

This is a forum for perspectives on designing for marginalized communities worldwide. Articles will discuss design methods, theoretical/conceptual contributions, and participatory interventions with underserved communities.

— Nithya Sambasivan, Editor

Beyond the Portal: Reimagining the Post-Pandemic Future of Work

Divy Thakkar, Google Research, Neha Kumar, Georgia Tech, Nithya Sambasivan, Google Research

As the epic Covid pandemic unfolds before us, it is the proletariat of the world who have been among the most affected. From waste pickers in Brazil to tourist guides in Vietnam to retail workers in the U.S., single-wage earners have experienced record-high job losses, thrusting entire households into despair and poverty. In many parts of the Global South, workers of the informal sector—which spans anywhere from 70 to 90 percent of national economies—have been the hardest hit. In India, the sudden lockdown led to the shutdown of transportation, food supply, and factories. Millions of migrant workers in the informal sector were left to walk hundreds of kilometers back home, facing the ordeal of hunger, starvation, and inhumane treatment from police forces, resulting in more than 300 lives lost from the lockdown itself.

These job losses are what many predicted would come about through improved AI. As Indian writer Arundhati Roy writes in the *Financial Times*, the pandemic is “a portal, a gateway between one world and the next” [1]. Here, we draw from our research on the future of work and perceptions of automation among vocational technicians in India [2]. Our research involved semistructured interviews with 38 vocational technicians in Bangalore, India. Based on an emic articulation of a future of work from the workers, we ask what generalizations we can draw for a future of work in the post-pandemic world,

with increased economic uncertainty, devalued human labor, and the worsening threat of climate change. What lies beyond the portal, and how can we shape the new world order to be fair and just to the working class?

Vocational technicians are a critical labor force transitioning from high school education to skilled technicians, specializing in fields like data entry, electrical wiring, and welding. An estimated 1.5 million students are enrolled in more than 13,000 vocational training institutes in India, and the national government has further plans to train 500 million Indians by 2022 [3]. India, like many countries of the Global South, has a large youth demographic dividend—over half the population is below 25 years of age. Workers enter the vocational trade to fulfill their economic and social aspirations, often coming from oppressed caste and class backgrounds. Despite the heavy investment and growth in the vocational labor force, the impacts of automation and the economic

downturn may likely significantly affect these technicians, due to the predictable, repetitive, and frequently mechanistic nature of their jobs. Across the Global South, entire industries built around rule-based jobs like call centers, technology outsourcing, and low-level factory jobs could face the risk of job destabilization from automation and global catastrophes.

Technicians we spoke to did not envision the workplace undergoing a dramatic change in the future, and were largely unfamiliar with AI speculation (in contrast to research in the U.S. that has shown heightened awareness of automation among workers [4]). The idea of machine learning or AI playing much of a role in their work lives seemed to some almost nonsensical:

If something goes wrong at work, my colleague will teach me how to do it. So will I for him. We learn from each other—how will we learn from a machine if it does my job? — Male, 21, Electrician

CASTE AND WORK

Among our study participants, vocational training was viewed as a vehicle to upward social and economic mobility. Most technicians came from oppressed caste backgrounds; their parents and relatives were employed in working-class professions such as daily wage laborers. Many reported being at the receiving end of hierarchical treatment because of their caste. Technical skills were often seen as a way to boost their challenged social standing, and machines were perceived as mechanized objects that were

Insights

- In a hierarchical caste structure, technicians viewed AI machines as having lower intellectual and social standing than humans.
- In India, automation is likely to impact jobs around content moderation, data entry, and call centers, which employ a large number of women.
- Technicians resisted the concept of universal basic income (UBI), viewing work as an integral part of their identities.



Women at work at Deliquial Components, a SCORE-supported enterprise in Chennai, India. The Sustaining Competitive and Responsible Enterprises (SCORE) program is a global technical-assistance program of the International Labour Organization (ILO).

below the hierarchy of technicians. Vocational training was also perceived as an enhancer of social capital by improving the likelihood of a desirable marital alliance.

In a hierarchical caste structure where technicians have repeatedly found themselves at the receiving end of social injustices, machines were viewed as having lower intellectual and social standing, beneath that of humans. Technicians had object-oriented relationships with machines and did not view them as collaborators, coworkers, or supervisors. They articulated their roles as executors of perfection—performing polished, complex technical tasks, and possessing leadership and creativity skills. Importantly, technicians were seen as having expertise and skill in correcting errors, whereas machines were seen as executors of repetitive tasks with no scope for correction without human input. In a sociocultural context where technical careers are linked with prestige and respectable social status, technicians

harbored a belief that their hard-earned technical skills could not be automated.

