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Robert Ivanschitz

Daniel Korn

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Digital Transformation and Jobs: Building a Cloud for Everyone

Robert Ivanschitz¹
Daniel Korn²

The history of technology – and indeed civilization – is a history of transformative innovations. For our generation, cloud computing is driving a digital transformation. Should we welcome this change? Should we fear it?

We have seen these questions before. A century ago, for example, many societies experienced a major revolution as horse-drawn carriages gave way to cars.³ Many embraced cars because they offered new freedom of mobility, minimizing the time to reach far-away places, opening the door to new industries and new markets.⁴ Traditional modes of transport were superseded, and traditional jobs gave way to new occupations.⁵

But a “farrier” might not have welcomed those changes. In 1905, one hundred thousand horses powered New York City – for local transportation, cargo deliveries, and more.⁶ As cars became dominant, the number of horses in the city fell rapidly, and so too did the number of people employed to maintain them – including farriers, stable-hands, blacksmiths, and saddle-makers.⁷

¹ Assistant General Counsel, Microsoft Latin America. This article expands on an article by the authors originally published in Spanish by the Inter-American Development Bank/Institute for the Integration of Latin America and the Caribbean as *Computación en Nube: La Reconversión del Espacio en Red*, I&C No. 42, Año 21, Agosto 2017.

² Director of Corporate Affairs, Microsoft Latin America.

³ See *A Cloud for Global Good: A policy roadmap for a trusted, responsible, and inclusive cloud*. Chapter 1, MICROSOFT, <http://news.microsoft.com/cloudforgood> (last visited Sept. 23, 2017).

⁴ *Id.*

⁵ *Id.*

⁶ *Id.*

⁷ *Id.*

Fast forward to today. The rapid pace of technological change driven by the advent of cloud computing is already here – online search, smartphones, apps, and other technologies. As Cesar Cernuda, President of Microsoft Latin America said, “[i]t is not that we’re preparing for [the 4th Industrial Revolution] . . . I just returned from Brazil where they have more than 100 million Facebook users: *that* is internet, *that* is cloud, *that* is mobile . . . this digital transformation is something that we’re living.”⁸

Few will doubt that cloud computing delivers enormous benefits. Through the cloud, consumers are accessing a greater universe of information and services than ever before, businesses are leveraging greater computing power to drive new business models that unlock new markets, and public institutions are becoming more efficient in delivering services to a broader array of citizens.⁹ All at a cost that is so accessible that people are speaking of a giant leap in the democratization of computing.¹⁰

Notably, these benefits go well beyond mere cost savings:

— By switching to the cloud, Miami’s municipal government enabled building inspectors to issue permits while onsite by accessing documents remotely, thus speeding development;¹¹

— Peru’s government used the cloud to increase citizen engagement by providing an app that located the nearest polling station for voters.¹² The result was a reduction of nearly 60% in voter absenteeism in 2016 compared to the 2011 presidential elections;¹³

— The government of Antigua and Barbuda created a Citizen’s Portal that, in the words of Minister of Information, Broadcasting, Telecommunications & Information Technology Melford W. Nicholas, delivered increased citizen engagement and provision of services online to include the renewal of driver’s licenses, applications

⁸ Interview by Xavier Serbia with Cesar Cernuda, President, Microsoft Latin America, CNN EN ESPAÑOL (Oct. 28 2016).

⁹ See *A Cloud for Global Good: A policy roadmap for a trusted, responsible, and inclusive cloud*. Chapter 1, *supra* note 3.

¹⁰ Daniel Korn, *La Tecnología al Servicio de la Comunidad*, *Revista UNO* No. 20, available at <http://www.revista-uno.com/numero-20/la-tecnologia-al-servicio-de-la-comunidad/>

¹¹ See *A Cloud for Global Good: A policy roadmap for a trusted, responsible, and inclusive cloud*, *supra* note 3

¹² *Id.*

¹³ *Id.*

for entry visas and access to the land and company registries at a “reduced cost in terms of total cost of ownership [and with] the additional benefit of it being scalable based on demand;”¹⁴ and

— The Tax Authority of Mexico (SAT) optimized one of its most important functions: processing electronic invoices.¹⁵ In 2012, SAT processed 25 million invoices a month.¹⁶ After moving to the cloud in March 2015, SAT achieved the processing of 35 million invoices in one day.¹⁷

In short, it is clear that the cloud can change the world for the better. But when we step back and look at the public discourse on cloud-enabled technologies, the sense of excitement is sometimes tempered by trepidation. People are asking a version of the “farrier’s question” of a century ago – how will cloud computing impact employment, and how can we ensure no one is left behind?

