tcs Empowers

Building on belief

Digital Empowers

Technology as a Catalyst for Empowering Communities

U.S. CHAMBER OF COMMERCE FOUNDATION

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Executive Summary

With the world becoming increasingly interconnected through the rise in digital technologies and global communications, so has the ability for this technology to have a positive impact on society. The opportunity for these technologies to be applied to solve for the world's most pressing problems has become more important than ever, for stakeholders on both the social and tech side. However, challenges exist for all stakeholder groups in breaking down silos in the access to and transfer of information to effectively leverage technology to meet the needs of communities.

Nonprofits and social impact organizations often face a host of challenges in accessing digital technologies that could create efficiencies in their program delivery and create transformational impact. Barriers can range from a lack of financial resources, to the capacity and know-how to effectively utilize them within their organizations, to the lack of knowledge of the power of these technologies in actioning change. On the other hand, corporations and technology leaders that have extensive expertise and resources are often searching for avenues to apply their knowledge and expertise in an impactful way. To bridge this divide and break down the silos at the intersection of emerging technology, expertise, and social impact experience is what led to the genesis of Digital Empowers.

Since its inception, Digital Empowers has engaged with thousands of experts to create and expand the knowledge base, explore technology solutions that have exponential impact on the most pressing problems—all of which have cross-sections and applications around the world—and to create an ecosystem of vital multi-sector partnerships leading to collaborative social impact solutions. The program has also opened doors for social entrepreneurs and changemakers to ideate and collaborate with business and technology leaders to bring novel social impact innovations to the community. The overall goal of Digital Empowers is to facilitate the generation of new ideas, and foster the spread of these ideas while facilitating action through a collaborative process.

Explore the key takeaways from three years of engagements with a myriad of experts that have led to novel ideas in many impact areas.

- Technology has served as a catalyst for reducing inequalities for people accessing basic human rights, with the COVID-19 pandemic further accelerating the adoption of digital technologies. Whether it be accessing education, healthcare, or housing, technology has played a unique role in driving equitable access to resources as well as in increasing efficiencies.

- While larger-scale—macro—social impact challenges are what gain attention globally, it is important to also look at the micro issues that afflict local communities. In order to gain a deeper understanding of the issue, it is important to look holistically at the challenge using a cross-sector approach and include local government, academia, nonprofit, and corporate voices to ideate on solutions.

- Technology continues to be transformational, applying itself uniquely to community needs. Leveraging technology to accelerate social impact for communities is the way forward. There is strong value in creating coalitions of multi-stakeholder partnerships. Public-private collaborations as well as partnerships with the nonprofit and for-profit sector can ensure best-in-class products, technology, and processes are easily made available to marginalized and underserved communities.

> "Digital Empowers has given us a platform to reach new partners that we may not be working with otherwise, and demystifying what digital can do.
>
> Brian Savoy
> SVP, Chief Transformation & Administrative Officer, Duke Energy Corporation

- People, like technologies, hold the power to transform communities across the world. By leveraging human-enablers with their uniquely human traits of empathy, curiosity, and problem-solving—and combining this with innovative new technologies—will be key to successfully adopting efficient and impactful human-machine environments. This human-centered approach to technology development and adoption will be essential in creating effective, sustainable solutions to social impact challenges.

Explore the key insights and interact with the report on https://on.tcs.com/Catalyst

Introduction

Digital Empowers is a program developed in partnership between the U.S. Chamber of Commerce Foundation and Tata Consultancy Services (TCS), celebrating the crucial role technology plays in improving our world. Topics covered since 2018 during in-person and virtual convenings were timely and topical. All of the content contained in this report is correct at the time of publishing, however some individuals' titles, positions, and organizations may have changed since their engagement in a Digital Empowers forum.

Emerging technologies have transformed the way we work—from the way companies do business and engage their value chains to the way governments and nonprofits serve their communities. While leveraging this for business transformations has been the norm, the greatest opportunity lies in the capabilities of these technologies to transform society to solve real world problems. New technologies including blockchain, cloud, augmented reality/ virtual reality (AR/VR), and many others, have a unique potential to fulfill human needs, address pressing community issues, and present new opportunities for innovation and growth.

With Digital Empowers, it is understood that these goals cannot be accomplished when business, technology, nonprofit, and policy makers work in silos. By leveraging the ingenuity and resources of the private sector, the innovative capacity of technologists, and the collective assets of governments, NGOs, and civil society, sustainable, scalable solutions to solve our most pressing societal challenges can be created.

Since 2018, Digital Empowers has been bringing together business leaders, technical experts, community impact organizations, academia, and public policy leaders to raise awareness on digital technologies and social issues, explore the art of what could be possible and, in that process, foster cross-sector partnerships. Digital Empowers has provided a collaborative platform for business and community leaders to co-create and co-innovate on solutions that will shape the future of innovation for social impact.

This report is a culmination of learnings from multiple collaborations over the last three years. Each chapter speaks to a specific social impact issue area and the technology powering the solution to address it. Through this program and this report, we hope to facilitate the generation of new ideas and foster their spread while facilitating action through a cross-collaborative process.

Education

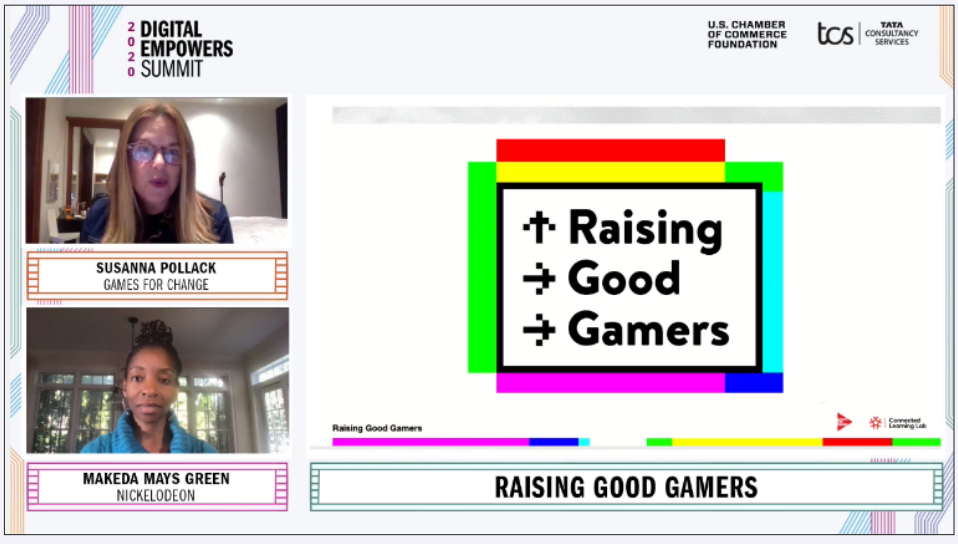
Globally, education has been one of the few industries that has not seen the same digital transformations from technology advancements and the disruptions of Industry 4.0 as many other sectors. "Chalk-and-talk" style teaching is still widely used as a primary instructional strategy and while this method of classroom teaching has been effective, there is now a growing need to invest in tools that make learning open, collaborative, and innovative.

As a result of the COVID-19 pandemic, the education landscape is undergoing a long-awaited shift with technology being the main driver of change. Virtual modes of engagement became the norm, with regions and communities around the world requiring accessible and open education tools essentially overnight. Despite the crisis, many schools discovered for the first time that new tech-powered instructional tools can provide more effective, personalized, and engaging instruction that tailor to the students' needs.

Digital Empowers has been exploring the application of technologies for education since 2018 and has witnessed significant advancements and awareness of "Ed-Tech." This program brought together cross-sector experts to collaborate on effective solutions to open learning, utilizing emerging technologies to inspire students and elevate learning outcomes and possibilities.

Effective Cross-Sector Technology Solutions

With technologies evolving at a rapid pace, so too are their use cases across industries. One trend uncovered during the 2018 Digital Empowers National Summit was how technology is becoming the great equalizer, with various emerging technologies now being applied to education. One such example came from Discovery Education, a company that works with educators, nonprofits and school boards to deliver high quality, digital education content. During the Summit, Discovery Education's Global Learning Initiative Director explained that Augmented Reality (AR) is changing how students and employees learn and grow. The company shared products it offers to educators and students, including a 360-degree virtual video of the real world to make learning an unforgettable interactive experience. Traditionally, VR was designed for NASA space missions, and now Discovery Education has utilized the same technology and a similar learning pedagogy to immerse learners within new environments, igniting a desire to learn more.



Susanna Pollack, President, Games for Change speaks with Makeda Mays Green, VP, Digital Consumer Insights, Nickelodeon on the power of partnerships to accelerate impact for business and social good.

Hall Davidson, Senior Director, Global Learning Initiatives, Discovery Education shares insights on immersive learning opportunities, such as through virtual reality technology.

Another organization utilizing mixed reality environments that Digital Empowers featured during the 2020 National Summit was Games for Change. This nonprofit provides resources to organizations that develop games for social change. They also run game design challenges for cross-industry partners including elementary school boards, colleges, universities, and corporate partners. The organization challenges participants to create social impact themed games that serve as tools in both humanitarian and educational efforts. Additionally, they utilize XR, also known as extended or mixed reality, to create immersive game experiences, and launched XR for Change, a program to develop a community practice of utilizing mixed reality for social impact. This program, combined with their interactive educational resources on game design, help students learn relevant digital skills and how technology can be applied to solve societal challenges.

As gaming is being used more frequently in educational tools and programs, it becomes even more important to ensure that these new virtual environments are safe spaces. Raising Good Gamers, a cross-sector partnership dedicated to rooting out toxic online environments, partnered with Nickelodeon to create recommendations to improve the social culture of virtual playgrounds. Makeda Mays Green, VP of Nickelodeon Digital Consumer Insights at ViacomCBS discussed their approach

> We're creating this interdisciplinary approach to how we cultivate the community of gamers. So when you combine developers, producers, policy-makers, educators, and researchers, we create a vehicle to drive meaningful change.
>
> Makeda Mays Green
> VP of Nickelodeon Digital Consumer Insights, ViacomCBS

to breaking down silos between sectors to create impact, stating, "We're creating this interdisciplinary approach to how we cultivate the community of gamers. So when you combine developers, producers, policy-makers, educators, and researchers, we create a vehicle to drive meaningful change."

