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Towards Responsible Digital Transformation

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Pervasive digitization will require the creation of responsible shared policies.

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The current pervasive digitization not only provides immense opportunities for industries to digitally transform themselves (World Economic Forum 2018), it can also profoundly impact all facets of human society – from government services, education, healthcare,

transportation, agriculture, manufacturing, energy, to the future of work.

Digitization allows information and services to flow without boundaries – the increased access for a wide range of users can break down socio-economic and cultural barriers. Innovations such as open-access learning in education and telemedicine in healthcare increase quality of life and promote developmental equity.

The emergence of "digital twins" – detailed representations of business and human entities based on activity data – can boost efficiency, enhance functionality, and improve lives.

For example, at the firm level, sensors and reinforcement learning allow logistics companies to optimize routes and reduce empty containers and fuels. With new product failure rates at over 90%, detailed models of consumers enable firms to perform simulations to more accurately predict demand before introducing new products to the market, resulting in lowered failure rates and more efficient resource allocation.

At the individual level, digital twins provide more accurate product recommendations before consumers' needs are realized; the Internet of Things (IoT) sensors from devices such as Nest, smart mattresses or smart lightbulbs can gather and analyze consumers' "in-use" data and promote healthy living habits; biometric data from increasingly sophisticated wearable devices can potentially detect illnesses before any symptoms emerge.

As computing becomes more ubiquitous, artificial intelligence more ambient, and digital transformation more commoditized, human society will become increasingly reliant on data and technology.

These seismic societal shifts are too important to be left by their own devices. We need to facilitate dialogues among multiple stakeholders such as public policymakers, legal scholars, technologists, social scientists, business leaders, and educational institutions, to ensure responsible, inclusive, and equitable progress in the age of digitization.

Laws and regulations need to be updated to protect citizens

Throughout history, trust in legal institutions has had an economic as much as an ethical purpose. In a recent large-scale survey of Microsoft's customers around the world, 70% surveyed said that current legal protections for data security were insufficient, while over 70% believed their information stored in the cloud had the same legal protection as physical files – a belief that is uncertain in the current legal climate.

As the Nobel-winning economist Douglass North stated, technical innovations alone are not enough to drive an economy to success. Legal institutions such as courts that will fairly enforce contracts are necessary (North 2002). A robust legal institution is a major reason why the United States has historically generated so much economic opportunity and progress. For example, the Fourth Amendment protects Americans against unreasonable search and seizure. These timeless values must be upheld through enforcement laws that require continual updating in the face of social, economic, and technological changes.

The need for updating laws is not new to digital transformation. Throughout history, every wave of technological change required the updating of laws to protect citizens. Benjamin Franklin's creation of the U.S. Postal Service quickly led to mail fraud – and to laws against it. The telegraph led to wire fraud and eavesdropping – and to laws designed to prevent them. Email marketing led to unsolicited email abuse – and to CAN-SPAM Act in 2003. More recently, concerns with privacy and data breaches gave rise to laws governing the collection and use of customer data such as General Data Protection Regulation (GDPR). Today's digital devices, the cloud, and AI will be used both for good and evil. It is the turn of this generation to design regulatory systems that discourage and punish the evil while encouraging the good to flourish.

Globally, the world community needs to affirm cybersecurity norms as global rules to protect civil rights and privacy – a multilateral "digital Geneva Convention" to commit governments to the norms that protect civilians on the Internet in times of peace. The updated legal framework should have the following features:

1. Commit governments to avoid cyberattacks that target the private sector or the use of hacking to steal intellectual property.

2. Ensure stronger privacy protection so that the security of user data is not eroded in the name of governmental efficiency. For example, companies should be allowed, except in exceptional cases, to notify users when their information is sought by a government.

3. Given the increasingly interrelated services in the digitized environment, users of technology have evolved to involve multiple sources in multiple jurisdictions. Thus, we need a principled and transparent framework for the collection of digital evidence that respects international borders while recognizing the global nature of today's information technology.

4. As global commerce shifts away from the movement of physical goods to the transfer of technology, information, and data, multilateral trade agreements and regulatory paradigms should accordingly reflect this shift.

5. Legal and regulatory reforms must not undermine advances in encryption and security, which are essential for users' trust in the digitized age.

These reforms based on innovative and collaborative thinking from leaders in technology and government not only protect property and civil rights, reduce chaos and unpredictable unilateral governmental actions, but will engender safety and trust in technology for users around the world.