The first part of the answer is that, as demonstrated in a recent study of census data for England and Wales since 1871, technological progress has consistently been a “great job-creating machine.”¹⁸ Cloud computing likewise creates jobs. It drives overall *growth* in employment, in at least three key ways:

— *Cloud stimulates demand for new occupations directly.* Cloud computing has already enabled the emergence of new occupations – such as data scientists – generating vast numbers of new vacancies that need to be filled.¹⁹ In late 2014, International Data

¹⁴ Skype Interview with Hon. Melford W. Nicholas, Minister of Information, Broadcasting, Telecommunications & Information Technology, Antigua & Barbuda (Feb. 13, 2017).

¹⁵ See *Tax Authority Improves Interaction With Taxpayers through Cloud Computing Services*, MICROSOFT (Dec. 11, 2015), <https://enterprise.microsoft.com/en-us/customer-story/industries/government/tax-authority-of-mexico/>.

¹⁶ Case Study, *SAT solutions on the Cloud*, citing Juan Manuel Galarza, Administrador General de Comunicación y Tecnologías de la Información del Servicio de Administración Tributaria (SAT) (Aug. 2015) (on file with the authors).

¹⁷ *Id.*

¹⁸ Katie Allen, *Technology Has Created More Jobs Than It Has Destroyed, Says 140 Years of Data*, THE GUARDIAN (Aug. 18, 2015, 2:00 AM), <https://www.theguardian.com/business/2015/aug/17/technology-created-more-jobs-than-destroyed-140-years-data-census>.

¹⁹ See IDC Reveals *Worldwide Big Data and Analytics Predictions for 2015*, BUSINESS WIRE (Dec. 11, 2014 11:42 AM), <http://www.businesswire.com/news/home/20141211005981/en/IDC-Reveals-Worldwide-Big-Data-Analytics-Predictions> (quoting Dan Vesset, Carl W. Olofson, David Schumehl,

Corporation predicted that demand for positions in data science, data management, and interpretation would reach nearly a million in the United States alone by 2018.²⁰ Likewise, in a 2016 survey, 42% of responding employers in the Americas reported job shortages for both skilled professionals and IT workers.²¹

— *Cloud enables organizations to re-allocate resources and thereby increase employment in other areas.* In a recent Rackspace survey of UK and US enterprise cloud users, 62% of respondents indicated they are reinvesting their savings from cloud computing back into the business to do things like increase headcount, boost wages, and drive product innovation.²² A Boston Consulting Group survey of small and midsize enterprises (SMEs) in five countries, including the United States and Brazil, found that SMEs using cloud technologies grew jobs nearly two times faster than SMEs not in the cloud.²³ The survey also found that within Brazil alone, adoption of new cloud-based and related technologies could boost formal jobs by up to 2.5 million.²⁴ And *The Economist* has noted that reductions in costs caused by automation can “actually increase demand [stimulating jobs] . . . [D]espite the introduction of the barcode scanner

Brian McDonough, Alys Woodward, Craig Stires, Maureen Fleming, Ashish Nadkarni, Ali Zaidi, and Mukesh Dialani, *IDC FutureScape: Worldwide Big Data and Analytics 2015 Predictions*, INTERNATIONAL DATA CORPORATION (Dec. 2014), <http://www.idc.com/research/viewtoc.jsp?containerId=253423>.

²⁰ *Id.*

²¹ See *Skilled Talent: It's at Your Fingertips. As Organizations Report the Highest Talent Shortage Since 2007, Employers Look to Develop Their Own Workforces to Fill In-Demand Roles*, MANPOWER GROUP (Oct. 18, 2016), <http://www.investor.manpowergroup.com/releasedetail.cfm?releaseid=994052>

²² Christina Weaver, *88 Percent of Cloud Users Point to Cost Savings According to Rackspace Survey*, RACKSPACE BLOG (Feb. 21, 2013), <https://blog.rackspace.com/88-per-cent-of-cloud-users-point-to-cost-savings-according-to-rackspace-survey>.

²³ See *Lessons on Technology and Growth from Small-Business Leaders: The Opportunity for Faster Growth*, THE BOSTON CONSULTING GROUP, https://www.bcgperspectives.com/content/articles/technology_software_globalization Ahead Curve Lessons Technology Growth Small Business Leaders/?chapter=4#chapter4.