Similarly, as discussed in the chapter on Future of Work, Smart Games Systems, a game design startup was featured during the Charlotte Region Forum in 2019. The company uses avatar-based simulations to support doctors, nurses, and midwives who depend on collaborative decision-making for positive patient outcomes. Avatar-based simulation technology, most notably used in video gaming, is an exciting application of technology in education by gamifying the experience through real-life scenarios, providing healthcare workers with essential hands-on experience with simulated patients.

Another unique technology application for education is the use of Internet of Things (IoT), cloud, and data analytics. Arkansas Early Learning, a nonprofit organization focused on providing early childhood learning resources, shared how it uses the cloud and IoT to monitor and collect data on its students, saving teachers' time. The time required for educators to report on student achievement and progress is significant, and often slows down learning. By establishing systems that communicate information seamlessly, Arkansas Early Learning ensures that the information collection does not impact hands-on teaching time. While some of the most well-known use cases for IoT include wearable healthcare devices and home automation, the application of this technology in the educational setting is an important step in exploring effective teaching techniques and time management strategies.

Since Arkansas Early Learning has been successful in collecting big data on student progress and achievements, it is also employing big data tools to create new predictive models for childhood development. This technology will allow parents and educators to make informed decisions about their child's education and identify early warning signs of learning difficulties, with the goal of identifying them early and compensating education where necessary so the child doesn't get left behind.

The most notable technology that has successfully been adopted by the education system recently is cloud platforms and open collaboration tools. Partly due to the necessity brought on by the global stay-at-home orders and in part due to the COVID-19 pandemic, online learning has become an essential mode towards creating an accessible pathway to connect learners to resources and foster continuous education. As discussed during a Digital Empowers forum focused on Creating Pathways to the Skills of the Future in 2021, speakers noted the importance of utilizing digital tools and technology as an enabler of education, but that it can't be enabled by those without access. As a result of the pandemic, youth from rural and underserved areas that lack this access and have fallen nearly a full year behind their peers. To bring them back up to speed, technology can

Families participate in computational thinking activities with Ignite My Future in School.

Student uses computational thinking to design a robot to complete daily tasks.

> As a result of the pandemic, youth from rural and underserved areas that lack digital access have fallen nearly a full year behind their peers.

be leveraged to accelerate infrastructure developments and fast track learning. Cross-sector partnerships between industry, policy, and nonprofits can be established to create these pathways for marginalized youth, now more important than ever.

One such pathway was introduced at the 2018 Summit. TCS featured their signature goIT and Ignite My Future in School (IMFIS) STEM education programs. TCS' goIT program introduces students to computational thinking (CT) as a problem-solving framework. Students acquire the experience in critical evaluation while troubleshooting designs, improving their ability to cooperate and coordinate, and refining their communication skills through public presentations. Collaborating with TCS associates to develop these apps helps students visualize a future career and understand the pathways available to them. As a result of the shifting education landscape, goIT introduced a virtual learning platform called goIT Online, which lets students go through the modules at their own pace through an open, collaborative learning environment.

Launched in 2017, IMFIS is a first-of-its-kind initiative to use CT as a catalyst to transform education around the world. This program enables educators, administrators, and school districts to become ambassadors of the transdisciplinary approach and introduce computational thinking skills within the context of core subjects such as English, mathematics, social studies, science, and the arts. The program also offers year-round assistance through its Learning Leaders Network, a responsive and involved nationwide network of teachers, Community Nights, an immersive and interactive event for students, teachers, and families to experience the curriculum, and Days of Discovery, an in-person professional development training for educators to meet with program experts and understand the curriculum. Like goIT Online, IMFIS is available through a digital platform, and to bridge the digital divide that exists for students who lack sufficient broadband connection, their lessons are also available in PDF to print for students to complete offline and at their own pace.

Increasingly, educators are understanding the need to integrate technology into the classroom in terms of providing technology and digital literacy skills, as well as incorporating technology instructional tools. With more education-based applications of technology being created, students have the unique opportunity to learn about emerging technologies and educators have the ability to create more engaging content through innovative instruction strategies.

Conclusion and Key Takeaways

Traditional methods of classroom instruction have shifted in recent years, fueled by the growing Ed-Tech industry. Building on this shift, and recent global events including the COVID-19 pandemic, there is a growing urgency for cross-sector organizations to work together to make education more open, accessible, efficient, and collaborative. To solve for this demand, emerging technologies such as cloud, IoT, data analytics, augmented reality, and more exciting innovations are being utilized for education purposes. The key takeaways from this chapter include:

Virtual modes of engagement are increasingly becoming the norm, with the COVID-19 pandemic further accelerating this transition. When used effectively, **new tech-enabled education tools can help standardize instruction, increase learner engagement, and provide effective and differentiated instruction per the students' needs.**

Educators are utilizing mixed-reality environments, including AR, VR, and XR, to provide them with hands-on experience and engage students in real-world and future-focused scenarios. This **immersive learning environment provides students with an opportunity to adopt emerging technologies while also providing better learning outcomes.**

By employing big data, IoT, and predictive analytics, teachers and parents are able to identify learning hurdles in students and proactively employ more effective teaching strategies. Similarly, teachers can utilize this data to create more effective lesson plans and instructional strategies.

Open collaboration tools are vital to create an accessible learning environment. **Utilizing cloud platforms for digital learning can allow students to learn at their own pace while also providing them with valuable skills in digital literacy.**

Computational thinking and design thinking skills are essential to a students' long-term success and their ability to problem solve and troubleshoot. Programs that combine these skills into lesson plans will help students in their future education.

Explore the key insights and interact with the report on https://on.tcs.com/Catalyst

Employment and the Future of Work

There is a global transition occurring, known as the Fourth Industrial Revolution, and countries and industries that have higher capacities to innovate are at the forefront of this revolution. This digital revolution—Business 4.0™—is transforming the way corporations across industries work, with disruptive technologies leading the charge. The presence of emerging technologies such as cloud, artificial intelligence, and IoT have become dominant fixtures in our lives. While these emerging technologies continue to transform our lives, they too will transform the way we work, the employment landscape, and will dictate the skills needed for the jobs of tomorrow.

Accelerating this transition further is the onset of the COVID-19 pandemic. The pandemic created radical shifts in the market with increased demands for digital conveniences such as online banking and consumption, remote work, and virtual learning, as well as the necessary digital skills that accompany them. Simultaneously, the unemployment rate for workers in lower-skilled jobs, part-time employees, women and minority groups, has reached new heights.[1] The pandemic-accelerated shift in what skills employers are looking for is likely to continue alongside consumers' expectations of technology enabled conveniences, widening the opportunity and skills gaps between those with access to new skill sets and learning and those who are increasingly getting left behind.

In order to meet this demand of new skills, there are two type of shifts that need to occur: the need to reskill the existing workforce to layer new, cross-functional skills over current skillsets, and the need to upskill the incoming workforce on these in-demand skills. This growing skills gap can only be addressed through coordinated efforts by public, private, and nonprofit sectors working together to meet these needs and prepare populations for the future of work.

Addressing the Future of Work Challenges

There is a growing imperative for understanding the challenges associated with developing skills in line with the kind of work that will be mainstream in the future. Digital Empowers has been proactively engaging experts to discuss the key hurdles including human integration and adoption of technology, equity in opportunity, and up and reskilling of the workforce and has been ideating on unique solutions to these challenges.

Technology Adoption and Human Integration

Understanding how organizations can build better human-machine environments will be key for optimizing workforce integration with technology. Tomas Chamorro-Premuzic, psychologist and Chief Talent Scientist at ManpowerGroup, focuses on uniquely human skills and how these can complement the innovative nature of new technologies: "There is no question in the next 10 years, social progress will come if we can integrate the interface between humans and technology. Harnessing the capabilities of AI to work with humans will produce a better result than one without the other." The challenge is understanding how to best prepare the human enablers to leverage technologies that are available now, to make a better world.

Organizations play a role in addressing this challenge, by supporting employees to acquire curiosity, empathy, and humility to fully embrace the necessary digital transformation and the solutions technology can bring. ManpowerGroup is at the forefront of this work, providing research and insights into the topic of digital transformation, how to upskill workforces, and attract and retain talent, with a focus on empowering employees to adopt and integrate technology into their work. As future in-demand skills will consistently evolve alongside emerging technologies, it is essential that workers adopt a mindset that will allow them to understand how their work can be accomplished more effectively with the integration of new and innovation technologies.

Re- and Upskilling the Workforce

Once a technology enabled mindset is established, having effective re- and upskilling opportunities available for individuals to take part in will be essential in ensuring continued technology adoption. Addressing this up/reskilling hurdle is EmPath, a skills intelligence software founded by former U.S. Secretary of Commerce, Carlos Guiterrez. The software uses artificial intelligence to help ease workforce upskilling and redeployment for companies and pulls data from employers' databases and talent management systems and through their patent pending AI, EmPath is able to identify employees' skills and proficiency levels while making recommendations for more effective training on up/reskilling. By identifying employee skillsets and opportunities for further training, EmPath is able to increase employee retention and ultimately creating efficiencies for both the employer and the employee.

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1 https://www.americanprogress.org/issues/women/reports/2020/10/30/492582/covid-19-sent-womens-workforce-progress-backward/

It is also important to note that it's not only the technology skills that are in high demand, cross-functional skills such as professional communications, emotional intelligence, and empathy are highly sought after. Speakers at the Digital Empowers forum on Creating Pathways to the Skills of the Future, emphasized the importance of creating a culture of lifelong learning. As technologies continue to evolve, up and reskilling will need to be a continuous cycle, as well as the methods, channels, and platforms to provide that skilling. Ensuring learners have agile, design, and computational thinking skills will also ensure that they are better positioned to respond to the changing needs of the market.

Leveraging gaming and technology to upskill workers with cross functional skills is a unique approach discovered during the Charlotte Regional Forum in 2018. Smart Games Systems, a game design startup, uses avatar-based simulations to support doctors, nurses, and midwives, who depend on collaborative decision making for positive patient outcomes. By gamifying upskilling, Smart Games Systems is able to create an effective and engaging learning experience, resulting in better learning outcomes.

