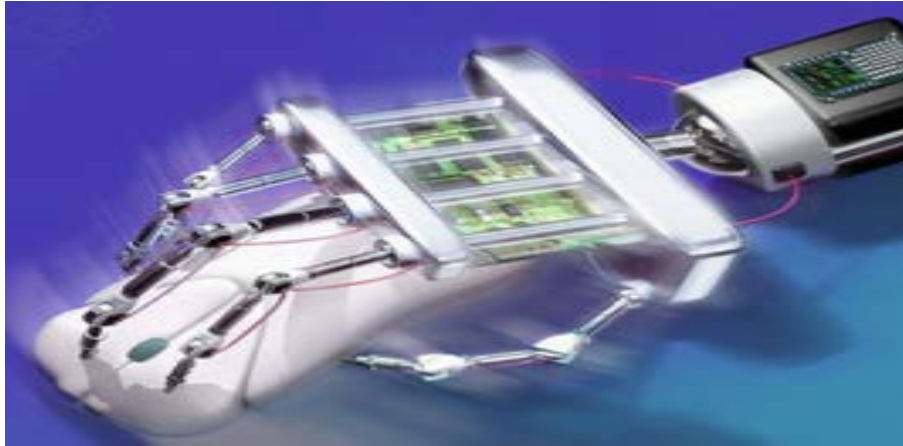


SUTD Library Special Alerts

2017

The Workforce of the Future



Source: Britannica ImageQuest

The Workforce of the Future

Automation is the main driver that will shape the workforce of the future. This is made possible due to advances and innovation in technology such as robotics and artificial intelligence. According to McKinsey Global Institute (MGI) report “A future that works: Automation, employment, and productivity”, MGI estimates 49% of work activities will and can be automated. This can help enhance the performances of businesses by reducing errors and enhancing the quality of output and hastening the production process. It can even achieve outputs well beyond what people can produce. However, the pace of automation is highly dependent on technological advancements, economic and labor costs, and social acceptance.

This alert covers topics on employment trends, the future of jobs, the impact of automation on the workforce, skills required for the future and how Singapore is preparing its workforce for the future. Jobs that are susceptible to automation are mainly those common in manufacturing, hospitality and food service, and retail industry. Singapore has been emphasizing skill acquisition along with partnerships in the future workforce. Skills to consider for the future workforce include interpersonal skills, problem-solving skills, resilience and adaptive thinking.

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Employment Trends

Outlines employment trend and growth pertaining to the workforce of the future.

Frey, C. B., & Osborne, M. A. (2017). The future of employment: how susceptible are jobs to computerisation? *Technological Forecasting and Social Change*, 114, 254-280.

The authors researched the likelihood of jobs being prone to getting taken over by computers. They developed a new technique that estimated the probability of computerisation for 702 different jobs, using a Gaussian process classifier. It was found that jobs in transportation, logistics and production were among those that were most likely to be replaced by computers.

Human Capital Trends 2016. (2016). Deloitte. Retrieved from

<https://www2.deloitte.com/global/en/pages/human-capital/articles/introduction-human-capital-trends.html>.

Changes in human capital trends have been driven by four main forces, namely demographic changes, the increasing adoption of digital technology, rapid business-model innovation and socially driven evolution in the employer-employee relationship. You can read more about them in this [report](#). This website also has a link where you can find the human capital trends interactive dashboard. The dashboard allows you to rate each listed trend based on its relative importance to your company.

Mack, T. C. (2014). Trends at Work: An Overview of Tomorrow's Employment Ecosystem. *Futurist*, 48(6), 14-19.

Read about various factors that led to changes in the economic, social and technological landscape in the workplace. They include the creation of new jobs, new job development, workplace demographics and trends affecting the workplace environment.