²⁴ *Id.*

in supermarkets and the ATM in banks, for example, the number of cashiers and bank tellers has grown.”²⁵

— *Cloud makes possible the creation of innovative services and accelerates the creation of new companies in the digital economy.* For instance, the relatively new mobile ecosystem in Latin America – driven by growth in mobile app developers and related service providers relying on cloud infrastructure – already employed as many as 1.9 million people in 2015.²⁶ By reducing barriers to entry for new businesses, cloud computing can also help lift people out of poverty. Colombia’s former Minister of ICT, Diego Molano, credits the Colombian government’s initiative to increase the number of Colombian citizens connected to the Internet from 2.2 million in 2010 to 8.8 million in 2014, as the reason that 2.5 million citizens were lifted out of poverty during that period.²⁷

Overall, cloud computing is likely “to be positive [for jobs], creating more jobs than are destroyed and accelerating the creation of new businesses.”²⁸ These jobs may also be better-quality jobs: a new International Labor Organization (ILO) study concludes that the expanding use of digital technologies to enable work at home and elsewhere could help to improve work-life balance, reduce commuting time, and boost productivity.²⁹ To promote such “teleworking,” the

²⁵ Andrew Palmer, *Lifelong Learning Is Becoming An Economic Imperative*, THE ECONOMIST (Jan. 12, 2017), <http://www.economist.com/news/special-report/21714169-technological-change-demands-stronger-and-more-continuous-connections-between-education>.

²⁶ See *The Mobile Economy, Latin America and the Caribbean 2016*, GSMA <http://www.gsma.com/mobileeconomy/latam/> (last visited Sept. 23, 2017).

²⁷ Julianne O’Connor, *Internet Could Solve Poverty in Colombia*, THE BORGAN PROJECT BLOG (Aug. 15, 2014), <http://borgenproject.org/internet-solve-poverty-colombia/>.

²⁸ Jonathan Liebenau, *The Impact of Cloud: How Cloud Computing Will affect Jobs and the Economy*, ECONOMIST INTELLIGENCE UNIT (Jun. 5, 2014), <http://www.fujitsu.com/lu/Images/wp-eiu-impact-of-cloud.pdf>.

²⁹ *Working Anytime, Anywhere: The Effects on the World of Work*, INTERNATIONAL LABOR ORGANIZATION (Feb. 15, 2017), http://www.ilo.org/global/publications/books/WCMS_544138/lang--en/index.html.

Government of Colombia has launched a website that offers companies and workers a wealth of information on teleworking, “including job openings in the modality of telework.”³⁰

However, we should not expect the cloud transformation to be painless or to occur without the right mix of public policies and worker training. Many people today are unable to benefit from the emerging digital economy because they lack the appropriate skills and opportunities to master them.³¹ The United States, for example, had 600,000 open computing jobs last year but produced only 40,000 new four-year computer science graduates.³² In Brazil, 67% of companies identified the lack of qualifications in the current labor force as a key roadblock to higher productivity,³³ while “a whopping 59% of employers in Argentina said that they faced difficulty in finding skilled labour for open positions.”³⁴

As one of the world’s leading cloud providers,³⁵ Microsoft is working hard to address concerns over the social and economic impacts of cloud computing. One of our key efforts is to promote solutions aiming to ensure that everyone, regardless of socioeconomic status, has affordable access to high-speed Internet. Examples include Microsoft’s *Rural Airband Initiative* in the United States, where Microsoft is investing in partnerships with telecommunica-

³⁰ See *¿El teletrabajo no termina de convencer en Colombia?*, SEMANA (Feb. 5, 2015), <http://www.semana.com/tecnologia/articulo/teletrabajo-en-colombia-no-seria-convinciente/416990-3>.

³¹ Brad Smith, *Responsible Technology Can Play a Crucial Role in Moving Our Country Forward*, LINKEDIN (Dec. 1, 2016), <https://www.linkedin.com/pulse/responsible-technology-can-play-crucial-role-moving-our-brad-smith>.

³² *Id.* See generally *Promote Computer Science*, CODE.ORG, <https://code.org/promote> (last visited Sept. 23, 2017).

³³ See Fernanda De Negri and João Maria de Oliveira, *O Desafio da Produtividade na Visão Das Empresas*, IPEA, http://www.ipea.gov.br/agencia/images/stories/PDFs/livros/livros/produtividade_no_brasil_miolo_cap10.pdf (last visited Sept. 23, 2017).

