

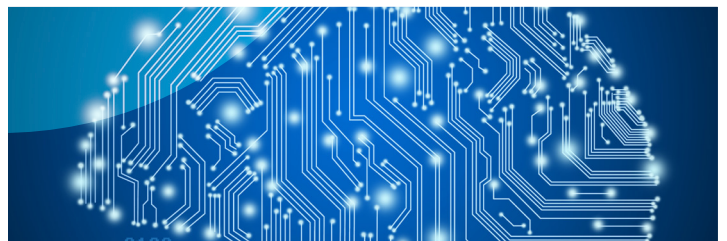
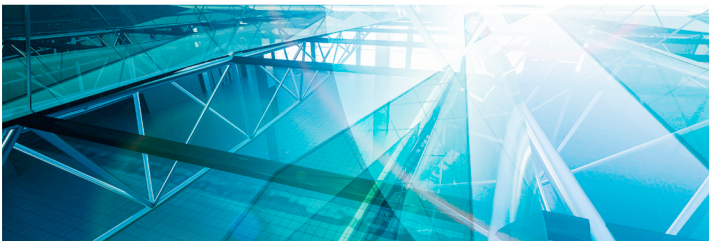
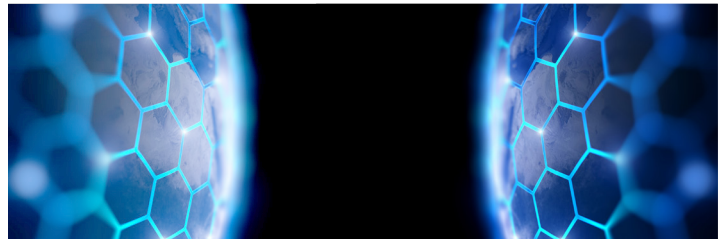
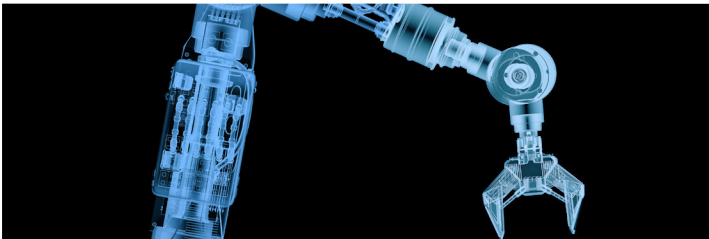
White Paper

Eight Futures of Work

Scenarios and their Implications

In collaboration with The Boston Consulting Group

January 2018



This White Paper is the first of a series produced by the World Economic Forum’s System Initiative on Shaping the Future of Education, Gender and Work as part of its Preparing for the Future of Work project. For more information, or to get involved, please contact the World Economic Forum’s Education, Gender and Work team at educationgenderwork@weforum.org.

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Eight Futures of Work:

Scenarios and Their Implications

Introduction

The world of work is undergoing a period of dramatic change. As automation, primarily in the form of robotics, artificial intelligence and other new technologies, are developing at an unprecedented rate, and are having a significant impact on multiple industries, they are leading to wide-ranging changes to the jobs, tasks and skills required within each sector. Concurrently, a number of other factors, such as labour mobility and migration; demographic change; changes in the delivery and quality of education and skills; and growing talent needs in sectors such as infrastructure, healthcare and education are also changing the nature and quality of work.

In this White Paper, we provide various scenarios of what the future of work might look like by the year 2030. These scenarios present possible outcomes based on how different combinations of key variables—some of them already in effect and underway—are likely to influence the nature of work in the future. We have selected three core variables—the rate of technological change and its impact on business models; the evolution of learning among the current and future workforce; and the magnitude of talent mobility across geographies—to map out potential scenarios.

While these scenarios are designed to create a basis for discussion among policy-makers, businesses, academic institutions and individuals, and to support them in anticipating and preparing for the changes to come, they are not predictions. Indeed, our intention in this work is to demonstrate that the future is not pre-determined. All of the scenarios we present are possible, but none is certain. The most likely outcome is a combination, with different scenarios playing out simultaneously in different geographies, industries, age cohorts and socio-economic groups.

No single actor—a government, business, individual, educational institution or union, among others—can decisively impact all of the variables, or indeed any single one of them. We therefore treat these variables as exogenous factors for the purpose of generating different possible scenario worlds. However, while actors cannot definitively choose to bring about any scenario that they might prefer on their own, through collaboration they can seek to manage the changes underway already and influence the future, taking action in the direction they desire. The implications of these scenarios, therefore, include dialogue to determine societal preferences and measures to proactively shape current trends or execute well-planned responses.

In the first section, we explain why scenarios are a useful tool to address the uncertainties around the future of work and describe the framework used to generate them. Next, the eight scenarios—developed on the basis of the framework—are described. In the last section, we explore the implications of these scenarios and possible actions to take in the face of an uncertain future.