Learning new skills is not just for seasoned professionals. Increasingly, there is a need for fresh graduates to upskill in areas that traditional university education has not prepared them for. Ruben Harris, CEO of Career Karma, a job training platform featured during the 2020 National Summit, recognized that the need for rapid reskilling was being further accelerated by the COVID pandemic. Harris stated that 43% of higher education graduates are underemployed, highlighting the need for additional career-focused training. Because of this need, the brand and mindset around last-mile training, trade schools and bootcamps has shifted. What was once a stigmatized education type is now being utilized to bridge the skills gap between university education and hands-on work experience. Career Karma provides these trainings to underemployed professionals who need to upskill to participate in the future of work. Similarly, Jobcase is working to connect job seekers with peers, coaches, and mentors to upskill and reskill people into new technology careers and other industries like manufacturing and construction.

The skills-gap issues are not new, as noted during the 2018 Digital Empowers National Summit. Blockchain experts from Deloitte, BitLumens, Global Food Traceability Center, and Liquid Markets Group Inc., discussed the difficulty of finding skilled employees in this emerging technology. To solve for this challenge, companies have been able to find employees with the basic skills needed to learn blockchain and provide them with the educational resources to become blockchain experts, through upskilling. Experts noted that many have accessed talent through university incubators that combine blockchain skills with industry expertise.

It's clear there is a need for last-mile training, particularly for new and emerging technologies, and when organizations work together in an open and collaborative environment they're able to create a pool of highly skilled resources in the form of a talent cloud, available for cross-industry utilization. This example of successful cross-sector collaboration was highlighted during the Digital Empowers Chicago Regional Forum in 2019, where we heard from corporations working together with nonprofits to empower the future workforce with new skills. HERE Technologies collaborated with Year Up to mentor students from underrepresented communities for the skills of the future. The collaboration provided students with skills through hands-on training, corporate connections, and internships, to best prepare them for the future of work.

> **43% of higher education graduates are underemployed, highlighting the need for additional career-focused training.**

Equity and Access to Opportunities

Building awareness of the skills of the future requires there to be equitable access to opportunities. Communities that are less connected to the digital economy are at a particular disadvantage, and in order to meet future skills demands, it is essential to drive awareness of education and skilling opportunities within marginalized communities. Comcast NBCUniversal has been working on these issues since well before the pandemic. At the Digital Empowers Atlanta Regional Forum in 2018, The Farm, Comcast's corporate accelerator, featured their work to support local entrepreneurs. The accelerator focuses

Innovators across industries will share how they apply blockchain technology to address issues ranging from the opioid crisis and food safety to financial access in emerging markets.

Olga Selina, Vice President, HERE Technologies shares how the company partners with nonprofits in Chicago to empower underrepresented youth with skills of the future and ensure equitable access.

Comcast NBCUniversal's Burunda Prince shares how the company is working to support local entrepreneurs through mentorship, educational resources, and funding.

New Profit's Dr. Angela Jackson speaks to leaders, including Comcast's Dalila Wilson Scott and The Wall Street Journal's Bowdeya Tweh, on how the COVID-19 pandemic has impacted the future of work and how we can rebuild the economy in an inclusive way.

on local talent and early-stage entrepreneurs, offering seed funding, educational resources, mentorship, and community. Its most recent cohort was nearly 20% women and more than 75% people of color. These programs have significant impact on underrepresented communities by helping to address the lack the supports and resources necessary to participate in the future of work.

Pre-pandemic, many systems—including startup and venture capital—weren't inclusive to those who come from marginalized communities, and the pandemic has brought to light these inequities.

New Profit's Dr. Angela Jackson discussed the shift in awareness the pandemic has brought to these issues. Building back the economy in a way that works for everyone by creating systemic changes that allow for continuous learning and upskilling is vital. The venture philanthropy organization is supporting this important work through its ongoing The Future of Work Grand Challenge, powered by XPRIZE and MIT Solve. The challenge champions solutions that train and place millions of workers into higher skilled, higher wage careers by incentivizing BIPOC entrepreneurs to think about accelerated learning programs, how to cut training times by 50% as well as how to provide wrap-around supports in addition to necessary skills training. Competing teams form to rapidly upskill workers in underserved communities to bridge both the skills and the opportunity gaps.

Programs designed to cultivate a diverse workforce with relevant hard and soft skills and the ability to leverage and integrate technology into their work, utilizing open and collaborative learning platforms will help provide the necessary talent that industries around the world will require now and in the future.

Conclusion and Key Takeaways

Now, more than ever, workers need to participate in lifelong learning to maximize employment outcomes. Learning to lean into and leverage technology for economic opportunities through a growth mindset will help workers remain agile as in-demand skills continue to evolve alongside technology. Creating equitable access to reskilling, upskilling programs and, notably, essential soft skills training is needed to meet the demands of the new workplace and economy. Key learnings from this chapter include:

Public, private, and nonprofit sectors can work to provide tools and resources to marginalized and underserved communities to help bridge the opportunity gap. To address these skills gaps, a **focus on creating equitable access to up/ reskilling through open collaboration tools can democratize access to learning.**

Leveraging technology for education is an effect method of instruction while also allowing learners to gain digital skills. **Utilizing emerging technologies such as gamification and avatars will allow learners to experience real-world and future-based scenarios to better prepare them for the future of work.**

Last-mile training for recent graduates is an effective approach to gaining the necessary, hands-on and real-world skills needed to be job-ready. **Trade schools, colleges, and bootcamps provide these learning experiences. Cross-sector collaborations that integrate these last-mile training programs with corporate partners will provide additional opportunities to learn in-demand skills combined with industry experience.**

Developing a learning and growth mindset will ensure jobseekers are well positioned for jobs of the future, by understanding the importance of continuing education of evolving technical skills and the soft skills that are essential for career progression.

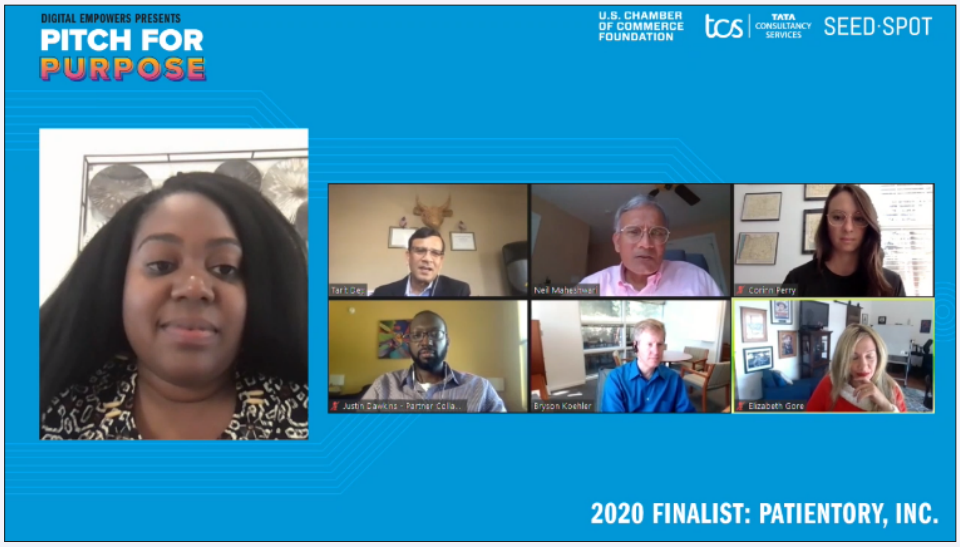
Healthcare

For the first time in history, expected lifespan has surpassed 60 years of age for residents of all countries. Not only are we living longer, but we are living a more fulfilling, active life. This incredible achievement has been made possible thanks to advancements in healthcare infrastructure development, research, and technology. Curing diseases and developing medicines have been occurring at an accelerated rate due to the applications of emerging technologies in healthcare.

Surgeries that were once considered dangerous are now commonplace and safe with advancements in techniques and robotic surgery tools. Similarly, diseases that would have affected entire populations have all but vanished due to research and vaccines. And now, getting access to doctors is as simple as dialing a phone via telemedicine, or pressing the button on a smartphone through an app. Technology has significantly advanced healthcare and, as new technology is used in innovative ways, will continue to make lasting impacts on the longevity and quality of life for all.

Exploring Health-Tech Advancements

Digital Empowers has explored some of these solutions, including providing reliable and safe access to patient health data, increasing access to healthcare professionals, and new treatment tools and techniques. Several new technologies including cloud, big data analytics, blockchain, and artificial intelligence were explored to understand their implications and use cases within healthcare.



Chrissa McFarlane, CEO, Patientory, Inc. pitches her business—a health data analytics company that aims to improve population health outcomes—to a panel of judges during Pitch for Purpose, a startup for social entrepreneurs.

Access to Patient Health Data

Cloud technology has been essential in streamlining patient health data, creating efficiencies, and ultimately providing better patient outcomes. Rimidi, a digital health startup, was featured during the Digital Empowers Regional Forum in Atlanta. The startup has created a cloud-based software platform to treat cardiometabolic conditions, such as diabetes and cardiovascular disease, which the company estimates affects over 1 million Atlantans. This software integrates real-time patient-generated and clinical data such as blood pressure, weight, and blood glucose levels, as well as medical practice guidelines. This enables physicians to optimize treatment and care according to patient progress, existing risks, and other needs. For example, Rimidi was used by the Boston Medical Center to monitor new moms who had high-risk pregnancies and helped to ensure that their blood pressure remained within normal levels to reduce separation from babies after birth and manage hypertension effectively.

Similar to cloud technology, blockchain has seen several applications within healthcare. Featured as one of six finalists for the inaugural Digital Empowers Pitch for Purpose competition in October 2020, Patientory, Inc. is a population health data management and analytics company. Chrissa McFarlane, Founder and CEO of Patientory, Inc. explains, "Our software, which runs on a national healthcare data network, integrates health data from over 200 million Americans in order to provide machine learning and artificial intelligence around social and economic determinants of health risk for improved population health management." This is achieved by integrating a blockchain platform to integrate otherwise siloed healthcare data to help providers identify the at-risk populations while developing plans to change harmful behaviors in patients and providing them information to make early decisions about their health interventions to reduce the overall cost of care.

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>
> Chrissa McFarlane
> Founder and CEO, Patientory, Inc.