Schmitt, J., Shierholz, H., & Mishel, L. (2013, November 19). *Don't Blame the Robots: Assessing the Job Polarization Explanation of Growing Wage Inequality. Economic Policy Institute*. Retrieved from <http://www.epi.org/publication/technology-inequality-dont-blame-the-robots/>.

Technology has been viewed by many economists as the main factor for the growing wage inequality since the late 1970s, as job skill requirements brought on by technology have surpassed the workforce's educational levels. According to the "skill-biased technological change" (SBTC) theory, technology entails a higher demand for more educated employees who get increased pay and this leads to greater wage inequality. In this article, you can read about how existing SBTC models fail to sufficiently explain wage inequality for the past 30 years.

World Economic Forum. (2016). *Employment Trends*. Retrieved from <http://reports.weforum.org/future-of-jobs-2016/employment-trends/>.

This report discussed employment trends based on various industries, such as business, IT, management, construction and administration. It also analyzed the impact of technology on employment and changes in the simplicity of the job recruitment process. Main findings included the strong employment growth in the IT industry spearheaded by rapid urbanization and that there will be a decline in administrative jobs due to technological trends in which may render them redundant; cloud technology and the Internet of Things (IoT).

International Labour Organization. (2016). *World employment and social outlook : Trends 2016*. (2016).

This report discussed recent trends in the global economy and mentioned that job quality is a pressing issue. It was mentioned that the global economy has weakened, that the decrease in growth of emerging economies together with a decline in commodity prices undermined the recovery of the global economy, that trade and investment flows have been slow along with the presence of increasing unemployment. It then proceeded to subdivide employment and social trends by multiple world regions.

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Future of Jobs

Describes how technology will enhance future work output and that although technology will soon displace mundane jobs, it will at the same time create new jobs that require complex skills such as expertise-based decision making tasks.

Chandy, L. (2017, January 31). *The future of work in the developing world*. *Brookings*. Retrieved from <https://www.brookings.edu/research/the-future-of-work-in-the-developing-world/>.

Read about how technology will impact work in developing countries here. Firstly, it will lead to disruption, due to relocation and replacement of jobs. Secondly, it will lead to the need for less human labour. Thirdly, there will be decentralization of economic activity from companies to individuals. You will also be able to find out about skills for the future, job matching platforms and more, labour movement and more.

Colbert, A., Yee, N., & George, G. (2016). The digital workforce and the workplace of the future. *Academy of Management Journal*, 59(3), 731-739.

This article explained the impact increasing digitization has on the workplace. It starts by illustrating the abilities of 'digital natives', those who were raised to be familiar with computers and the internet from young, to harness digital technology in the workplace and then discussed how to revamp the concept of work for the 'digital natives'.

International Labour Organization. (2016, July 7). *ASEAN in transformation: How technology is changing jobs and enterprises* (1-51).

The report illustrated how technology was revolutionizing five labour-intensive sectors in ASEAN. They included the automotive industry, the electronics industry, the textile industry, the outsourcing of business processes and the retail industry. Additionally, it included findings from surveys and stakeholder interviews. Clearly, both current and future technologies were expected to enhance productivity, while making some occupations obsolete and replacing them with new ones.

McKinsey Global Institute. (2017, January). *A future that works: Automation, Employment and Productivity*.

This report discussed how automation will impact the workforce. It was mentioned that automation can aid businesses in enhancing productivity as means less errors and improvement in both quality and speed of work output. The speed and extent of automation, along with its impact on other workers, will however vary depending on the industry. The report also stated five factors that will affect the speed and extent of automation. They include technical feasibility, cost of deploying and developing solutions, labour market dynamics followed by economic benefits and lastly, regulatory and social acceptance.

Smith, A., & Anderson, J. (2014). *AI, Robotics, and the Future of Jobs*. *Pew Research Center*.

A survey was carried out in 2014 to find out how robotics and artificial intelligence will impact the job market and the nature of work. Some of the findings are presented in this report. Although technology could eventually displace certain kinds of jobs, particularly mundane ones, it can create new skill-intensive jobs. Technology could also allow people to view work in a more positive light.

