



MCKINSEY GLOBAL INSTITUTE

PREPARING BRAZIL FOR THE FUTURE OF WORK: JOBS, TECHNOLOGY, AND SKILLS

BRIEFING NOTE

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The world of work is facing unprecedented disruption, and, understandably, anxiety runs high. Unemployment and underemployment are rife, particularly among young people. Educational systems are not keeping pace with sweeping changes in the nature of jobs and the skills needed to fill them. There is increasing polarization of opportunities for low- and high-skilled individuals. Labor markets are inefficient, failing to match skills with available jobs. A great wave of automation is under way that will raise productivity but also displace many tasks, necessitating reskilling and support to help individuals through the transition. The biggest question on the agenda is whether there will be enough jobs to employ everyone.

This briefing note aims to provide a fact base on the multiple trends and forces buffeting the world of work, drawing on recent research by the McKinsey Global Institute.

Labor markets face multiple challenges

Some 30 to 45 percent of the working-age population around the world is underutilized—that is, unemployed, inactive, or underemployed. In Brazil, 12 percent of the workforce is unemployed, or 12 million people. In addition, there are 13 million people who work less than they could, or would like to work but haven't looked for a job or were not able to start. Attention tends to focus on the unemployed and less on those who

are underemployed or inactive portions, and yet they account for a huge body of untapped human potential.

Youth unemployment, and the underemployment of women, are two significant losses to the potential labor pool. Almost 75 million young people are officially unemployed globally. In Brazil, the unemployment rate for individuals aged 18 to 24 stands at around 25 percent, more than double the overall unemployment rate. Women are a huge pool of untapped labor. Globally, 655 million fewer women are economically active than men—a very significant missed opportunity to boost GDP growth. In 2015, MGI took a comprehensive view of gender inequality in 95 countries around the world, looking at 15 indicators of gender inequality in work and in society, and combining these into a Gender Parity Score, or GPS. The research found that if all 95 countries were to match the country in their region with the most progress toward gender parity in work—a “best-in-region” scenario—\$12 trillion could be added to annual GDP by 2025. This is equivalent to the GDP of Japan, Germany, and the United Kingdom combined. In Brazil, addressing gender inequality in work on three dimensions—raising the female-to-male ratio of labor-force participation, increasing the hours women work, notably more women working full-time rather than part-time, and

boosting the share of women working in higher-productivity sectors—could add 14 percent to annual GDP by 2025. The GDP boost would come mostly from higher participation and hours worked. The highest potential relative to GDP within Latin America would be in the countries with the largest gender disparities in the region, namely the Dominican Republic, Guatemala, and Mexico.

It is a paradox that so many people are underemployed or underemployed, and yet many employers are facing skills shortages—two related global crises. One factor is that educational systems have failed to produce individuals with the skills they need to find a job. McKinsey research has found that half of young people around the world are not sure that their postsecondary education has improved their chances of finding a job.

In a survey of young people and employers conducted in autumn 2012 in nine countries, between 40 and 50 percent of Latin American employers cited a lack of skills as the main reason for entry-level vacancies. According to the World Economic Forum, despite a sharp increase in labor-force participation over the past 20 years, companies in the region report significant numbers of unfilled vacancies. Thirty-seven percent of companies surveyed said that finding workers with the necessary training was one of the main obstacles that they faced. This was higher than the global average. In Brazil, 68 percent of managers said that they had difficulties filling positions, followed by Argentina at 41 percent, Costa Rica at 40 percent, and Mexico and Panama at 38 percent. As in other regions of the world, the main reasons cited included lack of technical skills, an inadequate number of applicants, and lack of experience. The skills shortage is likely to worsen. MGI has estimated that there will be a global shortfall of 85 million high- and middle-skilled workers by 2020.

Employers, education providers, and youth live in parallel universes. Fewer than half of youth and employers, for example, believe that new graduates are adequately prepared for entry-level positions. Education providers, however, are much more optimistic: 72 percent of them believe new graduates are ready to work. The same disconnect occurs in education; 39 percent of education providers believe the main reason students drop out is that the course of study is too difficult, but only 9 percent of youth say this is the case (they are more apt to blame affordability).

In Latin America, skills shortages can be traced back to deficiencies in education systems. On average, the region scores lower than high-income OECD countries on a range of educational indicators in the World Economic Forum's Global Competitiveness Report, the largest gap being in math and science. McKinsey's 2012 study on education to employment found that in the Latin American countries surveyed, between 50 and 60 percent of young people were working in jobs unrelated to their field of study. Another study finds that 50 percent of 15-year-olds in Latin America who took the Programme for International Student Assessment (PISA) did not meet basic competence on math, science, and reading, compared with the OECD average of 21 percent.