This document is one of a series from the World Economic Forum's Preparing for the Future of Work project. It is complemented by a study of reskilling and job transition pathways, also released in January 2018. Over the course of 2018–2019, the project will engage in dialogue with key stakeholders engaged in shaping the future of work, produce further analysis and actionable insights to help leaders respond to changes in the world of work, and collaborate closely with public and private sector actors to introduce new initiatives for preparing for the future of work.

Framework

Scenarios provide a vision of how the future could unfold, given various factors. They are useful tools when the future does not seem to be a linear projection of the past, with many large-scale forces or trends making it difficult to predict with certainty what the future will look like. The purpose of an explorative scenario¹ is not to predict the future, but to show how these forces or trends could influence it. Scenarios need not be mutually exclusive; different scenarios might play out simultaneously in different geographies, industries, age cohorts or socio-economic groups. They are intended to be neither utopic nor dystopic, but to set out an objective vision of potential versions of the future. Scenarios can help leaders across industries and organizations to think more prospectively about what might happen in the future and to begin to identify preferred actions in preparation.

For the purpose of developing a simple but useful framework we sought to identify the most critical factors for labour supply and demand over the coming years. In particular, our scenarios are formed around the most *volatile* variables – those that are the most *impactful* and most *uncertain* variables. Impactful variables are those that would have the greatest influence on the future, as determined by their influence in the past and by projections of their likely future impact. Uncertain variables are those where it is most difficult to be sure about the direction of the outcome. We used research and expert interviews to explore the various trends that impact the labour market. This process led to the selection of three major trends to develop the scenarios: the rate of technological change and its impact on business models; the evolution of learning among the current and future workforce; and the magnitude of talent mobility across geographies.

While we have treated these variables as largely independent from one another for the purposes of generating the range of scenarios, they have some causal interactions. For instance, in scenarios with rapid technological progress, there may be stronger pressure for new skills and stronger incentives for learning evolution. Or, technological advancement may impact talent mobility patterns, creating on the one hand tools facilitating remote work and on the other hand new physical hubs of economic opportunity that are attractive to workers from diverse geographies. Within the scenarios, we create internal consistency by considering some of these interconnections and interactions between variables.

Technological change

Recent innovations in technology have radically altered many aspects of our everyday lives, transformed entire industries and significantly disrupted the labour market. Developments in areas such as artificial intelligence, robotics and big data analytics have displaced whole occupations, shifted the tasks and needed skills within some occupations, and created wholly new tasks and occupations. The repercussions of many of these technological developments thus far are already being felt today. How quickly and broadly these developments are adopted and how quickly and broadly further developments impact business models, will determine the relative stability or volatility of future labour markets. For simplicity, we consider two outcomes for this trend: one in which technological change and diffusion progress at the current (or slower pace) than recent years ('steady'), and another in which technological change and diffusion accelerate significantly ('accelerated').

Learning evolution

The extent to which the working population—both today's and tomorrow's—acquires the right skills to carry out the tasks required of them in the workplace is one of the most impactful and uncertain variables for the future of work. A range of inputs determine how this factor evolves: the development of updated and agile curricula in basic, vocational and higher education; access across geographies and socio-economic groups; the availability of retraining opportunities for the current workforce; and the mindset and willingness towards lifelong learning among students and workers, among others. For simplicity, we consider two outcomes for this trend: one in which learning outcomes remain largely in line with the status quo ('slow'), and another in which there is a rapid learning evolution in the current workforce as well as among the students who will form the workforce of the future ('fast').

Talent mobility

In the current economic climate, labour mobility has become a topic of widespread debate, and its likely extent in the future remains unclear. Workers' movement between and within countries may be affected by availability of economic opportunity, travel regulations or crises and conflict, and can have a significant impact on labour markets in different geographies. For example, whether job growth occurs—physically or remotely—where workers currently are or whether workers need to move to areas of economic opportunity will be a strong determinant of labour mobility within countries. For simplicity, we consider two outcomes for this trend: one in which labour concentrations largely continue where they currently are ('low'), and another in which labour is highly mobile within and between national borders ('high').

Eight Futures of Work

For each of the three variables, we have laid out two options for the future, as described above. The combination of the trends and their degree of intensity generates eight permutations, or scenarios, for the future of work. Taken together, these eight scenarios demonstrate a wide range of possible visions for the future. To reiterate, while these are not predictions, this exercise is designed to help leaders consider alternative paths

that the global labour market could take and consider more thoughtfully the complex dynamics that impact the workforce. A plausible future may well involve a mixture of these scenarios occurring concurrently. Considering each of their implications in isolation is intended to help decision-makers in government, business and academic institutions, as well as individuals, prepare for and guide the outcomes they wish to advance.