Tripathi, A. K. (2016). The Future of Technology and Jobs: An interview with Dr. RA Mashelkar. *Ubiquity*, 2, 1-12.

This interview was conducted with an eminent Indian professor, Dr. Raghunath Anant Mashelkar, who is the current President of Global Research Alliance. He discussed the impact of automation on the job market and how automation is to influence productivity in both the developed and developing world.

World Economic Forum. (2016, January). *The future of jobs-Employment, skills and the workforce strategy for the fourth industrial revolution (1-167)*.

This report deals with how the workforce can be prepared for the future. It discusses the future of jobs and skills, the industry gender gap and how to involve women in the future workforce. It also reports on industry, regional and gender gap profiles. You can view drivers of change, such as top trends affecting business models and expected time to impact on employee skills. You can also view skills forecasts and read about planning for the future workforce.

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Impact of Automation on the Workforce

Discusses how technology that minimizes human intervention impacts the workforce. The use of robotics, artificial intelligence and automation used in jobs, such as logistics, supply chain and manufacturing are featured below.

Autor, D. H. (2015). *Why Are There Still So Many Jobs? The History and Future of Workplace Automation*. *Journal of Economic Perspectives*, 29(3), 3-30.

This essay highlighted that although automation is generally viewed as a substitute to human labour, it could also work in tandem with it. Yet journalists and scholars seemed to overemphasize mechanical substitution for human labor at the expense of consideration of automation which enhanced productivity and supplemented demand for labour. Even though workers have been shown to possess problem-solving skills and are adaptable and creative, computers are going to be used as a substitute to do mundane jobs.

Bessen, J. (2015, March). *Toil and Technology -- Finance & Development*. *International Monetary Fund*. Retrieved from <http://www.imf.org/external/pubs/ft/fandd/2015/03/bessen.htm>

Read about how technology was affecting the nature of work. This was particularly the case for the logistics, supply chain and clerical tasks. It was also the case for a variety of other jobs such as bank tellers and the white-collar industries. The article also mentioned that policymakers must be flexible in understanding how technology is headed.

Bogue, R. (2014). What future for humans in assembly? *Assembly Automation*, 34(4), 305-309.

The authors intended to analyse the projected growth of both robotic and three-dimensional (3D) printing technologies to understand how this may affect the global assembly and manufacturing workforce. They discovered that the use of robotics will grow and that 3D printing will become a major manufacturing technology. Thus, the need for human intervention in the assembly and manufacturing workforce will be reduced.

**Ford, Martin. *Rise of the Robots : Technology and the Threat of a Jobless Future*. 2015.
Available at Main Library General Lending (HD6331 FOR)**

This book review offers insights on how robots will take over jobs in the future. Robots will replace people in mundane jobs. However, robots and artificial intelligence (AI) have become more common in the service sector that currently has the bulk of employees. Thus, robots and AI are projected to jeopardize the jobs of both blue-collar and white-collar workers. At the same time, the medical and healthcare sector will use robots to complement, rather than to replace workers. Subsequently how employees can adapt to the rise of robots in the workforce is discussed.

Gaskell, A. (2016, December 22). *Automation And The Future Of Work*. *Forbes*. Retrieved from <https://www.forbes.com/sites/adigaskell/2016/12/22/automation-and-the-future-of-work/#7985cc6171fc>.

Read about how automation will impact work in the future. According to the Chief Scientific Advisor to the British government, automation could be beneficial to tax collection. In contrast, both the United Nations committee and the United States' President's Council of Economic Advisors have raised concern that automation may pose a threat to routine jobs, such as driving. In response, the United States' President's Council of Economic Advisors has suggested enhancing the skills, training, job search assistance and labor market institutions to help those currently in routine jobs to be employed in more knowledge-driven jobs.