Around the world, employers report gaps in technical skills such as STEM subject degrees, but also soft skills such as communication, team work, and punctuality. The skills shortage is particularly severe in occupations requiring digital skills. Within the next decade, MGI estimates a potential shortfall of 250,000 data scientists in the United States alone. According to LinkedIn, most of the top skills demanded by employers in Brazil all relate to digital technologies, with statistical analysis and data mining, web architecture and development framework, and mobile development topping the list of requirements. The supply of such talent is far from meeting demand, but conversely it may be that those in work are not always realizing their potential. LinkedIn also found that 37 percent of respondents said their current job did not fully utilize their skills or provide enough challenge.

Exacerbating the mismatch of educational attainment and available jobs are geographical mismatches: workers with desired skills may be in short supply where companies are hiring, while places with the highest unemployment may have little job creation. This geographic imbalance is occurring both across national borders and within them.

Technology can be part of the solution through online platforms that match workers with jobs, and enable independent working

Online talent platforms can ease a number of aspects of disfunction in labor markets by more effectively connecting individuals with work opportunities, and creating new flexible ways of working. A US survey, for example, reports that three-quarters of stay-at-home mothers would be likely to work if they had flexible options.

With powerful search capabilities and sophisticated screening algorithms, online talent platforms can speed the hiring process and cut the time individuals spend searching between jobs, reducing unemployment. By aggregating data on candidates and job openings across entire countries or regions, they may address some geographic mismatches and enable matches that otherwise would not have come about.

Such platforms include websites such as Monster.com and LinkedIn, that aggregate individual résumés with job postings from traditional employers, as well as the rapidly growing digital marketplaces of the new “gig economy,” such as Uber and Upwork. In China, where demand for delivery drivers is soaring because of rapid growth in e-commerce, there are now platforms that crowdsource delivery drivers. E-commerce giant JD.com launched its own delivery network, which today has more than 1.3 million crowdsourced delivery drivers in 37 cities.

By helping put the right people in the right jobs, these platforms can raise productivity and job satisfaction, and draw people who are engaged in informal work into formal employment, especially in emerging economies. By raising labor participation and working hours, such platforms can raise global GDP. Even if a small fraction of inactive youth and adults were to use these platforms to work a few hours per week, the economic impact would be significant. MGI has found that online talent platforms could add \$2.7 trillion to global GDP by 2025, and start to ameliorate many of the persistent problems in today’s labor markets.

In Brazil alone, \$69 billion could be added to GDP as a result of such platforms, which have the potential to help 21 million people, or 14.2 percent of the working-age population, to benefit. Brazilian respondents to a 2015 LinkedIn Survey found that LinkedIn or similar platforms had reduced the time spent looking for a new job by 52 percent, the highest percentage of countries surveyed. Fifty-six percent of Brazilian respondents said that LinkedIn or similar platforms had helped to broaden or improve their job options—again the highest percentage of the countries surveyed.

MGI research finds that 20 to 30 percent of the working-age population in the United States and the EU-15, or up to 162 million individuals, engage in independent work. Digital platforms are transforming independent work, building on the ubiquity of mobile devices, the enormous pools

of workers and customers they can reach, and the ability to harness rich real-time information to make more efficient matches. Today these online marketplaces are used by 15 percent of independent workers. But the rapid growth of the largest platforms suggests we have only just begun to see their impact. There will be policy challenges, of course. Those who work independently (digitally enabled or not) by choice generally are satisfied; those who work in the gig economy by necessity tend to be dissatisfied with variability in earnings and a lack of the benefits and protections typically associated with traditional work.

Scope for digital technologies to disrupt and make labor markets work better depends on the extent to which these technologies are penetrating the economy. Our research has found that the United States has captured only 18 percent of its potential from digital technologies, while Europe only 12 percent. The potential for further digitization in Brazil is even larger—today, we estimate that it is capturing only 5 percent of its digital potential. Nearly 40 percent of Brazilians still lack access to the internet, suggesting an urgent imperative to build the digital infrastructure.

Automation is coming, disrupting the world of work

The shift, more than a century ago, from an agrarian to an industrial society was the greatest economic revolution in history. It transformed the workforce and raised living standards to an unimagined degree. We’re on the cusp of an equally transformative change. Robotics (manual automation) and AI (intellectual automation) will disrupt virtually every sector of our economy.