³⁴ Imogen Reeve-Tucker, *Argentina Has The Highest Shortage Of Skilled Labor In Latin America*, THEBUBBLE.COM (Nov. 1, 2016), <http://www.thebubble.com/argentina-has-the-highest-shortage-of-skilled-labor-in-latin-america/>.

³⁵ *Media alert: Leading cloud service providers accelerate in Q3 2017, fueling 43% growth*, CANALYS, (Oct. 27, 2017) <https://www.canalys.com/newsroom/media-alert-leading-cloud-service-providers-accelerate-q3-2017-fueling-43-growth>.

tions companies to take advantage of underutilized broadcast spectrum and achieve the goal of bringing high-speed internet connectivity to 2 million people in rural America by 2022.³⁶ Microsoft also works with governments and organizations around the world to make digital technologies more accessible to people with disabilities, including innovative efforts to use eye-tracking technology to help people control wheelchairs with their eyes,³⁷ and to use Microsoft 3-D soundscape technology to enable people with vision loss to navigate urban environments.³⁸ Microsoft has also established a range of programs to make the cloud more readily available to entrepreneurs, start-ups, and small businesses, including through more than 100 Microsoft Innovation Centers across the world, and our *Microsoft Accelerator*, and *Microsoft BizSpark* programs.³⁹

Moreover, through the Microsoft Professional Program, Microsoft has begun training people directly in reskilling needed to work with cloud technologies, Big Data, and Internet development.⁴⁰ Over 70,000 people have enrolled in the program so far (more than 30,000 are from the United States and Canada, and over 5400 are from Latin America).⁴¹ The first certificates for Data Science were issued in February 2017, and programs in Big Data Engineering and Front-End Web Development were launched in June.⁴² Cloud Administration and DevOps will launch in the fall.⁴³

³⁶ See Brad Smith, *A Rural Broadband Strategy: Connecting Rural America to New Opportunities*, MICROSOFT (Jul. 10, 2017), <https://blogs.microsoft.com/on-the-issues/2017/07/10/rural-broadband-strategy-connecting-rural-america-new-opportunities/#b2BPs1fvB4w4sGZW.99>.

³⁷ See Jennifer Chen, *Former Pro Football Player Uses Eye-Tracking Tech on Surface to Communicate*, THE MICROSOFT FIREHOSE BLOG (Jan. 31, 2014), <https://blogs.microsoft.com/firehose/2014/01/31/former-pro-football-player-uses-eye-tracking-tech-on-surface-to-communicate/>.

³⁸ See Katie Stainer, *Cities Unlocked: A Voyage of Discovery*, MICROSOFT (Nov. 25, 2015), <https://news.microsoft.com/en-gb/2015/11/25/cities-unlocked-a-voyage-of-discovery/>.

³⁹ See *A Cloud for Global Good: A policy roadmap for a trusted, responsible, and inclusive cloud*. Chapter 1, *supra* note 3.

⁴⁰ Email Interview with Keith Boyd, Director of Business Strategy, Microsoft Professional Program (Aug. 14, 2017); see also MICROSOFT PROFESSIONAL PROGRAM, <http://academy.microsoft.com/> (last visited Oct. 17, 2017).

⁴¹ *Id.*

⁴² *Id.*

⁴³ *Id.*

LinkedIn is also working hard to create opportunities for every member of the global workforce through its “Economic Graph” — a digital map of the global economy that includes every member of the global workforce and their skills; serving as a direct conduit between open jobs and job seekers, employers, educational institutions and government partners.⁴⁴ As Nicole Isaac, Director of Government Relations for LinkedIn said:

We’ve been sharing labor market insights from the Economic Graph with dozens of policymakers across the globe to help increase access to opportunities for all individuals, and from all backgrounds. In Latin America we’re working with the Inter-American Development Bank to help strengthen the public employment systems across the region, and to expand opportunities in a transparent way for all individuals at every level.⁴⁵

Microsoft also focuses on improving the employment prospects of today’s youth, undertaking a range of educational and community outreach measures to equip the next generation with the technical skills and entrepreneurship tools they need to succeed in the cloud era. For example, Microsoft’s global program, YouthSpark, has benefited 60 million youth in Latin America alone by increasing access to digital skills including computer science education to create employment opportunities. Microsoft’s *#YoPuedoProgramar / #EuPossoProgramar* initiative creates computer science training opportunities in partnership with schools, nonprofits, teachers, government, youth centers and more than 200 partners who together have reached 4 million youth in the region.”⁴⁶ Microsoft’s support of *#YoPuedoEmprender*, recently launched in collaboration with the

⁴⁴ See generally *Economic Graph*, LINKEDIN, <https://www.linkedin.com/economic-graph> (last visited Sept. 23, 2017) (showing that the Economic Graph is comprised of over 500 million members on LinkedIn around the world, 9 million companies, over 30,000 institutions of higher education, and almost 10 million open jobs).

