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Eradication of poverty and other development issues: human resources development

Human resources development

Report of the Secretary-General

Summary

The ongoing digital revolution is driving rapid changes in the labour market influencing the nature, quality and productivity of work. Countries face the challenge of making use of technological developments to foster economic growth and employment, while at the same time ensuring decent working conditions, social protection and equal opportunities for all. In the present report, the possible impact of technological advancement on the nature of work and future job growth is explored and the emergence of new business models is discussed. Also highlighted are the skills that will possibly be in demand and the adjustments required in education systems to prepare students for the jobs of tomorrow. Lifelong learning has been identified as important for enabling workers to develop the skills necessary for a constantly changing labour landscape. In this context, the present report also covers the institutional changes that will have to take place at the government, private sector and other levels to support lifelong learning, as well as the overall policies that will have to be adopted, to overcome the digital divide and create future-ready workers.

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I. Introduction

1. The ongoing digital revolution is having a major impact on the realization of the 2030 Agenda for Sustainable Development, including Sustainable Development Goals 8 and 10. The digital revolution is reshaping work, leisure, behaviour, education and governance and is having unforeseen impacts on society even as it creates massive opportunities to achieve sustainable, inclusive growth. However, technological change is seldom neutral or cost-free. Rapid technological change, while holding out the promise of valuable opportunities, also creates unforeseen impacts.

2. Specifically, digitalization is currently driving rapid changes in the labour market that influence the nature, quality and productivity of work. By facilitating automation, connectivity and market entry, it changes the price of capital relative to labour, the fixed cost of production, the cost of transactions and the speed of innovation. This fundamentally affects the organization and the choice of location of production, and thus the quantity, quality and distribution of jobs.

3. Interconnected trends, such as digitalization, globalization, the increasing diversity of work arrangements and an ageing workforce, can also have positive and negative implications for labour markets. They include adapting structures to new realities, including by such means as new labour relations, changing business models, rising inequality, job displacement, depreciation of workers' skills and widening gaps in skills.¹

4. Because the way in which work and labour markets are organized plays a major role in determining the degree of equality that societies achieve, fundamental changes in working life can therefore deeply affect economies and societies.

5. Governments face the challenge of making use of technological developments to foster economic growth and employment while at the same time ensuring decent working conditions, social protection and equal opportunities for all.

6. The solution is not to steer clear of or to stifle technological progress. Technological change should be harnessed to speed progress and improve living conditions, but it needs to be managed properly. To ensure that further advances in technological progress do not increase income inequality, and to support the overarching goal of leaving no one behind, appropriate investments in human capital should be made.

II. Impact of technology on human resources development

7. Technological change is a key driver of economic development. Increasing productivity and national income almost always require the adoption of more advanced technology. Historically, the advent of new technologies has resulted in important changes in the workspace, creating demand for new skills and making others obsolete.

8. The adoption of innovative technologies has increased productivity and helped to raise wages, thereby lifting standards of living and lowering the prices of goods and services for consumers. This has stimulated demand across the economy and resulted in increased growth and job creation.

¹ European Commission, *Report of the High-Level Expert Group on the Impact of the Digital Transformation on European Union Labour Markets* (Brussels, 2019).

9. Past technological changes have also led to a decline in the average number of hours worked per week and conversely an increase in the amount of leisure enjoyed by individuals. As leisure time increases, people spend money on hobbies, entertainment and other personal services, giving rise to entire new industries that, in turn, create jobs.

10. While technological changes have been generally beneficial for both economies and societies in the past, the latest technological advances have the potential to transform work simultaneously in multiple sectors, increasing the level of complexity and uncertainty about whether such changes will ultimately be beneficial for everyone.

11. The impact of automation on employment could diverge from earlier waves of technology disruption in the following three ways:

(a) The speed with which scientific advances are made, in particular the accelerated rate of progress in machine learning and artificial intelligence;

(b) The potential to displace a larger share of the workforce in a relatively short period of time, in particular if the adoption of automation is rapid across multiple sectors of the economy;²

(c) The pace of adoption of emerging technologies.