The wave of automation is inevitable and may roll out quicker than we expect because there is a compelling economic justification for it. In an aging world, boosting productivity is the only way to guarantee growth. Over the past 50 years, GDP growth was fueled by the twin engines of more workers and higher productivity. The first of those engines is sputtering out, leaving productivity to keep economies growing at a healthy clip. MGI finds that automation could raise productivity growth globally by up to 1.4 percent a year.

To ascertain the potential for automation, MGI conducted research in 46 countries representing about 80 percent of the global workforce, examining more than 2,000 work activities. Globally, we calculated that the adaptation of currently demonstrated automation technologies

could affect 50 percent of the world economy, or 1.2 billion employees and \$14.6 trillion in wages.

In Brazil, MGI research has found that it is already feasible—with existing technology—for half of total employee time to be automated. Manufacturing and retail trade are the sectors with the largest potential to be automated, with 10.9 and 10.4 million automatable full-time equivalent (FTE) jobs, respectively. Manufacturing is also the sector with the largest automation potential rate (69 percent), followed by transportation and warehousing (61 percent).

As machines evolve and acquire more advanced performance capabilities that match or exceed human capabilities, the adoption of automation will pick up. However, the technical feasibility to automate does not automatically translate into the deployment of automation in the workplace and the automation of jobs. Technical potential is only the first of several elements that must be considered. A second element is the cost of developing and deploying both the hardware and the software for automation. The supply-and-demand dynamics of labor are a third factor: if workers with sufficient skill levels for a given occupation are in abundant supply and significantly less expensive than automation, this could slow the rate of adoption. A fourth to be considered are the benefits of automation beyond labor substitution—including higher levels of output, better quality, fewer errors, and capabilities that surpass human ability. Finally, regulatory and social issues, such as the degree to which machines are acceptable in any particular setting, must also be weighed. It is for these various reasons that go beyond purely technical feasibility of automation that our estimates for “whole-job” automation are lower than other estimates.

MGI has modeled the adoption of automation technologies and focused on a “midpoint adoption” scenario. In Brazil, we estimated that around the equivalent of 15.7 million full-time jobs (about 14 percent of the total of such jobs) could potentially be displaced by 2030 due to automation technologies in a midpoint adoption scenario. This is roughly in line with the average displacement rate observed around the world, but there is huge variation. Among advanced economies, potential displacement rates are 26 percent in Japan, 25 percent in Switzerland, and 22 percent in Norway. Within this timeframe, the displacement potential is far lower in less digitized developing

economies; for instance, the rate is expected to be 7 percent in Peru and only 5 percent in Kenya.

Although automation will displace many jobs, fears about robots stealing jobs wholesale any time soon are overhyped. The research found that less than 5 percent of occupations can be automated entirely, but two-thirds of jobs have components that can be automated by adapting existing technology.

Many more people will need to work alongside robots and AI. Many jobs will be “machine-enhanced”—more productive and ideally more fulfilling, as computers absorb routine operations and free individuals to use more creative talents. Highly skilled workers working with technology will benefit. Low-skilled workers working with technology will be able to achieve more in terms of output and productivity. Yet these workers may also experience wage pressure given the potentially larger supply of similarly low-skilled workers —unless demand for the occupation grows more than the expansion in labor supply.

History shows us that technology is a net jobs creator... but this time could be different

The scale of shifts in the labor force that automation is likely to unleash is likely to be of a similar order of magnitude to those that have occurred as countries around the world that had been largely agricultural underwent industrialization, and, subsequently as incomes rose, moved increasingly into services. Those shifts did not result in long-term mass unemployment because new types of work were created.

For example, the growth in the use of computers since the 1970s has enabled the net creation of 15.8 million jobs in the United States. MGI identified 3.5 million jobs destroyed by the introduction of computers, but at least 19.3 million that were created in occupations such as software developers, computer scientists, customer services representatives, and stock and inventory clerks.

When digital editing made it easier and more efficient for authors to type and then directly edit their own work, computers eliminated the need for people specialized in editing and retyping documents—including typewriter manufacturing, secretarial work, and bookkeeping.

But many new jobs were also created. Of this total, only about 1 percent of net new jobs came directly from the computer manufacturing industry and only 3 percent came from supplier industries. A larger share of employment gains has come in professions enabled by computers (18 percent of net employment created). This includes the entire computer software and services industry, with companies such as Oracle, IBM, and Microsoft. Because of the multitude of applications of the computer, more than 75 percent of net employment generated in the United States has been in occupations that use computers. For example, employment of computer scientists in finance, manufacturing, business services, and other industries grew at about 7 percent a year between 1980 and 2015, and employment of financial managers and specialists able to use spreadsheets to track and analyze large amounts of company data by about 3 percent.