SOCIAL SAFETY NETS

We asked technicians to describe a future of work in line with their values, anxieties, and aspirations. In an automation-enabled future, legal protections and measures were particularly salient for them. Union bodies were considered crucial for collective negotiation to protect worker rights, or for the enforcement of laws such as a mandatory ratio of machines to people in a workplace. Technicians noted the need for longer notice periods in case of job displacement and the need for upskilling. The costs of reskilling

Machines were viewed as having lower intellectual and social standing, beneath that of humans.

and upskilling were considered appropriate for employers to bear. Several technicians mentioned the need to demand accountability from upper management for any decisions on job layoffs. In the hierarchical societal context of India, access to upper management is often limited to lower-level technician workers, potentially making contestability and recourse problematic for workers. Technicians also sought alternate paths for displaced employees in the same company, noting the need for reskilling to train for new jobs.

Interestingly, technicians expressed strong resistance to the concept of universal basic income (UBI)—a widely hyped scheme for societies anticipating increased automation. Work was viewed as an integral part of technicians' identities as well as a place for social interactions. Technicians viewed a life without work and free income as “going wrong,” “going mad,” and “wasting their life.” As a preview, Covid-19 welfare disbursements for roughly 800 million beneficiaries in

India show fault lines in how very few people had registered with the federal food welfare scheme, or possessed the documents needed to secure benefits.

On the topic of freelancing and the gig economy, technicians were open, even enthusiastic, toward the possibility of pursuing gig work outside of their full-time job's working hours. However, they viewed gig work as being complementary to full-time jobs. Whereas stable jobs in industry or a manufacturing plant were coveted, freelancing, on-demand, and contract work were viewed as highly undesirable. Technicians also expressed their lack of awareness regarding avenues where they could find such work.

REINFORCED DISCRIMINATION FROM PLATFORMS

Despite active dependence on education and employment platforms to complement skills and look for jobs, technicians felt deeply excluded by these systems. One key challenge was that of language; technicians were taught in Kannada and were familiar with vernacular terms, but the content online was typically in English (or formal, unrelatable Kannada). Additionally, search terms often carried a different meaning online versus in technicians' contexts. For example, technicians reported using terms such as *welding job* or *grinding job* where *job* referred to an activity or a task, rather than an employment opportunity. We also learned that searching for learning videos by profession, such as grinder, fitter, or fitness instructor, led to a host of irrelevant semantic mismatches, such as exercise videos for these search terms.

Technicians reported receiving paper certificates at the culmination of each term to indicate the skills that had been acquired therein. They found these vital in the context of their job searches; a dossier of these would be carried to job interviews as evidence of

Many technicians reported not finding relevant jobs for their skill set online.



A gas filling at an SRF factory, India



SCORE enterprises in Chennai, India.

various milestones in their academic training. Technicians reported that certificates were a key component of their interviews, and needed to be available in physical form (and preferably laminated).

Most technicians were unaware of online certification or MOOCs. Currently, MOOCs cater only to college education or K-12 learning, and there are no platforms that cater to vocational training students that would provide validation of their learning. Access to desktops and laptops with stable Internet access has shown glaring gaps, with only 8 percent of households having such a privilege, making remote education during the pandemic a farther reality [3].

Many technicians reported not

finding relevant jobs for their skill set online, and that the job postings they came across catered primarily to students with college degrees and those based in cities. They detailed instances where portals asked for a number of details that did not apply to them, such as high school and college grades, which confused them and resulted in incomplete profiles. Nevertheless, the popularity of these portals, along with the hope of finding a job, kept technicians engaged on these platforms.

GENDER AND AUTOMATION

Designing an equitable future of work must also consider the gendered implications of automation on the workforce. In India, where the

percentage of women in the workforce is already a low 22 percent [5], automation is likely to impact jobs around content moderation, data entry, and call centers, which employ a large number of women. The skewed gender balance in our study, except in the area of computing, raises questions around gendered associations with certain genres of work. For example, care work—typically seen as a feminine, pink-collar undertaking—is predicted to grow in importance in spite of automation. Gendered perceptions of care work stem from cultural norms; it is important to consider how traditional definitions of masculinity and femininity affect workers whose jobs are at risk of automation.