12. The size of the impact of automation could depend on: technical feasibility; advancements in artificial intelligence, in particular in speech and sensory perception; the cost of automation; wage and labour market flexibility; potential productivity gains; improvements in the quality and convenience of automation; regulatory frameworks; and behavioural factors.³

Changing nature of work

13. Technological change also affects the types of skills that employers demand. Increasingly, since the 1960s, computer technology has been substituting for workers in performing routine tasks while complementing their work in executing non-routine tasks demanding flexibility, creativity, generalized problem-solving capabilities and complex communication.⁴

14. A bifurcation of some jobs into highly specialized, complex, well-paid ones on the one hand and lower-wage, lower-skilled work across service sectors on the other hand has already been observed. Since 1970, the real wages of high-skilled workers have risen faster than the wages of medium- and low-skilled workers.⁵ The skill-biased nature of technological change suggests that higher-skilled workers, and richer countries, stand to benefit most. In many advanced economies, the process of job polarization has already contributed to rising inequality.⁶ These trends, coupled with increasing inequality within and among countries, risk undermining progress toward a shared global prosperity, envisioned in the 2030 Agenda.

15. If the rising demand for high-skilled workers is not accompanied by a rapid expansion and upgrading of worker skills, wage inequality will increase. In emerging

² McKinsey Global Institute, *Jobs Lost, Jobs Gained: Workforce Transition in a Time of Automation* (n.p., 2017).

³ *World Economic and Social Survey 2018: Frontier Technologies for Sustainable Development* (United Nations publication, Sales No. E.18.II.C.1).

⁴ David H. Autor, Frank Levy and Richard J. Murnane, "The skill content of recent technological change: an empirical exploration", *Quarterly Journal of Economics*, vol. 118, No. 4 (November 2003).

⁵ *World Economic and Social Survey 2018*.

⁶ European Commission, *Report of the High-Level Expert Group on the Impact of the Digital Transformation on European Union Labour Markets*.

economies, the rate of job growth is highest in occupations for which a university degree or a higher level of education is required, but the absolute amount of job growth is highest in occupations for which a diploma in secondary education is required.⁷

16. The potential impact of automation on employment will vary by occupation and sector. The activities that are most likely to be automated include repetitive physical ones in unpredictable environments. Other activities, such as childcare work, are technically difficult to automate and often command relatively lower wages, which makes automation a less attractive business proposition.⁸ Automation will have a lesser effect on jobs that involve managing people, applying expertise and those involving social interactions because machines are unable to match human performance for the time being.

17. In countries of the Organization for Economic Cooperation and Development, for example, the share of employment in the manufacturing sector decreased from about 25 per cent in the 1970s to some 10 per cent in 2013, with automation considered to be a key underlying factor.⁹ Studies on robotization show that displacement is high for routine tasks that can easily be computerized. As a result, many of those who are at risk of job loss may be forced to accept lower-skilled and lower-paying jobs, thus putting further pressure on wages in the low-wage sector.¹⁰

18. With further automation, the polarization of labour markets is expected to continue, which would potentially further aggravate wage inequalities. The International Federation of Robotics estimates that the number of robots in advanced economies could increase fourfold by 2025, leading to significantly stronger negative consequences for aggregate employment and wage income than those observed thus far. On the other hand, the increase in income for higher-skilled workers has led to an increased demand for goods and services in sectors largely requiring low-skilled labour involved in manual non-routine tasks that are not likely to be computerized.¹¹

19. In low-income countries, 10 per cent of the total labour force was working in industry from 1991 to 2017, which generated greater demand for goods, services and technology. While in some developing countries, the share of industrial employment overall is increasing, a large number of workers remain in low-productivity jobs, often in firms in the informal sector, whose access to technology is poor, despite economic growth, the changing nature of work and improvements in the business regulatory environment.¹²

20. Even as it causes a decline in some occupations, automation will change many more of them; in 60 per cent of occupations, at least 30 per cent of constituent work activities could be automated. Moreover, 3 to 14 per cent of the global workforce will need to switch occupational categories by 2030, and all workers will need to adapt as their occupations evolve alongside increasingly capable machines. Overall, while about half of all work activities globally could be automated by adapting current technologies, the proportion of work actually displaced by 2030 will likely be lower as a result of technical, economic and social factors that affect adoption.¹³

⁷ McKinsey Global Institute, *Jobs Lost, Jobs Gained*.

⁸ Ibid.

⁹ *World Economic and Social Survey 2018*.

¹⁰ International Labour Organization (ILO), "The impact of technology on the quality and quantity of jobs", Issue Brief No. 6 (Geneva, 2018).

¹¹ *World Economic and Social Survey 2018*.

¹² World Bank Group, *World Development Report 2019: The Changing Nature of Work* (Washington, D.C., 2019).

¹³ McKinsey Global Institute, *Jobs Lost, Jobs Gained*.