Nobody can be certain that automation will create jobs as other waves of technological innovation have done. Demand for workers could increase as economies grow, partly fueled by productivity growth enabled by technological progress. Rising incomes and consumption (especially in developing countries), the need for increased provision of healthcare in aging societies, investment in infrastructure and energy, and other trends will create demand for work that could help offset the displacement of workers. Additional investment on infrastructure and construction, beneficial in their own rights, could be needed to reduce the risk of job shortages in some advanced economies.

New jobs will differ a great deal from those displaced by automation, but projections of increases in demand for goods and services should mean that enough are created to offset job losses. The tradeoff between productivity and employment is smaller than it first appears, since the boost to GDP that productivity brings will raise consumption and hence labor demand, as it has always done in the past. The magnitude of future job creation from innovation and automation varies significantly by country, depending on four factors:

- **Wage levels:** Higher wages make the business case for automation adoption stronger. However, even low-wage countries may automate if companies are looking to boost quality, achieve tighter production control, move production closer to end consumers in

high-wage countries, and secure other benefits beyond reducing labor costs.

- **Demand growth.** Economic growth is essential for job creation; economies that are stagnant or growing slowly create few if any net new jobs. Countries with stronger economic and productivity growth and innovation will therefore be expected to experience more new labor demand, although the amount and nature of job creation will vary depending on the sectors that drive growth.
- **Demographics.** Demographics affect both labor demand and labor supply. Countries with a rapidly-growing workforce, such as India, may enjoy a “demographic dividend” that boosts GDP growth—if young people are employed. Countries with a shrinking workforce, such as Japan, can expect lower future GDP growth, derived only from productivity growth. In Brazil, the end of the demographic bonus implies in the next 15 years GDP growth rates may fall 45 percent (or 1.2 percentage points) compared with the past 15 years, if no increase is observed in productivity growth. Countries with a declining workforce need automation to offset their shrinking labor supply, while countries with growing workforces have greater job creation challenges.
- **Mix of economic sectors and occupations.** The automation potential for countries reflects the mix of economic sectors and the mix of jobs within each sector. Japan, for example, has a higher technical automation potential than the United States because the weight of sectors that are highly automatable, such as manufacturing, is higher. And within Japanese manufacturing, a larger proportion of jobs involve activities that can be more easily automated, such as production, than in the United States. Brazil’s mix follows roughly a similar pattern as the global economy, with a technical potential for automation of nearly 50 percent of FTEs.

Even if there is enough work to ensure full employment by 2030, many people will face significant transitions in their working lives. MGI’s scenarios suggest that, by 2030, 75 million to 375 million workers (3 to 14 percent of the global workforce) will need to switch occupational categories. For an emerging economy such as Brazil, we estimate that up to 10 percent of workers may need to switch occupational categories by

2030. The most vulnerable workers are likely to experience the most wrenching change, as it is low-skilled jobs that have the highest automation potential. Conversely, job categories with the highest percentage job growth net of automation include health-care providers, professionals such as engineers, scientists, accountants, and analysts; IT professionals and other technology specialists; managers and executives; educators; and people in creative professions such as artists and entertainers.

The real question is how to forge a fundamentally new social contract between man and machine. The imperative is to explore how to train, and retrain, workers to continually adapt to the demands of the new economy. A large part of the equation will be enhancing educational attainment, but many more people may protect their earning power and employability by spending more time on activities that require social and emotional skills, creativity, high-level cognitive capabilities, and other skills relatively hard to automate.

The future of work in Brazil: An agenda

Labor markets around the world present multiple challenges, and now an arguably unprecedented wave of disruption is underway due to automation. Significant challenges lie ahead for Brazil's policy makers and business leaders as they navigate this dynamic and difficult landscape to make it work for people and for companies. Here we summarize some areas that they may consider prioritizing:

Sharpen focus on skills and training

There is already an acute skills mismatch. Recent OECD research shows that as much as one-third of staff is either underutilized or unable to cope with existing duties. Without an upgrade in skills, the mismatch could become twice as severe in the next decade, resulting in a loss of productivity and rising inequality. Upgrading skills on a large scale will require coordination between parents, educators, governments, employers, and employees—with a keen focus on individuals with poor skills. A sea change is needed. In developed economies, public spending on labour markets as a percentage of GDP has declined in the past two decades—by 0.5 points in the United States to more than 3 percentage points in Canada, Germany, and Scandinavia. Tax and other incentives to encourage more business investment in workforce training, especially by small and medium-size companies, may be necessary.