When implemented within healthcare, blockchain allows for greater versatility and control of patient data across public and private medical providers and insurers. This feature is especially beneficial for patients with chronic conditions who rely on public health and urgent care services.

Additionally, and as discussed within the chapter on interventions around COVID-19, the advancements in technologies leading to the creation of access to patient data has become increasingly important throughout the pandemic. When patients are aware of their health status, they become empowered to make better choices. This is especially beneficial also for healthcare providers who may, as a result, be able to categorize a patient as high-risk for negative outcomes if impacted by COVID-19.

> Cross-industry organizations collaborated to create solutions that utilized a variety of technologies to address the health access gap. These included telephone, app, and online tools that allow you to talk with a doctor or nurse, and have treatments prescribed and sent directly to your local pharmacy

Access to Treatment Options

Another service that has integrated technology within its core and has become widespread in its application is telemedicine. With the global stay-at-home orders brought on by the COVID-19 pandemic, healthcare providers had to expedite their utilization of digital health assessment, management, and delivery tools. As a result, cross-industry organizations collaborated to create solutions that utilized a variety of technologies to address the health access gap. These included telephone, app, and online tools that allow you to talk with a doctor or nurse, and have treatments prescribed and sent directly to your local pharmacy. To learn more about the access gap and how organizations have addressed these challenges through digital connectivity and cloud, refer to the Digital Divide chapter.

Buffy Swinehart, Senior Manager, Corporate Social Responsibility, Aflac shares how the company leveraged human-centered design to create My Special Aflac Duck, a robotic duck and medical device to help pediatric cancer patients.

Another emerging technology gaining traction within the healthcare industry, as it is both highly effective and a safer option for patient and healthcare providers, is robotics. Robotics have mitigated the unnecessary risk to personal and patient health by being able to perform tests, monitor medication, disinfect equipment, and provide delivery services.

A unique application of robotics for patient treatment techniques comes in the form of a plush toy duck. Aflac Inc., an insurance company, views the delivery of effective and responsible medical care and support—especially for children and their families affected by pediatric cancer—as their corporate social responsibility. To that end, the company designed My Special Aflac Duck, a plush companion that is both a social robotic duck and a medical device. Sensors enable life-like movements, such as rhythmic breathing patterns and a heartbeat, which children can try to match, as well as emoticon cards which, when placed on the duck will emit vocal emotions, allowing the child to express their feelings through the duck. The duck provides emotional comfort to children from treatment to recovery, while also being an effective tool in cancer treatment for young children.

With advancements in technology continuing, so too will the applications within the healthcare industry, to address the needs of patients including creating access to health data, and access to treatment options.

Conclusion and Key Takeaways

Humans are living longer, healthier lives than ever before. Many deadly diseases have been eradicated and treatments have been made available that ensure longer life. Advancements in healthcare are being reached daily from the applications of emerging technologies. The key takeaways from this chapter include:

By creating access to health data through cloud-based apps, healthcare providers are able to make more informed decisions about a patient's diagnosis and treatment options. By providing this access to patients, they can become aware and empowered to make healthier lifestyle choices to improve their health outcomes. Blockchain is a safe and secure method of storing and sending this data and the technology has many applications within the heavily regulated healthcare industry.

The use of robotics to treat patients for a variety of illnesses is an innovative use of emerging technology. Robots can be safe and effective by delivering, explaining, and administering treatments to a variety of patient types. **This form of treatment is especially necessary for patients with compromised immune systems as robots will limit contagion transfer between patient and healthcare provider.** The treatment is also effective, by removing the element of human error.

Digital and telemedicine have become vital methods of treatment for patients during global lockdowns. Doctors and nurses are able to connect with patients through a variety of technology enabled devices, including the telephone, apps, and desktop computers. **Doctors can virtually diagnose some symptoms and send prescriptions to the patient's local pharmacy, helping to bridge the healthcare access gap through cloud and digital technologies.**

Innovation in healthcare is a continuous process. While many diseases have been eradicated, many more show up, with the COVID-19 pandemic being a prime example. **New technologies have supported agility and helped transition to new ways of resolving these new diseases while also treating persistent diseases more efficiently.**

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Sustainability and Disaster Response

Every year natural disasters cause an average of 60,000 deaths, globally.[2] Through the years, the impact of natural disasters has become even more severe, with increasing numbers of climate-related incidents having tripled in the last 30 years.[3] Drought stricken areas have become victims of violent wildfires in regions from California to Australia, with experts predicting these large-scale events will only increase in intensity. To respond to the growing need, technology-enabled disaster response strategies are being developed that create scale, ensure efficiencies, provide immediate support and mitigate the far-reaching impact on people and wildlife across the world.

Ensuring society and governments are prepared before disaster strikes is crucial to lessen the immediate and long-term impact on vulnerable populations. In addition, it is also essential to develop a coordinated response plan that minimizes wastage of resources, time, and efforts. Disaster preparedness can improve the capabilities of responders, governments, and communities to save more lives as well as support the transition of affected populations back to normalcy in the shortest possible time.

We have seen an evolution to disaster response over time. Advances in warning and communications technology offer emergency responders the ability to address the events quickly and efficiently, making it easier to assess threats, share information, and plan emergency responses. Robotics, blockchain, virtual reality, cloud analytics, and artificial intelligence are revolutionizing the assessment, logistics, and management of disaster response and climate change issues.

Enhancing Disaster Response Using Technology

Virtual Reality

Digital Empowers showcased a wide array of organizations that are developing and using emerging technologies to make public safety and response to disaster efficient and effective. The U.S. Federal Emergency Management Agency (FEMA) has created a VR experience called IMMERSED, a flood risk visualization virtual reality tool, designed to help community leaders understand the real-life challenges faced during a flood to ensure local preparedness. Flood risk is difficult to visualize, so virtual reality enabled IMMERSED allows the user to experience and understand a major flood event in a real, personal way.[4] Armed with the necessary information, tools and skills, and virtual visualization, leaders can take decisive action during an immediate crisis.

Cloud, Big Data, and the IoT

The skills and experiences of military veterans—trauma medicine, logistics—are often invaluable when responding to large-scale disasters. Team Rubicon recognized the value of these unique skill sets and leveraged veteran support to rapidly provide relief to communities across the globe

At Digital Empowers 2018 National Summit, Team Rubicon Global's Interim CEO Stephen Hunt, Ph.D., showcased how IoT and Big Data are integrated in the organization's response delivery design. During Hurricane Sandy in 2012, Rubicon Global partnered with a volunteer team from Palantir Technologies, to establish a command station in a school bus and created a software that converted a paper form system into cloud-based support for volunteers. As a result, relief efforts were better coordinated and expedited.[5]

While creating efficient and agile responses to disasters is essential, we also need to proactively reduce disaster-related incidents by building resilience through environmental sustainability. Whirlpool, a home appliance manufacturer, is incorporating IoT into its appliances to reduce energy and water consumption, reconciling economic competitiveness with sustainable development. Whirlpool has partnered with Amazon to incorporate Amazon Virtual Dash Buttons (VDB) on its refrigerators with touchscreens. Amazon Prime customers can order groceries from the refrigerator VBD and have them shipped via Prime, eliminating the transportation emissions that would result from a consumer trip to the grocery store.

Transportation emissions are top-of-mind for the airline industry. United Airlines is working on creating efficiencies in air travel by reducing incidents of missed flights, subsequent re-booking, and low capacity travel by leveraging their app to contact customers in real time and holding connecting planes when possible. This solution will ensure planes operate at greater capacity, optimizing travel over routes and therefore reducing fuel emissions.

> "Governments have very little funds, so these partnerships when they come together, can leverage learnings to accelerate outcomes for citizens in the community, that governments couldn't do on their own.
>
> Brian Savoy
> SVP, Chief Transformation & Administrative Officer, Duke Energy Corporation

2 https://ourworldindata.org/natural-disasters
3 https://www.oxfam.org/en/5-natural-disasters-beg-climate-action
4 https://preparecenter.org/sites/default/files/gdpc_casestudy_10_femaimmersed.pdf
5 https://www.uschamberfoundation.org/sites/default/files/Digital_Empowers_Report_FINAL_WEB_0.pdf

Robotics and Artificial Intelligence

An emerging technology with the potential to revolutionize disaster management are unmanned aircraft systems (UAS). Drones and UAS can deploy and deliver services in remote areas and under conditions that are inaccessible or attainable to first responders, providing greater safety, security, accuracy, and immediacy for all affected parties. UAS are also able to capture and relay data between cloud-connected devices in real-time, enabling response and management teams to prioritize resources, improve the coordination of their responses and operation of these tools, and better assess risk at a moment's notice.

At the Digital Empowers Disaster Response Forum in 2020, experts in the field of robotics and AI discussed how their companies were designing and utilizing UAS—from last-mile deliveries of medicinal supplies to carrying water and combating fires in forests blazes. The combined advancements of UAS in hardware and software has enabled humanitarian aid and meaningful assistance to individuals in distress or danger. The data collected from robots and artificially intelligent devices in disaster response is crucial in solving problems in disaster preparedness, response, and recovery.

Drones were effectively used after Hurricane Katrina in 2005 to search for survivors and assess river levels when road blockages could not be cleared. Underwater drones were used during the 2018 Hurricane Florence to collect data that was used for hurricane modelling.[6] The drones also helped scientists create better models and inform predictive analyses plans for the future.

Cloud, big data, and IoT are broad concepts about information creation, storage, and sharing. Practically, these systems are utilized for data storage and management, data analysis, and data communication. The cloud is an internet-based storage system for data. IoT is one of the most effective ways to get that data into the cloud. Instead of depending solely on human-based monitoring to communicate data to a single database site, auto-deployed sensors monitor and connect a variety of devices to offer continuous observations for greater context. Through the cloud and IoT, this results in a massive amount of data available to any user around the world.

> Instead of depending solely on human-based monitoring to communicate data to a single database site, auto-deployed sensors monitor and connect a variety of devices to offer continuous observations for greater context.

With the possibility of infinite data collection, certain data tools and structures must be used to analyze it. Since more than 2.5 exabytes (2.5×10^{18} bytes) of data are created every day, the analytics tools to process it need increased computational power.[7] Rather than using traditional styles of analysis, big data analysis uses machine learning to analyze massive data sets that are often stored in the cloud and collected through IoT.