Potential impact on employment growth

21. There is great concern that the latest wave of automation technologies could also be particularly harmful to future employment growth by changing the cost of labour relative to capital. Because automation and the increased deployment of robots require significant investments, their effects have, until now, been more pronounced in high-income countries. Firms in middle- and lower-income countries are slower to adopt digital technologies, although some show signs of labour market polarization that is similar to that of countries of the Organization for Economic Cooperation and Development.¹⁴

22. In the future, advanced economies are likely to adopt automation in the workplace earlier and faster than emerging economies, since their wages are relatively higher, making the business case for automation stronger.

23. The impact of automation is expected to be less in developing countries because automation adoption rates are expected to be lower, leading to smaller percentages of displaced workers, lower levels of capital investment and smaller increases in productivity. However, those countries may face the indirect consequences of automation and reshoring. If industrialized countries continue to develop and adopt labour-saving technologies, firms may find it more profitable to produce goods at home, using machines rather than workers in low-wage countries.¹⁵

24. However, the potential to automate certain tasks, and possibly entire occupations, does not necessarily signify a commensurate disappearance in the aggregate number of jobs, since the automation process will also result in new tasks and productivity gains, which will, in turn, spur additional demand for labour. In some studies, it is estimated that such new employment opportunities could offset the number of jobs lost to automation. However, the risk exists of creating new jobs, in particular in the service sector, that may not be as well paid as, or of similar quality to, those eliminated by automation.¹⁶

25. Job creation can also be driven by economic growth because rising gross domestic product (GDP) per capita positively affects rates of consumption and spending, thus stimulating increases in the demand for labour. Advanced economies have much lower projected rates of GDP growth than developing countries, reflecting their ageing workforce and slower growth of productivity.¹⁷ In general, automation is likely to adversely affect repetitive jobs in manufacturing.

26. When considering the impact of automation on employment, it is pertinent to differentiate between the labour-saving and labour-augmenting effects of automation. While labour-saving may increase unemployment, labour-augmenting technologies may increase the demand for high-skilled workers, leading to the polarization of labour markets and an increase in wage inequality. Growing polarization between low- and medium-skilled workers in terms of income has been noted, while middle-skill jobs have also been particularly affected, with wide-ranging distributional effects.¹⁸

27. Future automation is unlikely to destroy entire occupations but will, rather, change the types and number of tasks of most occupations. Fewer than 20 per cent of jobs are predicted to disappear completely. While there may well be sufficient job

¹⁴ Luc Christiaensen and others, "Framing the future of work", Jobs note, Issue No. 6 (World Bank Group, Washington, D.C., 2018).

¹⁵ *World Economic and Social Survey 2018*.

¹⁶ *Ibid.*

¹⁷ McKinsey Global Institute, *Jobs Lost, Jobs Gained*.

¹⁸ *World Economic and Social Survey 2018*.

creation to compensate for technological unemployment, the realization of such opportunities will depend on ensuring that workers can move to newly created jobs.¹⁹

Technological divide

28. Connectivity changes the cost of transactions and the potential for economies of scale. Access to markets and resources as a result of improved connectivity helps firms to grow and create jobs or attract work to new markets that are more competitive. Frontier technologies present developing countries with leapfrogging opportunities to achieve the Sustainable Development Goals by bypassing existing, less efficient, technologies. Technology has changed the speed of innovation, allowing more individuals to create and test new ideas and products more quickly while minimizing the attendant costs and risks associated with product development. Product innovations, created and distributed using various technologies, can give rise to new industries, firms and jobs. This also applies in developing countries.²⁰

29. Nonetheless, while developed countries – that is, countries at the technology frontier – grapple with the challenges and seize upon the opportunities associated with frontier technologies, many developing countries have yet to fully reap the benefits of existing technologies, which largely explains the development divide. Many developing countries, in particular countries in special situations, face formidable barriers to leapfrogging to frontier technologies, for lack of electricity and broadband Internet connections. The lack of access to the latest technology serves to increase inequalities because the poorest and most marginalized tend to be the last to benefit from potential opportunities. More than 1 billion people in developing countries still do not have access to electricity, and an additional 2.5 billion are “underelectrified”, experiencing weak connections and frequent power outages. They also lack access to modern education and health systems, which are crucial for the accumulation of a threshold level of human capital needed for the adoption of many frontier technologies.²¹

30. Given the centrality of digital connectivity to the acquisition and sharing of relevant learning resources for people of all ages and in all places, it is essential that affordable, reliable, trustworthy and high-quality digital connectivity be made available globally (CEB/2019/1/Add.4, para. 14 (c)).