WORKFORCE AUTARKIES

Technological change	Steady	Accelerated
Learning evolution	Slow	Fast
Talent mobility	Low	High

MASS MOVEMENT

Technological change	Steady	Accelerated
Learning evolution	Slow	Fast
Talent mobility	Low	High

ROBOT REPLACEMENT

Technological change	Steady	Accelerated
Learning evolution	Slow	Fast
Talent mobility	Low	High

POLARIZED WORLD

Technological change	Steady	Accelerated
Learning evolution	Slow	Fast
Talent mobility	Low	High

EMPOWERED ENTREPRENEURS

Technological change	Steady	Accelerated
Learning evolution	Slow	Fast
Talent mobility	Low	High

SKILLED FLOWS

Technological change	Steady	Accelerated
Learning evolution	Slow	Fast
Talent mobility	Low	High

PRODUCTIVE LOCALS

Technological change	Steady	Accelerated
Learning evolution	Slow	Fast
Talent mobility	Low	High

AGILE ADAPTERS

Technological change	Steady	Accelerated
Learning evolution	Slow	Fast
Talent mobility	Low	High



Workforce Autarkies

Steady technological change has led to large-scale automation of manual and routine tasks but most medium- and high-skilled roles remain relatively untouched by disruption, particularly those requiring non-cognitive skills and the completion of complex tasks. However, the pace of learning evolution has also been slow. Many displaced low-skilled workers have been left competing for fewer roles suited to their skill sets. Businesses have faced ever-increasing talent shortages. Reacting to the worries of displaced workers, governments have imposed restrictions on international labour mobility and sought to fulfil their economies' talent needs internally. Some local city and regional governments have created similar policies to protect local jobs in the short term. Though these workforce autarkies have provided some relief to lower-skilled workers in the short term, they have made it harder for employers to find the right on-site talent for higher-skilled roles. As a consequence, lower-skilled workers continue to depend on state protectionism for their livelihoods, and some large multinational employers have taken their higher-skilled roles abroad, to countries with larger, unrestricted talent markets. The resulting reduction in knowledge transfer and continued talent shortfalls for local companies has reduced growth and dynamism over time, reducing the capacity of local labour markets.

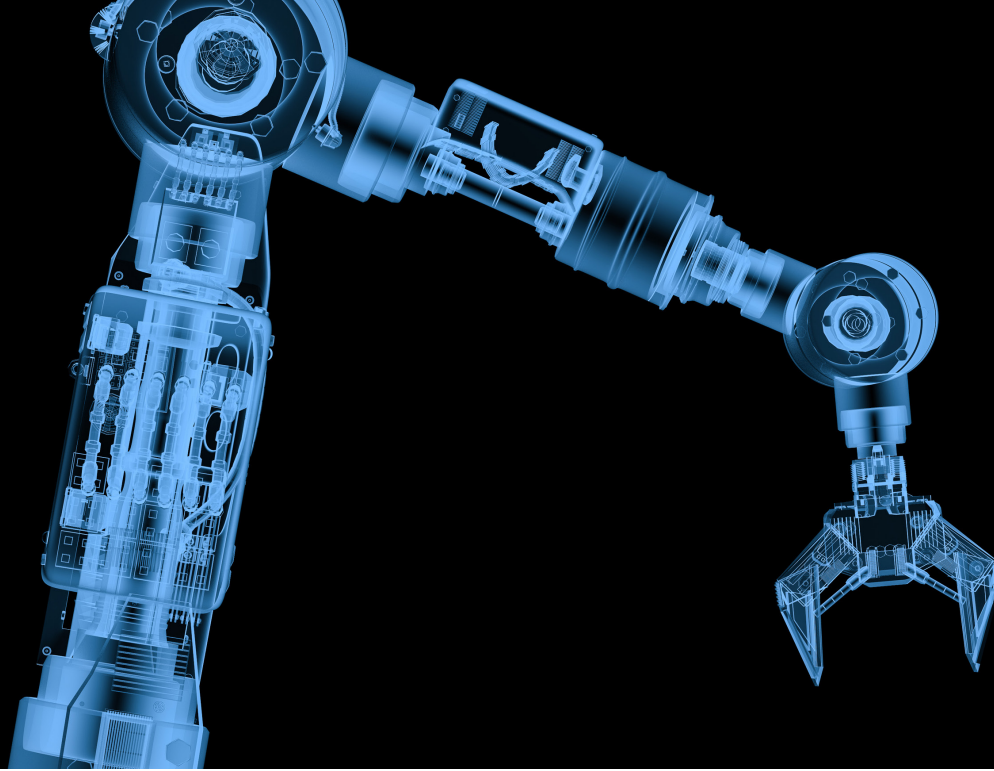
Technological change	Steady	Accelerated
Learning evolution	Slow	Fast
Talent mobility	Low	High