Innovations and technologies that encompass these three concepts of data—how it is stored, analyzed, and communicated—are key to solving many of society's problems, including disaster relief, climate change, and sustainability. By using cloud, big data, and IoT tools, collecting real-time and on-the-ground data allows for rapid, effective, and focused solutions to myriad problems.

Blockchain Technology

Blockchain technologies concentrate on tracking data movements and transactions to create transparency and accountability throughout the value chain. The chain's ledger, through which this flow of data is tracked through cryptography, allows for a greater amount of information to be conveyed to users and makes the chain impossible to break or remake either deliberately or by accident. This has yielded benefits to a company's business practices and can also yield substantial benefits to the climate when applied to renewable energy.

Solar energy is a key driver in the effort against climate change and the drive to reduce carbon emissions. BitLumens, a company working towards creating a decentralized, blockchain-based micro power grid has distributed solar power devices and connected them to blockchain. People use these devices and pay in installments, building their credit scores, leading to financial inclusion and poverty alleviation.

Matt Meier, Chief Information Officer, Whirlpool, discusses Whirlpool's longstanding commitment to sustainability and community impact at the Digital Empowers Regional Forum in Chicago.

6 https://www.itu.int/en/ITU-D/Emergency-Telecommunications/Documents/2019/GET_2019/Disruptive-Technologies.pdf
7 https://iicj.net/library/detail?key=675

Conclusion and Key Takeaways

Emerging technologies and innovation have expanded avenues for disaster management and environmental sustainability. Innovations in areas such as robotics and drone technology and disruptive technologies like the IoT, big data, cloud computing, and AI are revolutionizing how we manage disasters and climate change.

Virtual and mixed reality environments can be used to prepare for disasters by providing trainings wherein responders are immersed in a virtual yet life-like environment. VR allows users to be effectively trained across multiple scenarios that they might encounter in the field.

Improvements in cloud computing and data analysis have led to integrated and real-time systems like IoT are central to disaster prediction and management. **IoT sensors and devices allow for monitoring of data from multiple locations in real time, instead of relying exclusively on human-based monitoring.** The technology allows for communication of data to a single database site, connects a range of devices for continuous observations offering greater context, hastening recovery and response times during a disaster.

Drones can be deployed quickly over disaster zones, especially in areas that are not accessible to relief workers, resulting in greater safety, security, accuracy, and immediacy for all affected parties. **Drones provide mapping technology and imagery that increases situational awareness, search for survivors, assess infrastructure damage, and create maps of the impacted areas.**

Solar energy is an essential renewable resource in the world's endeavor to keep climate change events at bay. **Blockchain can act as a tool to make solar energy grids accessible and sustainable by promoting data-sharing in real time, offering consumers information regarding the source of their energy.**

Real-time analysis of big data and increasing the ability of logistics companies to leverage that analysis through cloud and IoT, will help make commuting and transportation more sustainable by reducing inefficiencies.

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Food Security

Today, more than 800 million people across the globe go to bed hungry every night.[8] Over 2 billion people do not have regular access to safe, nutritious, and sufficient food.[9] Having physical and economic access to sufficient food to meet dietary needs is essential for productive and healthy living.

Along with issues in food availability, food access, utilization of food, and stability, food insecurity is closely linked to poverty. Factors like an inadequate public food distribution systems and infrastructure can also contribute to food insecurity.

The world's population can be sustained with the current food supply if modern technologies and fair distribution systems are used to address all dimensions of food insecurity. Innovative technology and devices influence how humans interact with each other and the world—they also hold significant potential to affect positive change. While the utility and application of technology are ever evolving, the goals of technology remain constant—to solve real-world problems, fulfill human needs, and present new opportunities for innovation and growth.

Digital Empowers has explored the issues of food insecurity and found that there are three main solutions that can be addressed to affect change, and that technology has a role to play in creating these solutions. Effective supply chain management, accessibility in terms of affordability and inclusion, as well as sustainable agriculture, when implemented together, can help increase food security.

Supply Chain Management

Food security is an issue that affects us all. Since its inception, Digital Empowers has explored the transformational impact technology can have. At the 2018 Digital Empowers National Summit, blockchain experts from various sectors, including the food sector, discussed technology trends and their potential to secure equity and access for communities. This can be done by leveraging blockchain for supply-chain management thereby creating efficiencies across the entire value chain of a product or service. Blockchain can enable faster and more cost-effective product delivery, make products more traceable and enhance coordination among buyers, suppliers, and banks.[10]

> By using blockchain to monitor and track food supply, distribution vendors and consumers can make more informed decisions about their food consumption, including information about supplier safety, ethics and sustainability, among others

Andrew Kennedy, Interim Director of the Global Food Traceability Center, Institute of Food Technologists and Co-Founder, FoodLogiQ, a company that creates software for food supplier management, traceability and safety, contributed his expertise. Andrew spoke about how blockchain can allow for safer and more transparent tracing of fresh produce and other food products by physical tracking and verification. This can provide a secure, distributed way to perform transactions among different key elements in the agriculture and food supply chains that are involved from raw production to the supermarket shelf.[11] By using blockchain to monitor and track food supply, distribution vendors and consumers can make more informed decisions about their food consumption, including information about supplier safety, ethics and sustainability, among others. When purchasers and consumers are made aware of these aspects

Andrew Kennedy, Co-Founder, FoodLogiQ shares how the company leverages blockchain technology to enable safer and more transparent tracing of fresh produce and other food products.

8 https://www.usaid.gov/what-we-do/agriculture-and-food-security
9 http://www.fao.org/3/ca5162en/ca5162en.pdf
10 https://hbr.org/2020/05/building-a-transparent-supply-chain
11 https://arxiv.org/ftp/arxiv/papers/1908/1908.07391.pdf

in their food, it creates accountability from food producers and distributors, ensuring they meet safety and sustainability standards and guidelines, which are vital to increasing food security.

Sustainable Agriculture

Technology can also help promote sustainable agriculture methods, by raising agricultural productivity boosting yields, reducing losses, and cutting down input costs. Mesur.io combines real-time environmental measurements with advanced analytics and relevant external data. The company provides real-time information on soil and weather conditions, so that farmers can determine opportune times for planting and harvesting crops. Mesur.io is comprised of a core data acquisition system, a customized analytics and machine learning database, a front-end web application interface, and a communication path and dashboard to interpret and actuate the findings. This enables growers to accurately water, fertilize and seed, allowing for instant action and adjustment based on current conditions.

Accessibility and Inclusion

Still, to bring these solutions to rural communities and users, there must be access to connectivity. Speakers at the Charlotte Regional Forum, spoke about Google Fiber, which has made significant investments in the Carolina region, providing the infrastructure backbone to enable farmers to increase yields, monitor water usage for groundskeepers and increase the quality of life for rural residents. Similarly, at the start of the COVID-19 pandemic, Land O'Lakes activated Wi-Fi services through their facilities and made it available to the public at no cost through the American Connection Project, a business consortium advocating for better broadband access in rural communities. The company's investments to create access for all stakeholders were showcased by Michael Daniels, Director of Federal Government and Industry Relations at Land O'Lakes during the Digital Empowers August 2020 forum. Daniels states, "It is the diversity of the membership that brings unique value... it's a group of stakeholders who might not otherwise join together, but we can all agree that now, more than ever, there is a need to advocate for better connectivity, so we've joined together in this effort." The farm cooperative members can utilize access in rural areas where broadband is lacking, allowing them to participate in e-commerce during a time when digital access was a growing channel to sell their agricultural products.[12] For more details on this and other aspects related to digital access, refer to the chapter on The Digital Divide.

Jess George, Community Impact Manager, Google Fiber shares how the company is investing in the Carolina region to support farmers and increase the quality of life for rural residents.

Jennine Sullivan, Executive Director, The Pantry by Feeding Hawaii Together, presents at the Pitch for Purpose competition on how the organization is addressing Oahu's hunger crisis by providing consistent and reliable access to nutritional food.

More traditional technology partnerships have also succeeded in broadening the reach of social services, understanding that access to food is a challenge for many. With food banks struggling to serve clients as the need for donated food increased during COVID-19, Amazon created Community Flex Deliveries, which uses software programs built on Amazon Prime and Prime Fresh delivery services to deliver donated food directly to food bank clients. Amazon's first partner for this initiative was Washington, DC-based nonprofit, Bread for the City. As a result of the collaboration, Bread for the City has been able to reach 50%-100% more clients than before the pandemic.

Another organization working towards eliminating food insecurity is The Pantry by Feeding Hawaii Together. The nonprofit was featured during Digital Empowers' inaugural Pitch for Purpose competition, promoting social entrepreneurs and their ideas that will change the world. The Pantry runs a food distribution center that helps take care of

12 https://www.youtube.com/embed/NL78W4-WPx8

the daily food needs of Hawaii's working people who struggle with food insecurity. Families and individuals in need can get food free of charge and serve children, the elderly, and those who are disabled.

The Pantry leverages available technology, enabling people in need to select the food that they want and need via an online ordering system, providing people with safe, diverse, and nutritious food. The Pantry is also developing an app that will help eliminate food insecurity and foster better eating habits by providing increased nutritional information and choices to the people it serves, while streamlining operations and data on the back end.

> "It is the diversity of the membership that brings unique value... it's a group of stakeholders who might not otherwise join together, but we can all agree that now, more than ever, there is a need to advocate for better connectivity, so we've joined together in this effort.
>
> Michael Daniels
> Director of Federal Government and Industry Relations, Land O'Lakes

Improving global food security is a long-term process and the integration of both cross-sector partnerships and science-based technologies is key. These technological solutions generated by public-private partnerships are helping to ensure food security, by innovating the way we produce, distribute and consume our food, which can help food systems become more sustainable and efficient.