III. Education and skills for the future

31. Education is both a public and a private good that has a global and multifaceted impact on societies, economies and labour markets. It has a vital role to play in helping to develop the knowledge, skills, attitudes and values that can enable people to contribute to and benefit from an inclusive and sustainable future and in delivering all the Sustainable Development Goals. By increasing individual and national capabilities, skills and productive knowledge, education plays a key role in poverty reduction and economic and educational equality. The education process itself should empower young people to understand the nature of sustainable development challenges and the kinds of global cooperation needed to achieve the Goals.²²

32. Technological changes are currently affecting not only the composition of tasks but also the demand for skills, and they have significant implications for the future of

¹⁹ ILO, “The impact of technology on the quality and quantity of jobs”.

²⁰ Christiaensen, “Framing the future of work”.

²¹ *World Economic and Social Survey 2018*.

²² International Institute for Applied Systems Analysis, *Transformations to Achieve the Sustainable Development Goals: Report Prepared by The World in 2050 Initiative* (Laxenburg, Austria, 2018).

work, requiring education systems to provide people of all ages with appropriate learning opportunities so that they have the skills necessary for gainful employment.

Future skills in demand

33. The current levels of educational requirements for occupations tend to be correlated with the likelihood that their activities can be automated. The technical automation potential for occupations requiring less education than a high school diploma is 55 per cent, whereas for those that require a university degree, that potential is far lower, just 22 per cent. Occupations requiring some post-secondary education generally include work activities that are less automatable than those requiring a high school diploma and some experience.²³

34. A sharp increase in the importance of skills such as technology design and programming highlights the growing demand for various forms of technological competency. Automation and robotization are also expected to increase the demand for technical skills that can facilitate problem-solving and innovation, in particular in occupations related to science, technology, engineering and mathematics. To facilitate the capacity to adapt to change and to improve skills continually over the life cycle, such cognitive skills will need to be complemented by a range of non-cognitive social and behavioural skills, which are often acquired in early childhood and at school.²⁴

35. Contrary to conventional wisdom, purely technical skills do not have the greatest value for the future. “Human” skills, such as creativity, originality and initiative, critical thinking and persuasion and negotiation, will retain or increase their value, as will attention to detail, adaptability, flexibility and complex problem-solving. Emotional intelligence, leadership and social influence, as well as orientation towards service, will also experience an outsized increase in demand.²⁵ The most valuable roles will be those that enable machines to be paired with skilled, cross-disciplinary thinkers to innovate, create, and deliver services.

36. Workers with such in-demand skills may see their wages and job quality increase considerably. Conversely, workers lacking appropriate skills to adapt to new technologies and move to higher-value tasks may see their wages and job quality suppressed by technology that steadily erodes the value of their job as it encroaches on the tasks required to perform it.

37. The concept of competency, however, implies more than just the acquisition of knowledge and skills; it involves the mobilization of knowledge, skills, attitudes and values to meet complex demands. To be prepared for the future, individuals must also learn to think and act in a more integrated way, taking into account the interconnections and interrelations between seemingly contradictory or incompatible ideas, logic and positions from both short- and long-term perspectives.²⁶ Learning to set clear and purposeful goals, work with others with different perspectives, find untapped opportunities and identify multiple solutions to big problems will be essential in the coming years.

38. Above all, though, it is crucial that people gain the critical social skills necessary to understand the interests underlying the development and spread of technologies and have the acuity of mind to appreciate their role in shaping a sustainable world (CEB/2019/1/Add.4, para. 2).

²³ McKinsey Global Institute, *Jobs Lost, Jobs Gained*.

²⁴ ILO, “Skills policies and systems for a future workforce”, Issue Brief No. 8 (Geneva, 2018).

²⁵ World Economic Forum, *The Future of Jobs Report 2018* (Geneva, 2018).

²⁶ Organization for Economic Cooperation and Development, “The future of education and skills: Education 2030” (Paris, 2018).

Curricula for the future

39. Automation will have implications for how future generations of workers are trained, requiring adjustments to school curricula and education systems more broadly. Curricula will need to be adapted to provide students with the skills necessary for a dynamic, technology-oriented and increasingly service-oriented labour market, in particular in countries and industries in which automation technologies are likely to be adopted most quickly.

40. Data on education, training and learning will be key for the adoption of holistic and coherent curricular approaches to align curricula content, assessments, teachers' training, as well as school leadership and management, with one another. Nevertheless, such data have often been unavailable, creating a bottleneck in efforts to increase access to, and the quality of, education, training and learning in many parts of the world, in particular in disadvantaged communities and among marginalized peoples (CEB/2019/1/Add.4, para. 18).