Women's work in hospitality, domestic work, and tourism has already been badly hit due to Covid-19. Frontline health work, predominantly involving women workers, has led to several types of discrimination, in the form of gender-based violence, unequal pay, and unrecognized care work. Job displacements may disproportionately impact women via career growth, social and political status, and unemployment.

Similarly, Covid has brought focus to inequities in the distribution of household work, even in middle-class, two-income families. With the closure of schools, and with limited access to cheap domestic labor services, women working from home are taking a larger share of household and childcare responsibilities, which could potentially harm women's careers in the long term.

IMPLICATIONS FOR POST-COVID FUTURES OF WORK

The pandemic is exacerbating inequities in various aspects of education and work, and has the potential to significantly alter the lives of technicians and millions of other informal sector workers. First, the shift to online education has hinged on access to computing devices, private spaces for study, and access to high-quality supplementary material in the learners' language. All of these do not necessarily hold true for vocational technicians; hence, accelerated progress

through the development of MOOCs and interactive content that combines physical training with theoretical concepts are of the utmost importance. Early experiments with streaming educational content on TV and radio networks have been successful in reaching rural sectors. Actively addressing the algorithmic inequities highlighted in our research could be an early step to bridging the gap.

Second, a large number of migrant workers and technicians have returned to their hometowns, mostly in rural areas. Making job searches efficient, localized, and fair is of paramount importance for providing employment to these workers in industries located near their villages. Recognizing the unique backgrounds and skill sets on job platforms, identified by our study, could be one step in this direction. Similarly, providing hands-on technical training in local languages through blended learning models, combined with video instruction, could be important for ensuring a path to more technical jobs.

The pandemic has gendered implications for vocational students as well as working technicians. An inequitable distribution of household work will push female vocational students and workers to take up a large share of the household responsibilities and further deteriorate their learning, apprenticeship, and job-performance goals. Furthermore, with women students moving back to their family homes, including those in villages, there is greater control and scrutiny of, as well as shared access to, their cellphone use, making the remote-learning and working experience more difficult than it is for their male counterparts. Women technicians employed in call centers and data entry face immediate threats of lower business traction and potentially accelerated automation.

In general, it is possible that with the increased need for social distancing and the uncertainty of the pandemic and upcoming climate disasters, industries will seek out more automation in their industries, further disadvantaging technicians, who risk accelerated job loss. In such a scenario,

instituting policies that enable the agencies and aspirations of these workers is important. Other family members employed in the informal sector might also have lost jobs, increasing the burden and urgency for young trainees to secure jobs. To minimize the impact on the livelihoods of vocational technicians, providing access to digital skills and critical-thinking modules through subsidized smartphones, with recognized certification benefits, is of the utmost importance, especially given the constraints introduced by Covid-19.

ENDNOTES

1. Roy, A. The pandemic is a portal. *Financial Times*. Apr. 2020; <https://www.ft.com/content/10d8f5e8-74eb-11ea-95fe-fcd274e920ca>
2. Thakkar, D., Kumar, N., and Sambasivan, N. Towards an AI-powered future that works for vocational workers. *Proc. of CHI Conference on Human Factors in Computing Systems*. ACM, New York, 2020.
3. Kundu, P. Indian education can't go online—only 8 percent of homes with young members have computer with net link. *Scroll.in*. May 5, 2020; <https://bit.ly/2GZ767t>
4. Smith, A. and Anderson, M. Americans and automation in everyday life. PEW Research Center. Oct. 4, 2017; <https://www.pewresearch.org/internet/2017/10/04/automation-in-everyday-life/>
5. Labor force participation rate, female. World Bank. Apr. 2019; <https://data.worldbank.org/indicator/SL.TLF.CACT.FE.ZS>

📍 **Divy Thakkar** is part of the Google Research India team in Bangalore and pursues research in the domain of HCI for development and its intersections with AI. He is interested in exploring the role of human-centered AI applied to education, the future of work, and AI for social good.
→ dthakkar@google.com

📍 **Neha Kumar** is an assistant professor at Georgia Tech, with a joint appointment in the Sam Nunn School of International Affairs and the School of Interactive Computing. Her work lies at the intersection of human-centered computing and global development.
→ neha.kumar@gatech.edu

📍 **Nithya Sambasivan** is a researcher at Google Research and lead of the India HCI group. Her research is on human agency, fairness, and privacy in human-AI systems in the Global South.
→ nithyasamba@google.com