Conclusion and Key Takeaways

Although we currently grow enough food to feed everyone on the planet, one in every six of the world's poorest do not have access to enough food.[13] Food security is a complex, multi-faceted issue that affects people around the world, but by leveraging technology, solutions can be created that help ensure food traceability, safety, sustainability and access. Key learnings from this chapter include:

- **Blockchain technology can ensure food security with its ability to ensure the traceability of food from its origin until it reaches the end customer** through a healthier, more ethical, and better-quality supply chain.
- **Big data and the Internet of Things (IoT) can be harnessed for** a number of agricultural applications, including **farmer decision support, precision farming and insurance.** Innovative solutions for sustainable agriculture will benefit producers, consumers, and the planet.
- **At the local level, accessibility issues of food insecurity are being addressed through public-private partnerships between food banks, community food pantries and corporations.** These partnerships are bridging the access gap and creating solutions for those who are struggling to feed their families.
- Climate change will continue to pose a threat to agriculture with the increase in global flooding and droughts, but **modern technologies can promote sustainable agriculture by connecting farmers to a wealth of real time data and predictive analytics to better prepare for climate-related disasters.**

Explore the key insights and interact with the report on https://on.tcs.com/Catalyst

13 https://www.oxfam.org/en/press-releases/world-food-day-there-enough-food-grown-world-everyone-op-ed

Diversity, Equity, and Inclusion

Globalization, shifting demographics, and geopolitical transformations have long been making a significant impact within our daily lives. Demographic trends indicate that women and ethnic minorities are the fastest-growing segments of the U.S. workforce. Despite having high levels of education, these segments continue to be underrepresented in the workforce—especially in high potential sectors and high paid, higher seniority jobs.[14] This lack of opportunities among minority groups results in continued inequality throughout generations.

Diversity and inclusion, while not a new or novel concept, has taken on new meaning and importance in the wake of a global call to action to uproot systemic injustices. Amid global protests on racial inequities, there was a strong response from across industries and sectors to address the needs of minority communities and to fix a system that doesn't work for everyone.

In an effort to bridge the gap between economic opportunities and the access to them, organizations are creating inclusive solutions that are tailored to the unique needs of these communities.

Exploring Solutions from Cross-Industry and Sector Experts

To create a truly inclusive society, we must look at societal issues and challenges through a lens of access and equity. Policies and solutions that affect everyone—housing, employment, finance, healthcare—may have varied effects on different segments of the community. In an effort to rectify systemic inequities, there are a growing number of startups, nonprofits, and for-profit organizations that are integrating the needs of diverse communities within their technology enabled solutions.

Entrepreneurial Capital

Financial inclusion is a key principle of equity and is vital to reducing poverty and promoting prosperity. However, not everyone has access to the tools, services, and know-how that would allow them to participate in their own financial autonomy.

fundBLACKfounders, a crowdfunding platform and funding ecosystem for Black entrepreneurs, was featured as one of the finalists during the inaugural Digital Empowers Pitch for Purpose competition in 2020. Renee King, founder and CEO, envisioned fundBLACKfounders as a solution to bridge the funding gap for Black-owned businesses, which receive only 1% of venture capital funding.[15] fundBLACKfounders helps underfunded Black entrepreneurs secure business funding, whether it's through crowdfunding or connecting them with other capital options. They also provide support on crowdfunding that is culturally relevant and tailored to the needs of the business.

Successfully raising capital through fundBLACKfounders, The Nile List and EatOkra were featured in the Digital Empowers Annual Forum in 2020, along with Shop Katika. These companies work to unite consumers with Black-owned shops, brands, and restaurants through digital directory services to support the Black business community. These companies indirectly contribute to economic mobility for businesses by creating additional avenues for consumers to get engaged and increase awareness of Black-owned brands.

Renee King, Founder & CEO, fundBLACKfounders shares how she is providing a crowdfunding and capital ecosystem for emerging Black entrepreneurs.

Khadijah Robinson, Founder of The Nile List, explains how she views her venture success, stating, "We'll know we have succeeded when we see a real culture shift. When buying Black is not a day, not a hashtag, not a social media trend that comes and goes. It's a natural consumer behavior across the board, whether they're Black or not."

Also addressing the issue of limited startup resources for entrepreneurs from underserved communities is Impact Hub, which was awarded the Digital Empowers Power of Partnerships Award at the 2020 National Summit. Impact Hub focuses on creating technology alliances in emerging markets and opportunities for entrepreneurs from underserved communities. For example, the New York Metropolitan and Accra (Ghana) Impact Hubs have created pipelines between U.S. and African innovators to lift impactful entrepreneurs on both sides of the Atlantic, providing opportunities to underserved communities in the U.S., and within emerging economies in Ghana. The goal of the partnership is to connect global entrepreneurs to capital, in regions such as the U.S. where there's an abundance, as well as connecting entrepreneurs to knowledge and resources to accelerate the ideation and development of innovative products. This is

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>
> Khadijah Robinson
> Founder, The Nile List

14 https://www.mckinsey.com/featured-insights/diversity-and-inclusion/women-in-the-workplace
15 https://hbr.org/2020/06/a-vcs-guide-to-investing-in-black-founders

accomplished through remote educational programs, networking events, and global talent exchanges.

Housing Equity

Housing plays a significant role in creating stability and access to economic opportunities for people. A lack of access can also exacerbate inequalities. Disinvested communities often lack access to adequately funded schools and can also experience higher rates of crime, which can negatively impact a person's access to economic opportunities. It is therefore important to create platforms that allow access to housing in communities that have access to higher quality education, healthcare, and standards of living.

This growing need for affordable housing and access has spurred innovative solutions from across sectors. One such example is the startup, PadSplit, which was featured during the Atlanta Regional Forum in 2018. PadSplit has addressed the need for low-income renters by retrofitting Atlanta's houses into shared living spaces where residents pay by week, have utilities, and Wi-Fi included in their rent, with no long-term commitment. Its online platform allows both landlords and renters to monitor their payment history, maintenance requests, and associated metrics. This example of tech-enabled inclusion has allowed Atlanta residents to reduce housing costs for renters, and offset mortgage costs for landlords, ultimately supporting the increase in economic mobility.

Healthcare Equity

The healthcare sector is another example of an industry working to reduce the negative impact of systemic and unconscious biases. Startup Ayana Therapy, featured in the 2020 National Summit, matches members of underserved communities with mental health providers based on a user's unique ethnicity, traits, cultural values, and lived experiences. These considerations create an environment where patients feel safe and therapists can curate their advice to be more culturally attuned. With mental health becoming more highly valued as part of one's overall health and increased de-stigmatization, there's a growing number of organizations creating pathways to make mental health support more accessible to anyone who needs it. To learn more about how cross-sector organizations are creating innovative solutions to address the main barriers to receiving support, refer to the chapter on Mental Health.

It is well documented that AI, when created with available, biased health data, will simply create more inequities in healthcare. This was uncovered by scientists who shared findings of significant racial bias present in an algorithm that controls health-care choices for more than 70 million people in the U.S.[16] Delving deeper into healthcare equity, Digital Empowers explored the growing imperative to create unbiased systems to treat diverse patients. During the Chicago Regional Forum in 2019, health insurer Health Care Service Corporation (HCSC) highlighted its ethical AI group that has created a checklist that easily allows them to adhere to governance standards for unbiased technology development and implementation. The company has applied this AI governance checklist in the maintenance of its Guiding Care platform, which provides doctors with unbiased information and service recommendations for Medicaid patients. Ethical AI and governance standards will be essential in ensuring equality and inclusion of healthcare for all.

It is well documented that AI, when created with available, biased health data, will simply create more inequities in healthcare

Workplace Diversity, Equity, and Inclusion

Finally, ensuring diversity in the workplace is another tenet of equity and inclusion that has been explored through Digital Empowers. Recruiting start-up WeSolv, also featured during the Chicago Regional Forum, aims to connect diverse applicants to top companies. Started to provide solutions and services based on performance and not perception, the startup emphasizes the intentionality of data sources, algorithms, and professional development opportunities for its applicants and corporate users—all while incorporating the case to supporting diversity and inclusion in the workplace. The resulting return on investment of an inclusive workplace shows not only in employee satisfaction and retention, but innovation within companies and marketplaces, as new perspectives and experiences spur creativity.

In addition to improved internal perceptions, employee satisfaction, and community engagement, diversity can also result in

Marvin Richardson, Chief Information Officer, Health Care Service Corporation shares how the company is combating AI bias through responsible leadership.

16 https://www.nature.com/articles/d41586-019-02872-2#ref-CR2

better business outcomes and shareholder valuation. Experts from Boston Consulting Group, Medtronic Foundation, TCS, and Constituency Management Group shared their views on how corporations are successfully leveraging diversity and inclusion for a strategic advantage. Customers are increasingly demanding that corporations take action and incorporate social responsibility principles to ensure they're creating an equitable workforce. As a result, corporations are evaluating their values and beliefs and aligning with that of their customers and stakeholders.

There is a growing trend among corporations to create opportunities for marginalized people to participate in their workforce, with many companies making strides in providing resources to do so. Management Leadership of Tomorrow works with leading corporations to focus on helping BIPOC employees through their first promotion point, to the middle-manager level. This creates a shift in company culture, provides entry-level minority candidates a goal to aspire to, as well as provides a pipeline of minority managers who can then move up to the executive level, where diversity rates are low.

Similarly, there is an imperative to support disabled individuals in the workplace. Despite being the largest minority group within the U.S., individuals with disabilities lag behind other groups in terms of workplace retention and recruitment. To help support employees in the workplace, assistive technologies and devices have not only been developed, but also integrated in many traditional technology tools. Virtual video conferencing platforms now have automated closed captioning, voice to text, and other features that promote inclusion. With technologies becoming further advanced and accuracy increasing, disabled employees will be better supported in their workplace.

In order for job seekers to be effectively trained to be prepared for such work, it is essential they receive necessary skills and education. These topics are discussed at length within the Future of Work, Education, and Digital Divide chapters, where the solutions presented have cross-sections within equity and inclusion. Of particular interest to highlight is the nonprofit social innovation organization, New Profit, who works to support marginalized communities to up- and reskill to obtain gainful employment. New Profit has created The Future of Work Grand Challenge,

Despite being the largest minority group within the U.S., individuals with disabilities lag behind other groups in terms of workplace retention and recruitment.

powered by XPRIZE and MIT Solve. The challenge champions solutions that train and place millions of workers into higher skilled, higher wage careers by incentivizing BIPOC entrepreneurs to think about accelerated learning programs, how to cut training times by 50% as well as how to provide wrap-around supports in addition to necessary skills training. Competing teams form to rapidly upskill workers in underserved communities to bridge both the skills and the opportunity gaps. To learn more about up and reskilling, please see the Future of Work chapter.