41. Quality education is also essential for providing the skills necessary for the development of technologies in the first place. Although many countries have been able to catch up in terms of number of years of schooling, their capabilities with regard to adopting new technology and initiating a catch-up process remain limited. In this respect, artificial intelligence applications are currently developed and adopted mainly in countries at the technological frontier and in a few advanced developing countries. Reaping the benefits of technological innovation and strengthening domestic capabilities for research in developing countries requires improvement in the quality of schooling²⁷ and the right kind of investment in skills development.

42. The transition from school to work is an especially pivotal moment for young people, and one in which many of them are left behind. The rapidly growing youth population in some regions, in which youth unemployment is increasing together with education levels, will pose a challenge, but it also provides enormous potential that should be utilized. On-the-job training and experience can help to ensure that young people are equipped with the relevant skills and are exposed to the use of new technologies. Work-based learning provides learners with exposure to real work environments and, when delivered effectively, allows for strong pedagogical links to be created between the development of knowledge and of practical skills. Nevertheless, it remains a challenge for many education and training institutions to incorporate it effectively into their programme offerings.²⁸

43. Traditional methods of teaching should be also reconsidered. Digital learning resources are gradually rising in popularity as a result of their flexibility in terms of timing and content, compared with traditional classroom training. To reach the full potential of e-learning opportunities, access to online courses should be accompanied by certification and links to other types of training.²⁹

44. Given that access to higher and better education is often determined by the socioeconomic background of parents, education systems should be more inclusive to ensure that disadvantaged population groups have opportunities to acquire the skill sets that are relevant in markets for increasingly automated jobs.

²⁷ *World Economic and Social Survey 2018*.

²⁸ Paul Comyn and Laura Brewer, "Does work-based learning facilitate transitions to decent work?", Employment Working Paper No. 242 (ILO, Geneva, 2018).

²⁹ ILO, "Skills policies and systems for a future workforce".

Importance of teacher training

45. Within education systems, teachers are regarded as the most influential factor in determining student achievement and learning. To make teachers confident technology users, information and communications technology should be taught in all introductory and in-service teacher training programmes.³⁰

46. Just as digital skills must be incorporated into educational curricula, developing high-level cognitive skills will be equally crucial for future employment. Though it is perhaps challenging to impart such transferable skills to students, teacher training programmes should provide information to teachers on the most effective pedagogical techniques and activities to equip students with essential skills for life and work.

47. Proper teacher training in global citizenship and sustainable development is also necessary to achieve the 2030 Agenda. Consequently, teachers must facilitate an accepting, intercultural classroom that is respectful of the rights of all students, while also imparting knowledge on key lessons in sustainable development.³¹

48. Educational institutions will also need to adapt to the evolving demands of the labour market to ensure that critical job skills are being taught. For example, the growth of the green economy will create many employment opportunities for those making the transition from education to the workforce, and teachers should have knowledge of green technologies and concepts in order to best position students to address global needs. By educating teachers about green technology and making curricular modifications, countries can prepare primary and secondary school students to contribute to the green economy as adults. In the case of environmental sustainability, training teachers through short and circular modules focused on climate change can also improve teachers' understanding of the subject and give them the confidence to teach it.³²

49. In many areas of the world, however, recruiting qualified teachers who have knowledge of information and communications technology, high-level cognitive skills and sustainable development is unrealistic. Instead, teacher recruitment strategies should be crafted to attract teachers with a sufficiently high level of education, and in-service or vocational education programmes should be used to train underqualified teachers. Digital materials could be used to virtually connect remotely located teachers to in-service training programmes or to massive open online courses.³³

50. Teachers must learn about new trends and skills throughout their careers in order to best support new generations of learners and global citizens. In alignment with the emphasis in Sustainable Development Goal 4 on lifelong learning opportunities for all, in-service training opportunities and continuing professional development programmes could empower teachers to constantly identify, learn and teach new skills and instil in them the ability to deliver curricula effectively by drawing on their professional knowledge in the classroom.³⁴

³⁰ *World Economic and Social Survey 2018*; and United Nations Educational, Scientific and Cultural Organization (UNESCO), "Teacher policy development guide" (Paris, 2015).

³¹ UNESCO and the Right to Education Initiative, *Right to Education Handbook* (Paris, 2019).

³² UNESCO, *Global Education Monitoring Report 2016: Education for People and Planet – Creating Sustainable Futures for All* (Paris, 2016).

³³ *World Economic and Social Survey 2018*; and UNESCO, "Teacher policy development guide".

³⁴ Organization for Economic Cooperation and Development, "The future of education and skills: Education 2030".