Principled, empathetic, and humanistic approaches to technology design

Similarly, technology itself is not going to be adopted by users without trust. Trust is a humanistic outcome and takes time to build. Trust is especially critical for drastic and potentially anxiety-inducing innovations such as AI.

To engender user trust, technology not only has to be consistently secure and reliable, but its designs have to be empathetic and reflect the shared values between the technology designers, the adopting companies, and the final users. In a memo sent by Bill Gates in the early 2000s to Microsoft employees, he expressed the paramount importance of trustworthy computing – "if we don't do this, people simply won't be willing – or able – to take advantage of all the other great work we do".

As advances in AI will have an enormous impact on the future of human experiences, tech companies have a moral and social responsibility to design AI with a principled approach. The companies need to deeply reflect on their worldviews – how they comprehensively see and envision the world across economic, social, and political borders, and think about the purpose of their existence beyond profit, growth, and shareholder value. Technology should be a force for equitable progress, and not a force to worsen inequality.

In 2016, leading tech companies including Microsoft, IBM, Google, Amazon, and Facebook formed the Partnership on AI to advance public understanding of AI and to come up with best practices on the applications of AI and human-AI collaboration, with the focus on how AI can be used for social good.

The science fiction writer Isaac Asimov laid the foundation for ethical designs of robots in the 1940s by providing a hierarchical logic: First, robots should never harm a human through their action or allow harm to come to a human via inaction. Second, they must obey human orders. Third, they must protect themselves. Based on this set of core principles, additional design factors in different application contexts need to be addressed. As technology designs often do not emphasize social and behavioral aspects of design, the need for humanistic approaches is pressing (Breazeal 2003). This is where perspectives of social scientists, historians, and humanities scholars can add tremendous value.

Therefore, technology designs not only need to adhere to the principles of lawfulness and respect for sovereignty, but need to also embody higher-order humanistic and ethical principles. Research and business leaders in computer science have identified six ethical principles – fairness, reliability and safety, privacy and security, inclusivity, transparency, and accountability – to guide the cross-disciplinary development and use of AI (Smith and

Shum 2018). The better we understand these issues, and the more technology developers and diverse users can collaborate to incorporate these factors into the tech designs, the better machines can build solutions and accelerate the benefit to society.

Furthermore, if tech is going to serve the planet, then the tech workforce will need to accordingly reflect the planet. Diversity and inclusion efforts are not only important from the perspectives of ethics and social equality, but they also make technology more human that can empathize with diverse users throughout the world.

As technology becomes increasingly critical in shaping our society, we envision that in the future, studies of ethics and empathy will become mandatory for computer programmers and researchers and that a technological “Hippocratic Oath” will be required for technologists to uphold legal, ethical, and humanistic principles.

Managing digitization by learning from transformative technologies of the past

In previous industrial revolutions, we have seen society transition in several phases. First, we invent the technologies of transformation, which is the phase that we reside in today. Second, we envision an idealized future and try to retrofit it, which is the phase that we are entering now. Throughout the second phase, we navigate distortion and dissonance that requires us to fine-tune or question our original design philosophy. Each of these transitional phases poses difficult issues.

Policymakers globally can benefit from broadening their thinking about the role of technology in economic development through historical perspectives. During the Industrial Revolution of the nineteenth century, many of the technologies were developed in England. However, the previously impoverished country of Belgium dramatically increased its industrial production to a level rivaling that of England, by leveraging key British innovations and creating a pro-innovation regulatory environment. These initiatives completely transformed the economic trajectory of Belgium and made it into

one of the wealthiest countries in Europe. In contrast, the previously richer Spain significantly lagged the rest of Europe in industrial productivity as a result of its slow adoption of outside innovations and protectionist policies.

Accordingly, the economist Diego Comin found that the historical differences between rich and poor nations can be explained by the speed in which they adopted innovative technology, but equally important, is the "intensity" they employ in using the technology (Comin and Mestieri 2018). Even countries that were slow to adopt new technology can catch up – it is the intensity and pervasiveness in how they put the technology to use, and not just the access, that creates economic opportunity and prosperity.

Just like many small and traditional firms have been able to reinvent themselves and leapfrog larger competitors through consciously designed and committed digital transformation initiatives in recent years, entire countries, societies, and populations can also do so through the intense adoption of digital technologies through conscious policies and education efforts.

The urgent need for digital thinking at all education levels

We believe that in the future, most businesses will be digitally transformed to become "software companies," and understanding data and possessing analytic skills will be analogous to today's necessary job skills such as word processing and spreadsheets.