By looking at societal issues through an equity and inclusion lens, unique solutions can be tailored to communities that have historically been underrepresented or marginalized. However, with technology being the great equalizer, solutions that remove barriers and open access can be leveraged to create opportunities for inclusion and upward mobility.

Conclusion and Key Takeaways

Diversity and gender equity is increasing in countries around the world, but challenges remain on how to best serve these diverse population segments. There is no one-size-fits-all approach to policy and governance of societal issues that affect groups of people differently, so efforts from across sectors and industries must work collectively to help create tailored solutions. The key learnings from this chapter include:

Financial inclusion is a key principle of equity and is vital to reducing poverty and promoting prosperity. Companies and startups that are creating platforms that allow for greater funding opportunities to minority-owned businesses and greater connect to consumers are key to propelling innovation and supporting growth

The healthcare industry is working towards correcting biases within their systems by creating culturally nuanced pathways for marginalized communities to access care. This is being accomplished **through the creation and implementation of ethical AI standards to ensure algorithms can account for racial and minority predeterminations, both in prescribing and receiving treatment.**

Affordable housing is a key pillar in advancing upward mobility, as low-income neighborhoods are often associated with high levels of crime and underfunded education systems. To address this need, organizations are creating unique offerings to allow marginalized communities access to affordable housing and mortgage offsetting opportunities, which will ultimately create generational improvements as well.

Workplace diversity, equity, and inclusion has been established as an effective means to improve a company's bottoms line. To create a pipeline of minority candidates to leadership levels, organizations are working to upskill their employees through professional development programs and learning opportunities, **providing them with the necessary resources to not only move up within their organization, but also seek out senior leadership positions elsewhere.**

COVID-19 Pandemic

Coronavirus, specifically COVID-19, swiftly took the world by storm in 2020. Within a couple of months, the virus went from being first identified, to announced as a global public health emergency, to finally being declared a global pandemic in March 2020.[17] COVID-19 is an infectious disease, causing respiratory illness, with most people experiencing mild symptoms, but with older, immune compromised populations at higher risk of serious complications and death.[18]

As of March 2021, COVID-19 has since been responsible for the deaths of over 2 million people globally, and responsible for drastic short-term stock market declines, the likes of which had not been seen since the 2008 financial crisis.[19] As a result of worldwide lockdowns to stop the spread, unemployment rates skyrocketed, millions of children were without education, and hospitals around the world were reaching capacity.

Amidst the unknowns, losses, lockdowns, and economic crisis, COVID-19 has spurred unprecedented agility, ingenuity, and crowdsourced collaboration. Tech giants put their weight behind the response effort, startups stepped-up, and global communities of data scientists, researchers, medical experts, and government officials emerged to answer an international call-to-action to help reduce the impacts of COVID-19.

> **Amidst the unknowns, losses, lockdowns, and economic crisis, COVID-19 has spurred unprecedented agility, ingenuity, and crowdsourced collaboration**

Through cross-sector and cross-industry collaborations, vaccines have been created in record-breaking time. Within 12 months, the virus was identified and effective and safe vaccines were made available to prevent the disease.[20] This incredible feat of science was made possible, in part, through global cooperation.

Leveraging Global Cross-Sector Expertise for a Global Pandemic

Digital Empowers began addressing COVID-19 as early as April 2020, by shifting to virtual forums on topics that were highly relevant to community needs. Topics included the role of predictive analytics in mitigating a pandemic, digital mental health, virtual community building, the digital divide, and more. Cross-sector experts explored ways in which technology is being utilized to reduce the negative impacts of the virus on communities around the world. A few key methods being utilized included digital accessibility and cloud, data analytics, and cutting-edge technologies such as robotics and AI.

Digital Accessibility and Cloud

When stay-at-home orders were rolled out across the U.S. to stop the spread, millions of Americans were furloughed or laid-off, without any certainty of when they would be back to work. In an effort to reduce the amount of layoffs and assist businesses in staying afloat, the government introduced a variety of relief options through their Coronavirus Aid Relief and Economic Security (CARES) Act passed by the U.S. Congress, including the Paycheck Protection Program (PPP). PPP provided loans to help small businesses keep their workforce employed during the COVID-19 crisis.

A global leader in IT consulting, TCS developed an end-to-end, cloud-based solution to help banks provide seamless services to clients who were rushing to file forgiveness requests.[21] This solution, called Small Business Loan Forgiveness, has the ability to be scaled up and deployed within days, and offers transparent, efficient, and secure administration of banking needs. The ability of corporations to quickly create solutions to the community's most pressing needs is a testament to the agility within their organizations and the collaborative efforts in creating a solution with the end-user in mind. As a result of the efficiency of technology in deploying the PPP, over 55 million jobs were protected, helping to halt the growing employment gap.[22]

Additionally, TCS volunteers created a COVID-19 Technology SWAT Team, led by the Office of Information Technology Services (ITS) and the New York State Department of Labor (NYS DOL). The TCS Tech SWAT Team troubleshoot and helped process pending unemployment insurance applications—giving citizens expedited access to financial support. This SWAT team ultimately processed 3,500 unemployment cases and contributed to pro-bono efforts that equaled 25,000 hours of service, saving taxpayers approximately $14 million.[23]

17 https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen
18 https://www.who.int/health-topics/coronavirus#tab=tab_1
19 https://time.com/5930111/2-million-covid-19-deaths/
20 https://connect.uclahealth.org/2020/12/10/the-fastest-vaccine-in-history/
21 https://www.tcs.com/tcs-launches-cloud-solution-to-help-US-banks-manage-surge-in-small-business-ppp-loan-forgiveness
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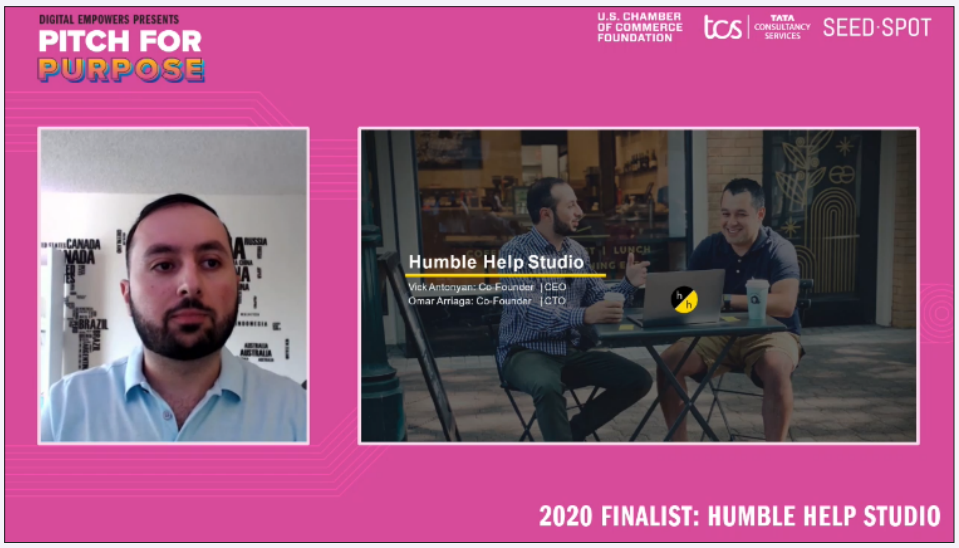
23 https://www.tcs.com/nys-dol-unemployment-insurance-benefit-csr-activities

While government programs such as PPP assisted small businesses in remaining afloat, many more businesses who closed their doors to the public due to the pandemic were left without options to sell their products or services. Throughout the world there was a call to support local small businesses to help them weather the storm, but there was a gap for many small businesses that weren't digitally connected. To address this need, Digital Empowers' Pitch for Purpose finalist and social enterprise, Humble Help Studio, worked to provide small businesses affected by COVID-19 with digital engagement tools. Humble Help Studio has been helping small businesses increase their digital footprint, create more customer impressions and engagement and provide services for these mom-and-pop shops to create their own e-commerce platforms. By helping to get these small businesses digitally connected, Humble Help Studio is expanding their customer base and providing them the opportunity to participate in the global economy.



Vick Antonyan, Co-Founder and CEO, Humble Help Studio presents at the Pitch for Purpose competition for social entrepreneurs, where he describes how he supports struggling small businesses with mentorship and training services.

Data and Analytics

Unfortunately, government or cross-sector programs were not been able to stave off mass unemployment and uncertainty. While those left unemployed from the pandemic were left to predict when they will be able to get back to work, health care providers were trying to predict when their systems would reach capacity. Similarly, educators and families were left predicting when schools will resume. Understanding the need for reliable models of predictions, Digital Empowers addressed the breadth of complexities surrounding COVID-19 forecasting. Speakers brought data visualizations and forecasting into the context of current public health, policy decisions, changes to clinical care, and patient management. Leading data visualization models that are enhancing the understanding of COVID-19, including Johns Hopkins University's web-based COVID-19 dashboard created through the Center for Systems Science and Engineering (CSSE), can serve as a vital driver to create efficiencies. This was the first interactive, web-based coronavirus dashboard that tracks the disease's spread in near-real time around the globe. Since its inception, the global dashboard has been available in real-time and uses AI to compare and validate data against independent data sources from organizations like the Center for Disease Control (CDC) and the World Health Organization (WHO). The website tracks COVID-19 deaths, recoveries, and hospitalizations, and is collecting data from over 100 primary, authoritative sources.

Other leading prediction models including the U.S. Centers for Disease Control and Prevention (CDC) data tracker, the Reich Lab's forecast hub have also played a crucial role in ensuring information is available when it is most needed.

Excella, a technology consulting company, underscores the "unknown unknowns" in COVID-19 information and the difficulty of creating accurate models during a pandemic which, in turn, leads to variations in the way data is interpreted. Forecasts play a unique role and can potentially help people change their behavior to avoid unwanted outcomes. Biofourmis—a fast-growing global leader in digital therapeutics that powers personalized predictive care—remotely monitored COVID-19-positive patients through wearable devices to aid in early detection, reduce incidents of deterioration and enable clinicians and nurse teams to provide interventions at an optimal time. Adopted by health systems in the United States, the United Kingdom, Australia, and Hong Kong, the patient-facing wearables protect frontline healthcare workers from unnecessary exposure and, at the same time, allow data collection through an IoT enabled methodology, leading to new insights about the virus from the scientific community. Having the capability to accurately predict future trends around the virus allows government and other sectors the ability to plan and future proof their organizations.

