from the experience of other countries however and a risk that mistakes will be expensively and wastefully repeated. This paper proposes a way to develop a trans-national resource that would enable those responsible for this sector rapidly to identify those approaches to funding and financing that might be most appropriate to their circumstances.

Alessia Zucchetti
Axel Rivas
Cristóbal Cobo

[Redesigning education landscapes for the future of work: third-space literacies and alternative learning models (T20 Policy Brief)](#)

Technology-driven transformations are redefining the role of education, the value of knowledge and skills. Non-formal learning, third-space literacies and alternative mechanisms for certification are emerging throughout the world, aiming to prepare youth for entering the job market. If non-formal mechanisms continue to expand, the role of the State, other actors and the G20 in education also need to be reassessed. This includes dimensions such as regional and global articulation, regulation, certification of non-formal education, among others. The scope of the policy brief is to provide recommendations to bridge the gap between schooling, learning and employability at a global scale.

Alejandra Cardini
Mathias Urban
Rita Flórez Romero

[It takes more than a village. Effective Early Childhood Development, Education and Care services require competent systems (T20 Policy Brief)](#)

There is a global consensus about the importance of high quality early childhood development, education and care (ECDEC) programmes. Increasingly, the systemic characteristics of early childhood programmes are recognised by policy makers and international bodies. This 'systemic turn' has created new challenges. Education, primary healthcare, nutrition, children's rights, social cohesion, equality and other aspects that contribute to the ECDEC system are often grounded in different, and not necessarily matching, conceptualisations, understandings, terminologies and accepted practices. Bringing them together in a Competent System (Urban et al, 2012) requires coordinated approaches to governance, resourcing, professional preparation, and evaluation that embrace complexity.

Funding Education

Alejandra Cardini
Bárbara Flores
Javier González
Santiago Cueto

[Financing Quality and Equitable Education in LATAM (T20 Policy Brief)](#)

Education learning outcomes in low and middle-income countries are still insufficient and unequally distributed. Several factors are behind this situation, many of which relate to education funding: low absolute expenditure per student; increasing gaps in spending levels between developed and developing countries; unequal distribution of key education inputs; inefficient use of pedagogical resources and low levels of innovation; inadequate political economy frameworks, in which rich individuals are incentivised to opt out of an already weakened public sector. Recommendations to deal with these problems are presented in order to provide not only more investment, but also a more effective and equitable use of resources.

Kazuhiro Yoshida
Shinichiro Tanaka
Yasushi Hirosato

[Transforming Education Financing for Inclusive, Equitable and Quality Learning Outcomes for the 2030/SDG4 Agenda (T20 Policy Brief)](#)

Education in developing countries faces the daunting responsibility of trying to enact realistic policies and strategies, while keeping to the principles and targets of SDG4 and the demands of Results-Based Financing. The education agenda demands ambitious and transformative changes that require significantly more financial resources and many related efforts to achieve learning outcomes. However, there is insufficient knowledge on how to achieve these goals, and we have yet to come up with more effective modalities and mechanisms for aid. This brief presents pitfalls that await these countries and partners and proposes possible policy actions and corresponding measures.

Technology in Education

Katherine McKnight
Kimberly O'Malley
John Franey

[Teaching in a Digital Age: How Educators Use Technology to Improve Student Learning (T20 Policy Brief)](#)

A successful digital conversion for classrooms, districts, and states is not determined by the technology, but by how technology enables teaching and learning. The purpose of our multisite case study was to document digital instructional strategies teachers use to enhance and transform student learning, and align that use with learning research. We conducted focus groups and interviews, and observed classrooms in seven exemplary schools across the United

States. We surveyed teachers' familiarity, use, and comfort with technology as well. We document six common strategies used across the seven sites and identify five roles that technology plays in enhancing teaching and learning, and discuss how these strategies benefit teachers and learners.

Financial Education

C. Aging Populations - Implications of Digital Age for Aging Workers

Challenge

This PB will highlight a few issues related to challenges posed by digital-related technical change to the employment opportunities of older workers.

Rapid technical change and digitalization poses especially large challenges for older workers who are not so digitally proficient. Retraining may also be more difficult for them. On the other hand, improvements in health and technical changes such as the development of robotics may actually make work easier for them. The PB will identify key challenges and potentials in this area. The PB will make concrete policy recommendations including role of governments.

[source: 2019 Japan T20, Description Task Force 7]

Policy Briefs / Literature

-- to be added --

D. Data Policy – Data Flows and Cyber Security in the Digital Age

Challenge

This PB will highlight a few issues related to how cyber security can be supported in the Digital Age.

The increasing importance of the internet, social media and data harvesting activities mean that greater efforts as needed in the areas of safeguarding privacy and strengthening cyber-security. The global nature of the internet implies a need to develop international cooperation efforts in these areas. The development of Fintech also raises many issues, such as how to measure Fintech activity and the value created by it, and how Fintech activities should be taxed. The PB will make concrete policy recommendations including role of governments.

Data localization policies…

[source: 2019 Japan T20, Description Task Force 7]

Policy Briefs / Literature

Paul Twomey

[Building on the Hamburg Statement and the G20 Roadmap for Digitalization : toward a G20 framework for artificial intelligence in the workplace (T20 Policy Brief)](#)

Building on the 2017 Hamburg Statement and the G20 Roadmap for Digitalization, this paper recommends a G20 framework for artificial intelligence in the workplace. It proposes high level principles for such a framework for G-20 governments to enable the smoother, internationally broader and more socially acceptable introduction of big data and AI. The principles are dedicated to the work space. It summarises the main issues behind the framework principles. It also suggests two paths towards adoption of a G-20 framework for artificial intelligence in the workplace.

E. Measuring the digital economy

Ariel Coremberg (University of Buenos Aires (UBA))
Beatriz Nofal (Eco-Axis Research)
Luca Sartorio (Universidad Torcuato die Tella)

[Data, Measurement and Initiatives for Inclusive Digitalization and Future of Work (T20 Policy Brief)](#)

As the pace of digitalization and automation accelerates globally, and more disruptive innovations in machine learning, artificial intelligence and robotics are expected, new data sources and measurement tools are needed to complement existing valuable statistics and administrative data. This is necessary to better understand the impact of technological change on the labor market and the economy and better inform policy decisions for inclusive people centered growth. In accordance with G20 Roadmap for Digitalisation(2017), points 10, 5 and 7, we propose to: i) track technological developments globally in a multidisciplinary and coordinated fashion; ii) develop new methods of measurement for the digital economy; iii) harmonize occupational taxonomies and develop new sources of data and indicators at the international level; iv) Build International Collaborative Platforms for Digital Skills and the Digital Transformation of SMES.