Jobs are being digitized at a rapid pace. The Brookings Institution found that in 2002, only 5% of jobs had high "digital content", measured by the amount of knowledge and interactions with computers, and 40% and 56% of jobs had medium and low digital content. By 2016, the percentages of available jobs with high, medium, and low digital content have respectively evolved to 23%, 48%, and 30%. Furthermore, the average wages for high, medium and low digital content jobs are $73K, $48K, and $30K. These findings indicate that not only are traditional, low digital content jobs shrinking rapidly, but the associated income inequality is also widening (Brookings 2017). Furthermore, there exist disparities in digital education by country and by gender (OECD 2019).

Therefore, the need for training programs focused on productivity outcomes will be crucial to prepare the current and future workforce for digitization and to reduce income inequality. Computer skills and, more importantly, “computational thinking” (Wing 2006), should be part of the required curriculum from a young age, just like English and math, and not just only in post-secondary education.

One point of comparison is that Germany and the U.S. both invest heavily in R&D, but Germany was able to enjoy higher rates of productivity growth across all segments of its population – one explanation is the German system of vocational training, which makes cutting-edge technologies available to the workforce quickly through vocational schools that have close relationships with industry. This comparison further illustrates that it is not just access to technology, but the intensity of its use, that drives economic prosperity.

In the short-run, there is no question that we will experience the pain of job dislocation due to machines. The economist Daron Acemoglu found that each new intelligent machine reduces employment by about three workers, which suggests that without any conscious changes, the spread of industrial automation could have severe consequences for jobs and wages. However, he also found that although automation tends to reduce employment and the share of labor in national income, the creation of more complex tasks has the opposite effects. (Acemoglu and Restrepo 2019). Throughout history, new classes of workers and previously unimaginable tasks have always resulted from cutting-edge technologies, and these new and complex tasks always increase wages and employment.

Therefore, digital training programs should also be made free and accessible to workers who are losing their jobs to automation. Just like countries that built up industrial capabilities in the previous Industrial Revolutions, societies that invest in building digital capabilities in their population will see the rewards for years to come.

The convergence of technology and humanity in higher education

As computers behave more like humans, the important skills for the future of work involve more than STEM. Steve Jobs once said of Apple's success, "it's in Apple's DNA that technology alone is not enough — it's technology married with liberal arts, married with the humanities, that yields us the results that make our heart sing." (The New Yorker 2011).

Indeed, the social sciences and humanities can teach critical, philosophical, and ethics-based skills that will be instrumental in the development and management of technological solutions. If machines are to reach their potential in serving humans, then every engineer will need to learn more about the liberal arts and every liberal art major will need to learn more about engineering.

As machines increasingly take on specialized roles, the future of education need to deviate from the current trajectory to involve more generalist, abstract, and adaptive thinking, to increase not just the depth, but the "range" of skills (Epstein 2019). Broadening the range through seemingly unrelated domains prepares humans for a changing world that increasingly requires not specialized, but higher-level and abstract reasoning.

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So, how do we broaden range? American higher education, which until the first half of the 20th century, has focused on the "humanistic ideal" - the university's purpose was teleological, to help answer the ultimate questions of life, to shape the students' souls, and to turn out students who were "acceptable at a dance, invaluable in a shipwreck" (Kronman 2019). However, over the years, the pace-setting universities gradually dropped the humanistic ideal to adopt the "research ideal" that emphasizes technical specialization and productivity and offers little way for the university to engage the student as a whole person. Big, vague questions like "the purpose of life" and "the moral life" began to be deemed as not only unrealistic but irresponsible and pernicious. The result is that universities, like the rest of modern society, are "information-rich, but meaning-poor."

Given that machines can tackle specialized tasks much better than humans can, it is time for policymakers, educators, and non-profits to revisit the educational framework to rejuvenate the emphasis on liberal arts and the “humanistic ideal.”

Finally, all stakeholders need to think about the future role of humans in the digitized world and the ways humans add value. Based on the current pace of development, it will be a long time until machines can develop creativity or empathy – the science-fiction images of “artificial general intelligence” and “the Singularity” still reside in the unforeseeable future. Humans, through our immense capacity for ingenuity, will add value where machines cannot. As we encounter more artificial intelligence, real intelligence, real empathy, real creativity, and real human connections will be scarce and valued. The future of work will be predicated on knowing how to work with machines, with uniquely human attributes.

▶ References

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