⁴⁵ Email Interview with Nicole Isaac, Director of Government Relations, LinkedIn (Aug. 2, 2017).

⁴⁶ Email Interview with Jennifer Brooks, Director for Latin America, Microsoft Philanthropies (October 29, 2017).

Organization of Iberoamerican Youth (*Organización Iberoamericana de Juventud (OIJ)*), provides digital resources and tools to empower young entrepreneurs.⁴⁷

Although Microsoft is committed to doing our part, our efforts alone are not enough. To make the transition to the cloud a success, governments must take an active role to prioritize, incentivize, and drive new programs to empower workers to have the skills they need for new occupations. This is one reason why we advocate for governments to expand computer science education in schools, and to undertake other policies – from adult education to increasing broadband access in rural areas – to help skill up, retrain, and empower workforces.

Even as governments lead, however, it is important that all stakeholders – including industry groups, educators, and NGOs – support those efforts. For example, Microsoft and other companies in our sector have gotten together to establish the *Partnership on AI to Benefit People and Society*, a non-profit with a mission to ensure that artificial intelligence (AI), built on top of cloud infrastructure, is harnessed for the benefit of us all.⁴⁸ As noted by Microsoft Research Technical Fellow Eric Horvitz, who is also the Partnership Co-Chair, “the influence of AI on jobs and economics more broadly is one of the planned thematic pillars of efforts for the *Partnership on AI*.”⁴⁹

The fact is that many jobs will be lost to robots, self-driving cars, and other computer-enabled innovations,⁵⁰ so investments in train-

⁴⁷ See generally *Microsoft y la Organización Iberoamericana de la Juventud fortalecen el diálogo sobre la inclusión del tema de jóvenes rumbo a la Agenda de Desarrollo Post-2015*, MICROSOFT (June 19, 2014), <https://news.microsoft.com/es-xl/microsoft-y-la-organizacion-iberoamericana-de-la-juventud-fortalecen-el-dialogo-sobre-la-inclusion-del-tema-de-jovenes-rumbo-a-la-agenda-de-desarrollo-post-2015/>; See also Email Interview with Jennifer Brooks, Director for Latin America, Microsoft Philanthropies (October 29, 2017).

⁴⁸ See *Partnership on AI to Benefit People and Society*, <https://www.partnershiponai.org/> (last visited Sept. 23, 2017).

⁴⁹ Email Interview with Eric Horvitz, Technical Fellow and Director Microsoft Research – Redmond Lab, Microsoft (Mar. 7, 2017).

⁵⁰ See generally *The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution*, WORLD ECONOMIC FORUM (Jan. 2016), http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf (indicating that the biggest employment decline of any job family is expected in current Office and

ing that prepare people for new high-demand jobs in science, technology, engineering and mathematics (STEM) is one of the most important actions we can take. Governments should also invest in high-quality worker retraining programs for those already in the workforce.⁵¹ As Brad Smith, President of Microsoft has said, “in a time of rapid change, we need to innovate to promote inclusive economic growth that helps everyone move forward. This requires a shared responsibility among those in government, across the private sector, and by individuals themselves.”⁵² With thoughtful efforts and public-private collaborations, the transformation of our time can truly change people’s lives for the better.

Administrative roles, since the latest technological trends have the potential to make many of those roles redundant).

⁵¹ See *The Dawn of Artificial Intelligence: Hearing on S. Hrg 114-562 Before the Sub. Comm. on Space, Science, and Competitiveness*, 114th Cong. 7-17 (2016) (statement of Eric Horvitz, Technical Fellow and Director, Microsoft Research).

⁵² Brad Smith, *Moving Forward Together: Our Thoughts On The US Election*, MICROSOFT ON THE ISSUES BLOG (Nov. 9, 2016), <https://blogs.microsoft.com/on-the-issues/2016/11/09/moving-forward-together-thoughts-us-election/#sm.00001ug9aft8a3dawyysglz7bm2oy>.