Mass Movement

Steady technological change has led to large-scale automation of manual and routine tasks, leaving most medium- and high-skilled roles relatively untouched by disruption, particularly those requiring non-cognitive skills and the completion of complex tasks. Meanwhile, the pace of learning evolution has also been slow. This has led to displaced workers competing for an ever-shrinking number of roles that match their skill sets. Businesses are facing wide talent gaps. In the absence of barriers to mobility and with remote online work still a relatively marginal phenomenon, there has been large-scale movement of workers in search of opportunity. Displaced lower-skilled workers in advanced economies are heading to the emerging world in search of better means of making a living, steadier incomes and lower living costs, or depend on state-sponsored welfare systems. High-skilled talent flows to wherever the latest and most lucrative opportunities are situated—often concentrated in large metropolises around the world. This has helped urban local businesses access the best talent and enhances knowledge transfer, but has increased competition between workers at all skill levels, and across regions. Societal cohesion has become harder to maintain.

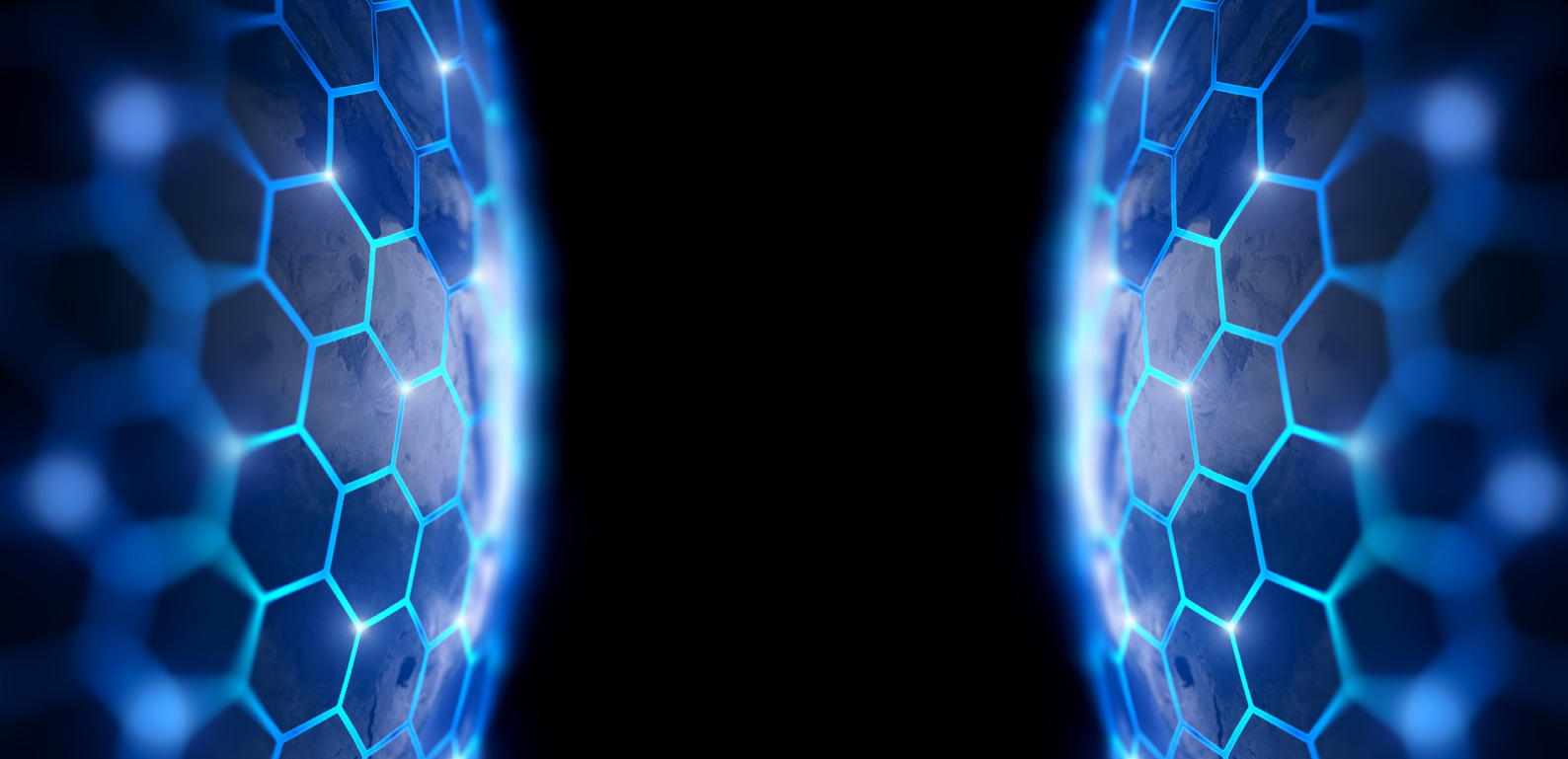
Technological change	Steady	Accelerated
Learning evolution	Slow	Fast
Talent mobility	Low	High