IV. Institutional changes

51. The new demands on education and learning resulting from technological and other changes mean that flexible opportunities for skills acquisition must be provided throughout an individual's life cycle. The front-loading of skills through initial training, for a single lifetime qualification, will no longer be sufficient or effective. Training systems of the future must be flexible and prepare the workforce to continue to learn during the life cycle. They must also be closely aligned with labour markets so as to forecast future demands for skills and match them with current skills development and training opportunities.³⁵ Such a life cycle approach, and the changing nature of skills that need to be learned, raise fundamental questions about the respective responsibilities of Governments, workers and enterprises in making choices about when and how to reskill and retrain.

52. The first step is to focus on ways to manage the various transitions that individuals will face so that they can successfully enter the labour market and interrupt, be reskilled and re-engage in employment throughout their career. Supporting people through those transitions will expand their choices and provide them with the security to cope with change. It will empower people to shape their working lives. It will allow societies to harness demographic advantages in some regions and create lifelong active societies in others.³⁶

53. To achieve this, it is critical to promote a culture that supports continuous learning, motivates people to take advantage of learning opportunities, and helps individuals to identify and develop new, needed skills. Specifically, policies should include the consideration that workers in the current economic circumstances increasingly need additional skills, knowledge and understanding of the labour market. Also to be taken into consideration are deeper psychological constructs that drive people to change, learn and grow.³⁷ Moreover, new approaches to learning that are oriented to cost-effective ways of delivering knowledge and support to individuals should be identified.

54. As labour markets evolve, policies to address income inequality and social protection systems will also need to be reformed to make them fit for purpose, ensure that no one is left behind, and enable people and businesses to make the most of the changing world of work. While individuals will have to take personal responsibility for their lifelong learning and career development, they should, nonetheless, be supported through periods of job transition and phases of retraining and upskilling by Governments and employers.

55. Solutions are likely to vary by country and to depend on local political, economic and social circumstances. Ultimately, the core objective for Governments, industries and workers alike should be to ensure that tomorrow's jobs are aligned with realizing the Sustainable Development Goals.

56. Lifelong learning encompasses formal and informal learning, from early childhood and basic education to adult learning, combining foundational skills, social and cognitive skills and the skills needed for specific jobs, occupations or sectors. Leveraging the transformations under way to open doors and create opportunities for human development requires that workers have an entitlement to lifelong learning. Establishing an effective lifelong learning ecosystem is a joint responsibility, requiring the active engagement and support of Governments, employers and

³⁵ ILO, "Skills policies and systems for a future workforce".

³⁶ ILO, *Work for a Brighter Future: Global Commission on the Future of Work* (Geneva, 2019).

³⁷ European Commission, *Report of the High-Level Expert Group on the Impact of the Digital Transformation on European Union Labour Markets*.

workers, as well as educational institutions.³⁸ Access to lifelong learning, including e-learning, could also help to overcome the rural/urban divide and contribute to the sustainable development of marginalized rural populations.

Role of Governments

57. The contexts of national education systems should be assessed to identify how to strengthen, adjust and/or adapt policy and planning frameworks and processes to reflect the 2030 Agenda.³⁹ Governments could encourage, identify and co-finance innovative pilot programmes that address known skills gaps among workers, post-secondary students and young persons and then scale the programmes that work. Employment services should collaborate with employers to provide effective assistance to workers, matching skills with jobs and facilitating job-specific training and retraining.

58. Striking a balance between flexible training offers and systematic quality assurance, using accreditation and testing mechanisms, can be a challenge. Governments might consider taking the lead in designing modern lifelong learning systems in close consultation with workers and employers.⁴⁰ A system of recognition, validation and accreditation of learning and competencies acquired outside formal education and training institutions should also be established to facilitate pathways between formal and less formal learning opportunities, as well as between education, training and work.⁴¹

59. Workers are also more likely to engage in adult learning when they are assured of the continuity of income and labour market security. Governments must therefore broaden and reconfigure skills development policies, employment services and training systems to provide workers with the time and financial support that they need to learn.

60. The relevant financing mechanisms will be tailored on the basis of individual country and sectoral contexts. Public funding can support workers and act as an incentive to their obtaining access to learning opportunities. This can be implemented through vehicles such as voucher financing models, entitlements, skills guarantees, individual learning accounts, subsidies, grants, credits and tax relief.⁴²

61. The rapidly changing work environment will also require people to be able to show their enhanced learning and skills acquisition pathways throughout their life cycles, and not just in terms of formal qualifications. Emerging digital technology, in particular in the form of learning passports, or digital portfolios containing a complete record of a person's qualifications, can greatly facilitate labour movement, which is of interest to workers and employers alike. Such systems are also of particular value to marginalized persons, in particular refugees, because they are a means of reducing inequalities in the labour market. The technical aspects that should be addressed in an initiative on credentials and qualifications include the following:

- (a) The crafting of systems for mutual recognition of qualifications;
- (b) The development of global reference levels to allow easier comparison of qualifications;
- (c) The formal recognition and credentialing of non-formal and informal learning, together with existing formal learning qualifications;
- (d) The importance of ensuring flexibility over time as new learning requirements and qualifications emerge;

³⁸ ILO, *Work for a Brighter Future*.