Gilmore, J. (2016, December 7). *Could automation make life worse for women?* *The Guardian*. Retrieved from <https://www.theguardian.com/sustainable-business/2016/dec/08/could-automation-make-life-worse-for-women>.

Here you can read about how automation was changing the nature of women's work, as mundane, labour intensive tasks are being taken over by technology. However, highly skilled, professional jobs may also be at risk.

Li, M. (2015). Laboratory automation: letting scientists focus on science. *Bioanalysis*, 7(14), 1699-1701.

Read about how laboratory technology has transform the jobs of scientists by allowing them to focus more on the cognitive and intellectual aspects of the scientific profession, relative to the experimental aspect.

Sarin, G. (2017, January 24). These futuristic jobs will make you rethink everything you know about manufacturing. Tech.Mic. Retrieved from <https://mic.com/articles/165749/these-futuristic-jobs-will-make-you-rethink-everything-you-know-about-manufacturing#.ccatNipVV>.

Read about some very new jobs in the field of manufacturing. These jobs arose due to increased automation. They include 3D printing engineers, artificial intelligence architects, human-robot interaction specialists and garbage designers.

Smith, A. (2016). Public Predictions of the Future of Workforce Automation. Pew Research Center: Washington, DC.

A survey by Pew Research Centre involving over 2000 Americans was conducted. It was revealed that 65% of the respondents believed that within 50 years computers will 'definitely' or 'probably' accomplish many of the tasks currently performed by people. 80% of the respondents expect that in 50 years' time, their own jobs will still exist in their current forms. However, 11% of the respondents were at least somewhat concerned that they would lose their jobs due to workforce automation.

Spinks, J., Jackson, J., Kirkpatrick, C. M., & Wheeler, A. J. (2016). Disruptive innovation in community pharmacy—Impact of automation on the pharmacist workforce. *Research in Social and Administrative Pharmacy*.

Discover how centralized automated dispensing systems will affect the pharmacy workforce of the future in this article. More planning must be carried out so that the introduction of any new technology provides positive results to consumers, insurers and the pharmacy workforce.

West, D. (2015, October). *What happens if robots take the jobs? The impact of emerging technologies on employment and public policy. Brookings*. Retrieved from <https://www.brookings.edu/wp-content/uploads/2016/06/robotwork.pdf>

Robots, augmented reality, computerized algorithms, machine-to-machine communications were all technologies to aid workers in their daily work. These technologies would take over mundane, low

skilled jobs, while keeping highly experienced ones unchanged. It is also likely that society will not need as many workers.

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Skills for the Future Workforce

Describes what skills are needed to thrive and succeed in the workforce of the future.

Bandi, R. K., & Shah, V. (2016). Future of Work and Work Skills in Knowledge-Intensive Services: Impact of New Media and Technologies. In *The Impact of ICT on Work* (pp. 95-107). Springerlink.

Two case studies were presented to illustrate how work was changing and what skills workers and organizations need to succeed. The main skills mentioned were social and interpersonal skills, problem-solving skills, together with simultaneous learning. This is because there is a growing need for internal collaboration in the workplace, along with a growth in crowdsourcing or external collaboration and the development of the knowledge-based economy.

Fidler, D. & Williams, S. (n.d.). *Future Skills-Update and Literature Review. Institute for the Future.*

Retrieved from http://www.iftf.org/fileadmin/user_upload/downloads/wfi/ACTF_IFTF_FutureSkills-report.pdf

Here are some skills and characteristics that will prove to be an asset in the future workplace. They include resilience, cross-cultural competency, social intelligence, virtual co-operation, novel and adaptive thinking, cognitive load management and sense-making.

Prinsley, R., & Baranyai, K. (2015). STEM skills in the workforce: what do employers want. *Office of the Chief Scientist, Canberra.*

This paper described the importance of skills in science, technology, engineering and mathematics (STEM) for the modern workforce. This was achieved by reporting on what skills employers wanted from STEM graduates, whether employers could readily recruit employees with the STEM skills they need and also if employers were willing to train STEM students to fulfil their job requirements.