Robot Replacement

Accelerated technological change and diffusion means that machines in the workplace have become capable of performing routine and non-routine tasks, and can perform a range of manual tasks as well as those requiring non-cognitive skills. Initially, there was much demand for human workers to complement the machines, managing and specializing in new kinds of roles. However, the pace of learning has evolved slowly, meaning many in the workforce have been unable to keep pace with the changes underway. They face a rapidly shrinking field of opportunities as their skill sets have been deemed largely redundant. The lack of appropriate talent for emerging new roles has led to increasing pressure to automate even further, and robotics, algorithms and machine learning, managed by a few, have begun to do most of the world's production and distribution. Widening talent gaps continue to dampen economic growth as businesses have lost faith in human talent. This 'hollowing out' of the labour market has led to deep and growing inequalities, polarized values and divided views about technology. Attempts to control social unrest have focused on efforts to keep jobs 'at home' via tightly controlled borders between cities, states and countries. As income accrues to a limited few, the economy of the past has disintegrated and conflict is on the rise. Governments are increasingly challenged to resort to radical new, often untested, policy interventions, from nationalization of technology-owning monopolies to far-reaching redistribution schemes.

Technological change	Steady	Accelerated
Learning evolution	Slow	Fast
Talent mobility	Low	High



Polarized World

Due to accelerated technological change and diffusion, machines in the workplace have become capable of performing both routine and non-routine tasks. They can perform a range of manual tasks in addition to those requiring non-cognitive skills. Initially there was much demand for human workers to complement machines, managing and specializing in new kinds of roles. However, the pace of learning has evolved slowly—meaning many in the workforce with a range of skills were unable to work in tandem with technology and keep pace with the changes underway. That has led to large swathes of the workforce becoming increasingly unemployable. The lack of appropriate talent for emerging new roles has led to increasing pressure to automate even further. Robotics, algorithms and machine learning—managed by just a handful of human workers—have begun to do most of the world’s production and distribution, leading to a ‘hollowing out’ of the labour market, which has resulted in deepening and growing inequalities. Polarized values and divided views about technology dominate society. There are large-scale movements of people, within cities, regions and countries and across international borders, in desperate search for opportunity. High-skilled people from lower-income communities have migrated to high-income, high-skill enclaves, as a cluster of globally-dispersed urban ‘super-economies’ have formed and trade ideas, goods and services with each other. Elsewhere, with the national economies of the past disintegrating, previously affluent left-behind regions and communities are increasingly reverting to efforts at local self-subsistence while a large segment of increasingly disenfranchised lower-skilled workers earn a meagre living by catering to the needs of a privileged few.

Technological change	Steady	Accelerated
Learning evolution	Slow	Fast
Talent mobility	Low	High



Empowered Entrepreneurs

Steady and constant technological change has led to large-scale automation of manual and routine tasks, with most medium- and high-skilled roles remaining relatively untouched by disruption, particularly those requiring non-cognitive skills and the completion of complex tasks. Deep concerns about the disruptive potential of rapid technological change have led to long-overdue reforms in education systems. Companies have invested heavily in training systems and reskilling. There is a new ethos—especially among younger generations—one that embraces lifelong learning. The fast pace of evolution in learning has enabled more workers than ever before to contribute a wider range of skills to society and the economy. Enhanced creativity, dynamism and productivity have contributed to developments across a range of industries and sectors. With large supplies of skilled, eager, curious lifelong learners in many geographies, there is a dynamic market for workers to create opportunities for themselves, attracting steady flows of investment capital. Having invested heavily in high-skilled talent, many economies have become reluctant to lose it. Migration has become restricted. With relatively low levels of physical labour mobility within and across countries, online platforms increasingly offer an additional outlet for accessing local and global markets. Many entrepreneurs have also turned to opportunities within their local markets, creating a range of products and services, ranging from artisanal wares to new ventures in the care economy to urban farming.

Technological change	Steady	Accelerated
Learning evolution	Slow	Fast
Talent mobility	Low	High



Skilled Flows

Steady technological change has led to large-scale automation of manual and routine tasks, but most medium- and high-skilled roles remain relatively untouched by disruption, particularly those requiring non-cognitive skills and the completion of complex tasks. Deep concerns about the disruptive potential of rapid technological change have resulted in long-overdue reforms in education systems, sparking companies to invest heavily in training systems and reskilling. There is a new ethos, especially among younger generations—one that embraces lifelong learning. This fast pace of skills evolution has enabled more workers than ever before to bring a wider range of skills and enhanced creativity, dynamism and productivity to a range of industries and sectors. With online remote work still a marginal phenomenon, there has been high mobility of workers between cities, regions and countries. In light of ample opportunities for both local and migrant skilled populations, labour mobility within and across borders has become the norm. Credentials, certifications and degrees have increasingly become internationally standardized. However, due to steady technological change, labour markets with better local access to technology have been better able to drive higher value creation with fewer resources, out-competing countries that have seen lower technological expansion for talent and production capabilities. Inequality between countries and technological ‘haves’ and ‘have-nots’ continues to increase.