³⁹ UNESCO, "Unpacking Sustainable Development Goal 4" (Paris, 2017).

⁴⁰ ILO, "Skills policies and systems for a future workforce".

⁴¹ UNESCO, "Unpacking Sustainable Development Goal 4".

⁴² ILO, "Skills policies and systems for a future workforce".

(e) The need for credentials to be seen as leading to further learning and skills development and not treated as merely a means in themselves (CEB/2019/1/Add.4, para. 13 (c)).

Role of the private sector

62. The business sector can take the lead in areas related to providing job retraining and enabling individuals to learn marketable new skills throughout their lifetime. This can include providing on-the-job training and opportunities to workers to upgrade their skills, through in-house training and partnerships with education providers.

63. Incentives should be put in place to ensure that managers support learning and that employees find learning opportunities practical to pursue.⁴³ A mindset of agile learning will also be needed on the part of workers as they shift from the routines and limits of today's jobs to new, previously unimagined futures.⁴⁴ Given the continuing importance of training in the workplace, employers need to contribute to its financing. In cases in which employers run their own training programmes, they can work together with workers' organizations to design relevant frameworks and steer funds to those programmes.⁴⁵

64. In the current era of longevity, an individual's career can last far longer than in the past, spanning generations of technologies and businesses. The pool of older workers represents a proven, committed and diverse set of workers that is an important source of institutional knowledge, and can also offer wisdom and life experience that should be tapped into. Reskilling also plays a role in successful strategies for utilizing the talent of older workers.⁴⁶

65. To date, however, reskilling has been often regarded by employers as a narrow strategy focused on specific subsets of employees, not as a comprehensive strategy to drive workforce transformation. The private sector could partner with educators to reshape school and university curricula, intra- and inter-industry collaboration on building talent pipelines, and partnerships with labour unions to enhance the mobility of cross-industry talent. Likewise, Governments may become key partners in creating incentives for lifelong learning, ensuring shared standards for retraining and strengthening safeguards for workers in transition.⁴⁷

V. Key messages and policy recommendations

66. Issues related to equality and equity emerge as new technologies create winners and losers. It is therefore critical to establish a delicate balance among the following actions: maximizing the efficiency gains of a new technology; reducing the gap in access to those new technologies within and across countries; achieving an equitable distribution of the gains of technological advances; and ensuring that the use of new technologies meets internationally agreed ethical, moral and human rights standards.⁴⁸

67. In order to address inequality, strategies would have to help to prevent vulnerable persons from being left behind in the future world of work, in particular women and girls, refugees, stateless persons, the rural poor, older persons and others who are less likely to have access to modern technologies. From the outset, it would

⁴³ Deloitte Insights, *Leading the Social Enterprise: Reinvent with a Human Focus – 2019 Deloitte Global Human Capital Trends* (n.p., 2019).

⁴⁴ World Economic Forum, *The Future of Jobs Report 2018*.

⁴⁵ ILO, *Work for a Brighter Future*.

⁴⁶ Deloitte Insights, *The Rise of the Social Enterprise: 2018 Deloitte Global Human Capital Trends* (n.p., 2018).

⁴⁷ World Economic Forum, *The Future of Jobs Report 2018*.

⁴⁸ *World Economic and Social Survey 2018*.

be helpful to examine who is most at risk, in particular those losing their livelihoods to automation, to ensure that the strategy would be targeted to the furthest behind first (CEB/2018/4, para. 32). Robust and effective social protection systems can help to minimize both the adverse impact of technological changes on specific income groups and the resistance to those changes. Social insurance programmes can be critical in providing affected workers with sustenance during transitional periods involving joblessness.

68. Overall, the scale and implications of the job design, reskilling and work reinvention involved in integrating people and automation more extensively into the workforce is new territory. The value of automation and artificial intelligence lies not in the ability to replace human labour with machines, but in the ability to augment the workforce and enable human work to be reframed in terms of problem-solving and the ability to create new knowledge.⁴⁹ In this respect, a “human-in-command” approach to artificial intelligence should be adopted to ensure that the final decisions affecting work are taken by human beings, not algorithms.⁵⁰

Education and skills

69. Learning is cumulative, and poor foundations mean that all subsequent investments in learning or skills development will be less effective. In this respect, investing in strong foundational skills, regardless of specific circumstances, is crucial. Without numeracy and literacy skills, the prospects of improving employment opportunities and earnings, whether in agriculture or in urban settings, are poor.