The Economist Intelligence Unit. (2015). *Driving the skills agenda: Preparing students for the future.*

Retrieved from <https://static.googleusercontent.com/media/edu.google.com/en//pdfs/skills-of-the-future-report.pdf>

This report discussed three case studies on how individuals can be better prepared for the future through the acquisition of a variety of skills essential to their career. The first case study involved the provision of wireless Internet support to disadvantaged families in New Zealand and this provided access to internet communication technology skills. The second study involved analysis of the “Teach Less Learn More” motto of the Singapore education system which enables students to acquire skills such as teamwork, problem solving and critical thinking. The last case study involved the incorporation of digital classrooms in Bangladesh, which helped students master digital literacy, teamwork and creativity, among other skills.

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Singapore and the Workforce of the Future

Describes what Singapore is doing to prepare itself for the future and provides projections of the future workforce.

Chartered Institute of Personnel and Development and Human Capital Leadership Institute. (2016, March). *The future of talent in Singapore 2030* (pp. 1-56).

This report collaboration with the Human Capital Leadership Institute (HCLI) highlighted the main drivers that would shape future work, so that leaders and decision makers can better consider their future strategies and the talents they require from workers. Four vignettes set in 2030 Singapore are also presented to allow active discussion on current predictions of the future and provide better approach to strategic planning.

[Committee of the Future Economy. \(2017\). *Report of the committee on the future economy-Pioneers of the next generation.*](#)

The report by the Committee of the Future Economy described how Singapore can prepare itself for the future economy through seven strategies. They include deepening and diversification of Singapore’s international connections with other economies, gaining and employing specialised skills through schemes such as SkillsFuture, building strong digital capabilities through aiding small-medium enterprises and through improved data analytics and for companies to form partnerships with each other to foster innovation. You can also read various subcommittee reports on various issues such as the future of connectivity, future growth industries and future jobs and skills.

Low, I. (2016, July 31). *The future of work: Working 9 to 5 may not work anymore. The Straits Times.* Retrieved from <http://www.straitstimes.com/singapore/manpower/working-9-to-5-may-not-work-any-more>.

Read about the opinions of four panelists regarding employment trends in Singapore. In particular, there is to be an increase in freelancing and in contract workers, technology is to create new jobs and that there is to be no boundaries to working hours.

Tan, W.K. (2015, August 11). *NTUC outlines its vision of a future-ready Singapore workforce. Enterprise Innovation.* Retrieved from <http://www.enterpriseinnovation.net/article/ntuc-outlines-its-vision-future-ready-singapore-workforce-451324897>.

The National Trade Union Congress (NTUC) has presented its concept of Singapore's workforce of the future. It mentioned the importance of soft skills in the workforce, in particular a sense of resilience, adaptability, intellectual ability and versatility. It also discussed the need for personal branding, which refers to employees highlighting how they can value-add to companies, along with a challenger mindset, which involves innovative strategizing. The article also encouraged professionals to explore opportunities beyond Singapore so that they stay competitive and progress in their careers.

***Update on the CFE: 'Skills and Experience for the Future'.* (2016, October 20). *Committee on the future economy.* Retrieved from <https://www.gov.sg/microsites/future-economy/press-room/news/content/skills-and-experience-for-the-future>.**

This article discussed training to help Singaporeans acquire skills for the future workforce, future job opportunities along with the skills needed for them and how to develop Singapore for the global market. It highlights SkillsFuture for skill acquisition. Future job opportunities mentioned include engineering, project management and infocomm communication technology. Skills needed include strong initiative, resilience, having an international outlook and high emotional intelligence. Developing Singapore for the global market is expected to involve providing internships for students along with collaborations between businesses and educational institutions.

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