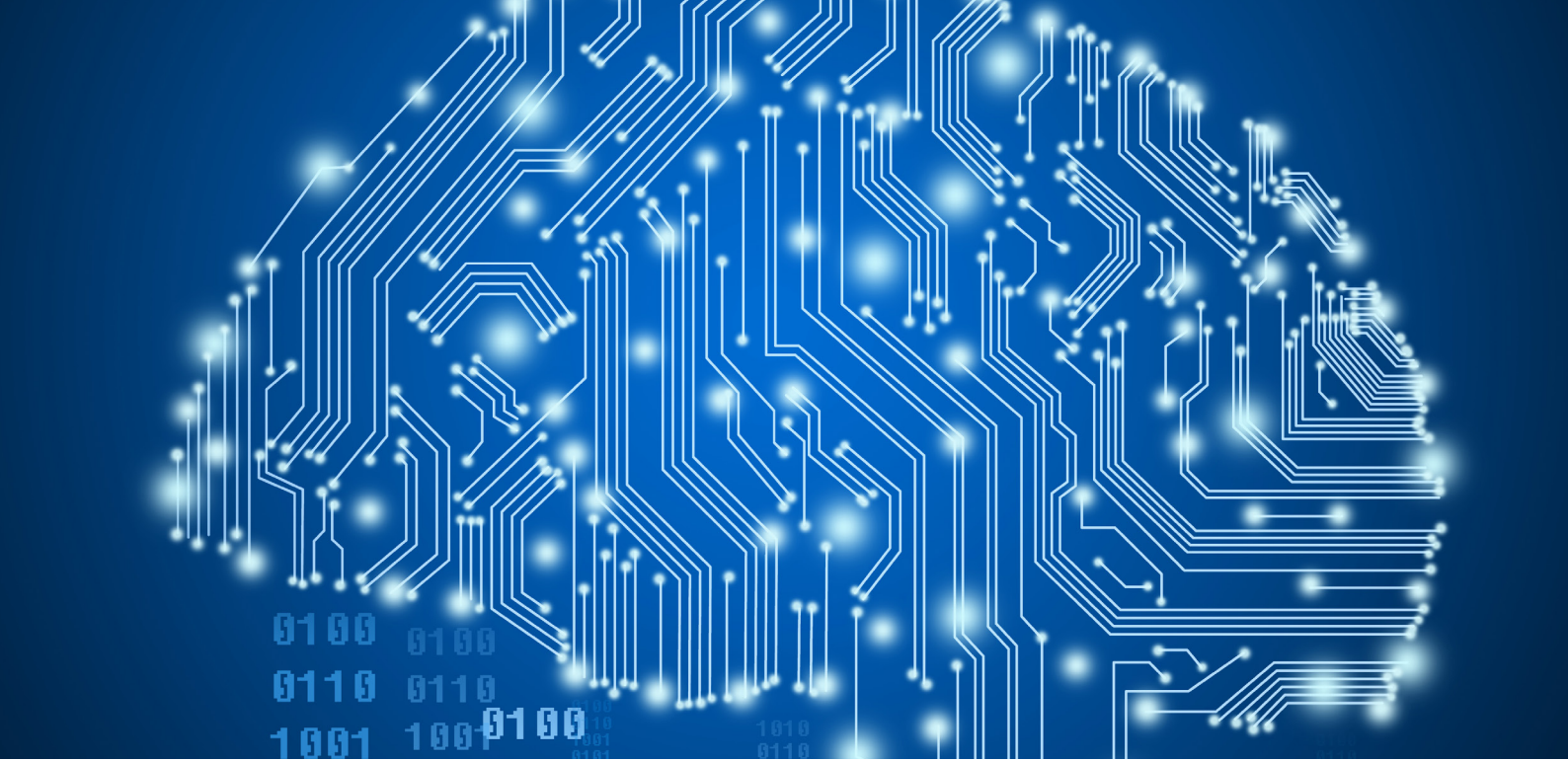
Technological change	Steady	Accelerated
Learning evolution	Slow	Fast
Talent mobility	Low	High