70. To meet the demand for workers able to develop and deploy technology or interpret and act on the data analytics that technology can produce, it is important to invest in early education in subjects such as statistics and science, technology, engineering and mathematics. A strong liberal arts education, together with high-technology workplace skills, could also be required to enable workers to acquire skills, such as social and emotional sensing and reasoning, and apply creativity and collaborative problem-solving.⁵¹

71. To help future workers to adjust to changing labour market demands, it will also be necessary to strengthen the relevance of technical and vocational education and training by, for example, broadening qualifications profiles and integrating core work skills into curricula.⁵²

72. To support prospective workers in their efforts to identify the right skills, Governments can work with the private sector and labour unions to develop programmes that provide key information on strategic sectors, including information on employment prospects, career pathways and demand for existing and emerging skills.⁵³ Establishing a framework and tools to measure workforce skills and the extent to which they align with the new world of work should be the first step in this process.

73. If learning is to become truly lifelong, skills must be portable. This requires establishing a common skills-recognition framework at the national and international levels. Quality assurance mechanisms related to lifelong learning could be created, together with employers’ and workers’ organizations, to monitor the effectiveness of lifelong learning systems.⁵⁴ Special attention needs to be given to promoting access to, and participation in, lifelong learning for young people who are not in employment, education or training to ensure their social inclusion.

⁴⁹ Deloitte Insights, *Leading the Social Enterprise*.

⁵⁰ ILO, *Work for a Brighter Future*.

⁵¹ UNESCO, “Unpacking Sustainable Development Goal 4”.

⁵² ILO, “Skills policies and systems for a future workforce”.

⁵³ *World Economic and Social Survey 2018*.

⁵⁴ ILO, *Work for a Brighter Future*.

Digital divide

74. Bridging the technological divide is an important precondition for closing the economic divide between countries. Ecosystems for innovation, such as technology hubs and makerspaces, are accessible online and facilitate the exchange of knowledge and ideas among peers. Software engineers and other skilled persons available in less advanced developing countries can serve as innovation leaders in enhancement, automation and absorption of artificial intelligence in those countries, which can then take advantage of rapid technological change to invest in upgrading their education and health sectors using suitable artificial intelligence applications. Furthermore, devising computer codes and algorithms is relatively less capital-intensive than the development of a competitive manufacturing base.⁵⁵

75. To bridge the digital divide within countries, Governments should narrow the innovative and absorptive capability gaps by improving overall human capital, with targeted support directed towards disadvantaged groups and enabling access for all to appropriate digital infrastructure. Policy actions to improve the education system should be focused on children's early development, greater exposure to innovation provided for women and disadvantaged young persons, and on motivating workers to invest in skills relevant for the rapidly evolving labour market.⁵⁶ National development strategies will also need to be targeted to basic infrastructure development and human capital accumulation.

Social protection schemes

76. A system of entitlements to training through a reconfigured employment insurance system or social funds could be established to allow workers to take paid time off to participate in training. Workers could be entitled to a number of hours of training rights, regardless of the type of work they do. In countries in which most workers work informally, national or sectoral education and training funds could be established and managed by tripartite boards and could provide workers with access to education and training, with a special focus on vocational skills.⁵⁷ Easing the burden on public funding can be achieved by striking a better balance between public and private responsibility for the financing of training.

77. In addition, active labour market policies can help to facilitate adaptation during transition periods, in particular in the case of less skilled workers. For instance, automation may create jobs in one region while eliminating them in other regions. Workers would therefore require help in relocating to areas in which employment growth is faster. Policies that facilitate such geographical mobility could be targeted at housing and moving costs, among others.⁵⁸

78. As frontier technologies increasingly favour self-employment, part-time work and new types of employment based on sharing-economy models, there will be a need to extend social protection rights and benefits that are accessible and portable, and funded with tax revenues, to workers whose conditions of employment are non-standard.⁵⁹ An international governance system for digital labour platforms could also be established to require platforms and their clients to respect certain minimum rights and protections.⁶⁰

⁵⁵ *World Economic and Social Survey 2018*.

⁵⁶ *Ibid.*

⁵⁷ ILO, *Work for a Brighter Future*.

⁵⁸ *World Economic and Social Survey 2018*.

⁵⁹ *Ibid.*

⁶⁰ ILO, *Work for a Brighter Future*.