However, the imperative is not only spending more, but focusing on what kind of skills are needed in the modern labor market. Individuals need marketable new skills throughout their lifetimes. Midcareer retraining will become ever more important as the skills mix needed for a successful career changes. Governments need to take action. Germany, for instance, is pushing a lifelong occupational counseling program offering a variety of advisory services with three primary objectives: (1) mitigating the shortage of skilled workers; (2) getting people into long-term employment with prospects for the future; and (3) securing existing jobs and taking preventive measures against unemployment. Programs that can more quickly retool the labor force by focusing on retraining for skills that are in demand will be vital. Massive Open Online Courses are increasingly focused on very specific skills rather than broad thematic subject matter. Udacity has partnered with AT&T, Google, Facebook and Amazon to offer “nanodegrees” in, for instance, data analysis or machine learning. For the vast majority of workers, the focus should be on developing their creativity, managerial, and problem-solving skills, and “meta skills”—learning how to learn and to be agile and flexible.

Strengthen the link between education and employment

Companies need to play a more active role as they will be on the front line of automation and know what skills they require. Collaboration between companies and educational institutions can provide workers with the new or enhanced skills that are increasingly needed. German-style apprenticeships combining classroom work and practical work, and enabling participants to earn a salary while learning, could be important solutions even for middle-aged displaced workers. In the United States, for instance, there has been a number of effective collaborations pioneered by major companies. For instance, IBM, is supporting the Sarah E. Goode STEM Academy, an early college high school in Chicago where students gain work experience, earn a free associate degree, and leave school with the possibility of a job offer. Boeing works with community colleges in Washington State and Missouri to train people for advanced manufacturing jobs. BMW's Scholars Program enables students to attend local community colleges full-time while working part-time at the car company. In Mexico, Unilever runs the Academia de Aprendizaje de Unilever,

which offers employees 7,600 different training modules, mostly delivered online; 95 percent of management-level employees used the system in 2011. The Mexican automotive industry and Ministry of Education are establishing the Center for Dual Specialization in Puebla in conjunction with the German Chamber of Commerce.

Collaboration between policy makers and education providers is needed, too. They need to work together to improve basic science, technology, engineering, and math (STEM) skills throughout the school system, put a new emphasis on creativity as well as critical and systems thinking, and foster adaptive and life-long learning. Conventional learning is increasingly to be augmented by online, self-guided learning because it is more flexible and relatively low cost. In China, monthly users on online education platforms now number 170 million in the case of children, 95 million for foreign language learning, and 45 million in the case of professional education. The challenge to overcome is to create a comprehensive skills program out of short online sessions, and to persuade employers to recognize online qualifications (many still don't).

Support workers through their transitions

As well as scaling up training and retraining, governments need to evaluate the income and transition support offered to displaced workers, or those struggling to make the transition to a different type of job. A range of policies can help, including unemployment insurance, public assistance in finding work, and portable benefits that follow workers between jobs. We know from history and from our analysis that wages for many occupations can be depressed for some time during workforce transitions.

More permanent policies to supplement work incomes might be needed to support aggregate demand and ensure societal fairness. If automation (full or partial) does result in a significant reduction in employment and/or greater pressure on wages, some ideas such as wage subsidies ("earned income tax credits" in the US is one form), more comprehensive minimum wage policies, wage rises tied to productivity, conditional transfers, universal basic income, and adapted social safety nets could be considered and tested. Governments will also need to offer universal and

portable social benefits like health care, child care, and retirement security, as well as transition support, to workers who are forced to change jobs, occupations, and employers frequently. Sweden's job-security councils, run by the private sector and funded by a payroll tax on companies, provide displaced workers with a comprehensive suite of income support, training, coaching, and assessment with caseworkers.

Improve the flexibility and mobility of labor markets

Labor markets need to be more flexible—and people more mobile—if they are to cope with the challenging transitions ahead. Digital talent platforms that enable the gig economy can help, matching people to jobs and offering new, flexible opportunities. In China, women entrepreneurs are far more well represented in technology and e-commerce sectors than in offline, traditional sectors, because online gives them more flexibility and autonomy. Governments should consider updating labor-market regulations to ensure that gig workers are not subject to discrimination, and uncertainties about benefits are resolved. They should also recalibrate employment services to ensure that they match people much more effectively with jobs.

Maintain robust economic growth to support job creation

Ensuring that there is sufficient demand to support the creation of new jobs—and the setting up of new businesses—is critical for all other measures to be effective. Fiscal and monetary policies need to be calibrated to sustain full-employment levels of aggregate demand. Policies to promote investment in infrastructure, housing, alternative energy, and care for the young and the aging can boost economic competitiveness and inclusive growth, while creating millions of jobs in occupations likely to be augmented, rather than displaced, by automation.

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