Productive Locals

Due to accelerated technological change and diffusion, machines in the workplace have become capable of performing routine tasks, non-routine tasks, a range of manual tasks as well as tasks requiring non-cognitive skills. Deep concerns about the disruptive potential of even more rapid technological change have led to long-overdue reforms in education, and local talent gaps have led companies to invest heavily in training systems and reskilling. This has led to a demand for human workers to complement machines, manage the shifts underway and specialize in new kinds of roles. A new ethos for pursuing lifelong learning, especially among younger generations, has contributed to an increased dynamism in the workforce, and technology is applied broadly, alongside human creativity and productivity, to a range of industries and sectors. Many economies that have invested heavily in high-skilled talent are now reluctant to lose it, and have made efforts to resist high levels of migration. With relatively low physical mobility but high engagement on globally connected online work platforms and large local pools of skilled, eager and curious lifelong learners, many economies have thrived. However, talent shortages continue to impact business growth as companies encounter skills gaps that cannot be met either locally or online. Further, lower levels of mobility have dampened the exchange of new ideas and expansion of markets, keeping technologies and livelihoods firmly dependent on local economies.

Technological change	Steady	Accelerated
Learning evolution	Slow	Fast
Talent mobility	Low	High



Agile Adapters

Accelerated technological change and diffusion has created machines that can perform routine and non-routine tasks, as well as a range of manual tasks and those requiring non-cognitive skills. Deep concerns about the disruptive potential of rapid technological change have led to long-overdue reforms in education. There is a strong demand for human workers to complement machines, manage the shifts underway and specialize in new kinds of roles. Talent gaps have led companies to invest heavily in training systems and reskilling. A new ethos for lifelong learning, especially among younger generations, has contributed to dynamism in the workforce, and technology has been applied broadly, alongside human creativity and productivity, to a range of industries and sectors. High talent mobility within countries and across borders, combined with widespread opportunities for online platform work that crosses borders, has created a global workforce that is highly agile, productive and globalized, rapidly diffusing values, ideas, technologies, goods and services around the world. Harmonized workforce and social policies and internationally standardized credentials, certifications and degrees have contributed to widespread economic dynamism and growth. Yet for some, the rapid pace of change has contributed to a wide-ranging feeling of disconnect and dislocation. With globally hyper-connected systems and a diminished sense of local belonging, people are continuously challenged to react and adapt to large-scale economic, technological and societal shocks.

Technological change	Steady	Accelerated
Learning evolution	Slow	Fast
Talent mobility	Low	High

Implications and Potential Actions

There are a number of potential courses of action that governments, businesses and other actors could take to prepare today to enhance the likelihood of a world where people are able to engage in meaningful, fulfilling and safe work; where workers impacted by changes to the labour market are supported through transitions; where people create new opportunities for themselves and those around them; and where growth is human-centred. Some of these may be thought of as ‘safe bets’ or ‘no regret’ actions, in the sense that there is generally a strong consensus across society and different stakeholders concerning their desirability, regardless of which scenario may come to pass. Other measures could be conceived of as ‘big bets’, in that they are likely to produce highly positive outcomes in some scenarios but currently command significantly less consensus, particularly as they often entail different views about the meaning of work, the worth of technology and values around social equality. Therefore, which precise courses of action might be thought of in each way will depend on a range of circumstances and attitudes in each geography and society.

Below, we identify a non-exhaustive range of actions that have been mentioned frequently in the current debate on the future of work and during our consultations with experts. They focus mainly on those actions that can proactively shape a better future but can also form the core tenets of smart reactions within each future scenario world.

- **Workforce reskilling.** The quality of and access to reskilling, upskilling and re-training support will determine how three billion people already in the world’s workforce will fare in the transition underway and engage with new opportunities in the labour market. Individuals’ willingness to undertake reskilling will also be important—and partly determined by the costs and time associated with it as well as clarity around its potential returns across different scenarios.²
- **Education systems reform.** Basic education reform—from early-childhood, primary and secondary education to vocational training and higher education—will determine how the next generation of workers will find its place in the future workplace across different scenarios. This will require refreshing curricula to include skills required in the future workforce—both digital as well as ‘human’ skills such as communication, problem-solving, creativity, collaboration and critical thinking. It will also require rethinking how education is delivered by combining offline and online methods, professionalizing and enhancing the role of teachers, recognizing and accrediting skills and developing better and more inclusive systems for lifelong learning.³
- **Enhanced digital access.** Regardless of the future pace of technological change, expanding access to communication technologies will be important to facilitate new opportunities for all, including by enabling more collaborative work, virtual work, access to information and access to markets across different scenario worlds.

- **Agile safety nets.** Agile, portable and sustainable safety nets can provide short- and long-term benefits and services, as well as income security. They can also help connect workers to re-training and re-deployment opportunities, minimizing both the social cost of labour market disruptions and the waste of previous investments into people’s skills through prolonged non-use. Governments, insurers, non-profits, unions, and other organizations will need to work together to determine the appropriate mix, reach and financing models.⁴
- **Job protection incentives.** In some scenarios, there may be a need for temporary incentives and rewards to companies for retaining human jobs or penalties for mass-displacement technologies, such as a ‘robot tax’ to provide longer transition periods for people to adjust and retrain. The benefits of such measures will need to be carefully considered relative to their potential toll on the pace of innovation.
- **Smart job creation incentives.** Many governments seek to incentivize job creation through various policies and some level of such incentives is likely to remain relevant across different scenarios. Identifying and supporting growing sectors and occupations will require new thinking and proactive policies and incentives today. For example, ‘soft infrastructure’ such as the care economy, education sector and healthcare, are all likely to grow rapidly in advanced and developing economies alike, and require a large influx of talent, building on the comparative advantage of humans and creating an opportunity for good jobs that leverage those skills that have low susceptibility to automation in most scenarios.⁵
- **Support to mass entrepreneurship.** Supporting entrepreneurs, including through better access to markets, finance and skills, can have significant benefits for economic resilience, innovation and new job creation. Vastly improving such support and using it as a deliberate strategy to shape the future of work may improve outcomes for many people, from all backgrounds, and their economies in different scenarios.
- **Governance of online platform work.** With online platform work gaining ground but still a very small proportion of the overall workforce, policy-makers must consider carefully how best to ensure that those who offer their skills through online platforms are, at a minimum, able to engage in safe and fair work. Depending on the scenario, this could include supporting online platform cooperatives, where the people who work for the system own and control the business together, creating thresholds and standards that cover online platform companies, or providing upskilling and training opportunities to workers specifically tailored to various types of lower and higher skilled online platform work.

Conclusion

- **Mobility management.** Improving recognition and accreditation of skills within countries can support people to navigate the future of work across scenarios. However, in higher mobility scenarios, common credentials for recognizing skills and standardized qualifications for all levels of education across different systems, countries and languages will become even more critical. Support with social integration, visa regulations and streamlined hiring processes are similarly important.
- **Participation incentives.** Greater flexibility to vary working hours, including the length of the work day, and the mix of part-time and full-time workers, could help to address surpluses or deficits in labour supply across scenarios. It could also lead to new ways of working by giving workers more flexibility. Encouraging increased labour force participation of women through a more equal distribution of unpaid work can tap into a diversity dividend, increase labour supply and support new industries in the care economy. Similarly, in some scenarios, connecting retirement age with life expectancy may help promote flexibility, expand the available workforce and generate more funds for social spending.

These scenarios provide a starting point for considering a range of options around the multiple possible futures of work. In addition, they are designed to help identify and prioritize key actions that are likely to promote the kind of future that maximizes opportunities for people to fulfil their potential across their entire lifetimes.

In practice, the multiple scenarios described here are likely to play out simultaneously, depending on their starting points in different sectors, industries and countries around technology, learning and mobility, as well as other factors not considered within this White Paper. However, in no circumstance are these outcomes a foregone conclusion. We have currently a window of opportunity for taking action, provided we collaborate on and coordinate these actions. It is imperative that governments, businesses, academic institutions and individuals consider how to proactively shape a new, positive future of work—one that we want rather than one created through inertia. It is our hope that this study can stimulate and support this kind of proactive management of the changes already underway.

Some of the most critical actions identified in this White Paper include reskilling of the current workforce and support for job transitions. These aspects are covered in detail in a complementary World Economic Forum report that discusses reskilling and job transition pathways using a data-driven approach, also released in January 2018. These documents belong to a series as part of the World Economic Forum's Preparing for the Future of Work project. Over the course of 2018–2019, the project will engage in dialogue with key stakeholders involved in shaping the future of work, produce further analysis and actionable insights for leaders to respond to changes in the world of work, and work closely with public and private sector actors to introduce new initiatives for preparing for the future of work.

Endnotes

- 1 Börjeson, Lena, Mattias Höjer, Karl-Henrik Dreborg, Tomas Ekvall and Göran Finnveden, "Scenario types and techniques: Towards a user's guide", *Futures*, vol. 38, iss. 7, September 2006, pp. 723-739.
- 2 See, for example, World Economic Forum, *Accelerating Workforce Reskilling for the Fourth Industrial Revolution*, 2017.
- 3 See, for example, the chapter "Transforming Education Ecosystems" in World Economic Forum, *Realizing Human Potential in the Fourth Industrial Revolution An Agenda for Leaders to Shape the Future of Education, Gender and Work*, 2017.
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- 5 International Trade Union Conference, *Investing in the Care Economy: A Pathway to Growth*, 2016; Staab, Silke, *Gender Equality, Child Development and Job Creation: How to Reap the "Triple Dividend" From Early Childhood Education and Care Services*, UN Women, 2015.

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