Despite the incredible efforts in creating trustworthy data models, Digital Empowers noted a disturbing trend in misinformation on the virus, the vaccine, and health outcomes. During the 2020 National Summit, experts from the University of Illinois Information School, Disaster Tech, and Graphistry, showcased their Project Domino, an open-data science tool that detects social media manipulation of COVID-19 health information. Other methods of identifying misinformation and data-driven interventions include the use of AI. By using AI, developers can move beyond simple keyword searches and utilize a broader content sentiment that analyzes paragraphic tone to locate misinformation and map it to other conspiracy theory-related content on social media. Data scraping, analysis, and visualization techniques by citizen volunteers provide regulators, media companies, community leaders, and others with information that pinpoints and triages sources of COVID-19 misinformation to act on. By

> We can't always look from the top-down, we really need to look from the bottom-up, from a grassroots perspective to empower local communities to intervene and to protect their loved ones and the community.
>
> Sean Griffin
> US Navy Veteran and Founder and CEO, Disaster Tech

identifying the sources of misinformation and remediating it, Project Domino is helping citizens with factual information on the virus that could ultimately save lives.

Sean Griffin, a US Navy Veteran and Founder and CEO of Disaster Tech states, "We can't always look from the top-down, we really need to look from the bottom-up, from a grassroots perspective to empower local communities to intervene and to protect their loved ones and the community."

Data has also been utilized to help track COVID-19 patients to identify transmission rates and notify those in contact with infected patients that they should quarantine themselves. During the U.S. Chamber of Commerce Foundation's Public-Private Partnership conference, Digital Empowers hosted a session on Disaster Response. The session centered on technologies that are helping frontline workers cope with the surge in infectious patients, tracking the virus in real-time, and using robotics, wearable technologies, and adaptive and artificial intelligence to create the next generation of personal protective equipment (PPE).

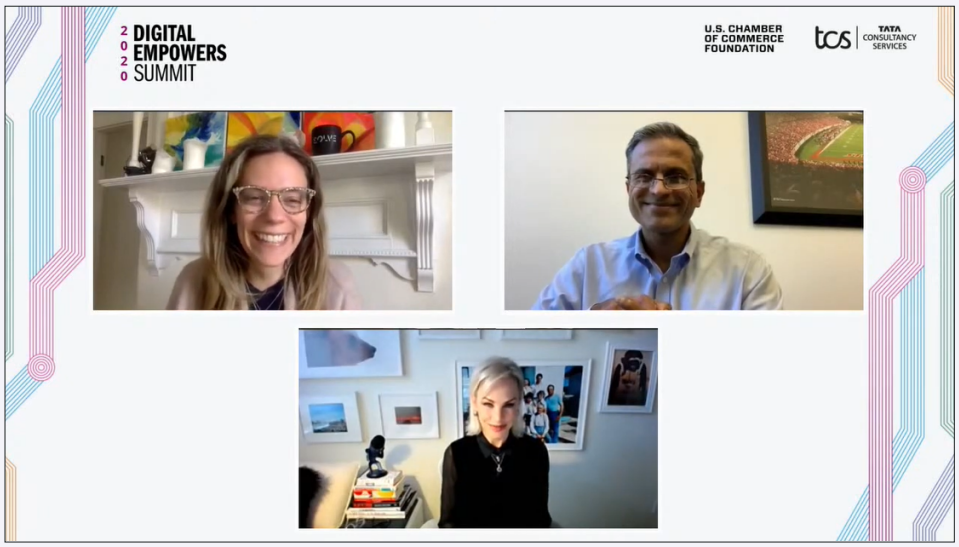
To further these efforts, The U.S. Northern Command on Mission Assurance and Critical Infrastructure Protection (USNORTHCOM) has been keeping the U.S. military force healthy and providing national disaster response as necessary, and have been an important resource throughout the COVID-19 pandemic. Through its private sector partnerships with companies like Apple, Google, Esri, and Palantir, USNORTHCOM has the ability to better track military medical providers and have real-time COVID-19 data from troops on the ground sent to USNORTHCOM central command for monitoring and rapid response.

AI and Robotics

The highly transmissible nature of the virus means that those who come in contact with infected patients, whether their symptoms are visible or not, are at higher risk of catching the virus. As a result, robots and autonomous systems were essential service workers throughout the pandemic. Within hospitals and healthcare centers, robots were used to screen incoming patients and check their temperatures, reducing the amount of contact for healthcare workers. Robots have also been used to automate the testing process, with the ability to test up to 4,000 COVID-19 samples per robot each day.[24]

Another novel use of robotics for COVID-19 response is through safe and effective supply chain management. United Parcel Service (UPS) has been at the forefront of innovations in medical supply chain; transportation and logistics. UPS' unmanned aerial vehicles (UAVs) were utilized during the Ebola outbreak, and the company's pandemic response continues to progress. Drones and robotic technologies provide pharmacy deliveries for patients of compromised immune systems who are required to quarantine. Equipped with AI sensors, UAVs can monitor and maintain temperature-controlled substances during shipping, a technological feat that can also be utilized in a post-pandemic world to deliver vaccinations and prescriptions to rural and remote regions.

Many of these technological advancements would not have been possible without the collaboration and cooperation between cross-sector and cross-industry partners. One such example is from Johnson & Johnson's (J&J) JLABS accelerator—which offers resources, equipment, areas for collaborations, and mentoring to budding, diverse startups. JLABS has teamed with the Biomedical Advanced Research and Development Authority (BARDA), a component of the Office of the Assistant



MIT Solve's Alex Amouyel speaks with UPS' Bala Ganesh and Johnson & Johnson Innovation's Melinda Richter on the impact of COVID-19 on digitization, leadership, and the next generation of business.

24 https://www.forbes.com/sites/saibala/2021/01/26/robots-have-become-an-essential-part-of-the-war-against-covid-19/?sh=3ca37fff5ef3

Secretary for Preparedness and Response in the U.S. Department of Health and Human Services, to create their Blue Knight initiative. Blue Knight has awarded seven JLABS startups $500,000 as well as mentorship from BARDA and J&J. This support helps founders navigate research and development challenges, production, and regulatory pathways surrounding the development and distribution of medical equipment, PPE, and vaccine and medicine research. The support and cooperation of government and corporate partners provided Blue Knight startups with additional resources and expertise to bring their products and services to market during a period where time was of the essence.

From the start of the pandemic, public, private, and nonprofit sectors answered a global call to action to work cooperatively to stop the spread and find a vaccine. While COVID-19 is expected to be prevalent for many years to come, the global pandemic will eventually retreat, and what will be left is the incredible technological advancements from cross-sector organizations and industries.

Conclusion and Key Takeaways

The pandemic has created unprecedented global challenges, on a scale that has never been witnessed before. Spiking unemployment rates, hospitals overcapacity, shuttered businesses, and millions of deaths are just some of the consequences this virus has had on the world. Despite myriad disasters, COVID-19 has also sparked ingenuity, agility, and global collaboration. Technology has advanced, with digital connectivity, cloud, data and analytics, AI, and robotics being at the forefront of innovation. Key learnings and takeaways include:

Small businesses have been able to stay afloat amid lockdowns due to government relief programs enabled by corporate technologies, and digital engagement enabled by social enterprises and nonprofits. **User-centric cloud platforms were created and deployed to ensure the thousands of small businesses seeking government relief packages had access to funds.** Nonprofit and social enterprise organizations assisted mom-and-pop shops to introduce e-commerce platforms to allow them to keep their doors open, virtually.

Data and citizen scientists created open dashboards to understand pandemic trends and keep track of cases. **Utilizing predictive analytics models, public and private institutions can make decisions based on what the trends and the models show. This data can also be used to predict patient outcomes and make decisions for their treatment and care.**

As the trend in misinformation around the disease grew so did the solutions to mitigate its spread. Project Domino, a collaborative effort of citizen science, **uses AI, analytics, data scraping, and visualization to identify misinformation at the source and provide feedback to authorities to take further action.**

Advanced robotics have been utilized to carry out essential services during the pandemic. From greeting hospital patients with temperature checks and testing COVID-19 samples, to carrying out the transport of safe pharmacy deliveries to home-bound customers. **The applications of robotics for vaccine delivery will be essential in rural and remote regions.**

The corporate sector answered a global call to action to shift their priorities and focus on the most pressing, COVID-19 related issues. **TCS utilized their employee base and created a Tech SWAT Team to help process unemployment benefits, ultimately saving millions in taxpayers money while also expediting the release of funds to those most affected by the pandemic.**

Explore the key insights and interact with the report on https://on.tcs.com/Catalyst

The Digital Divide

From farming to education to health care, the internet keeps individuals, communities, and businesses connected and engaged in today's world. The lack of access to the internet—also known as the digital divide—affects 52% of women and 42% of men worldwide,[25] which has direct implications for their literacy, social mobility, economic equality and growth.[26] According to the U.S. Federal Communications Commission's (FCC) Eighth Broadband Progress Report, approximately 19 million Americans—6% of the population—still lack access to fixed broadband service at minimally acceptable speeds. Even in areas where broadband is available, approximately 100 million Americans still do not subscribe to the service.[27]

While the number of Americans with access to computers and the internet has risen, evidence of the digital divide is stark. According to a study conducted by the National Telecommunications and Information Administration (NTIA), minorities, low-income persons, the less educated, and children of single-parent households, particularly when they reside in rural areas or central cities, are among the groups that most lack access to information resources.[28]

> "Bringing the infrastructure into the community is one thing, but we must ensure people within the community can connect.
>
> Pam Damoff
> Parliamentary Secretary to the Minister of Indigenous Services for the Government of Canada

Pam Damoff, Parliamentary Secretary to the Minister of Indigenous Services for the Government of Canada stressed on the understanding that being digitally connected affords us economic opportunities, as well as opportunities to meaningfully participate in civic engagement and education. In Canada, Indigenous communities in particular are deeply impacted by the digital divide, with up to 75% of households lacking access to affordable high-speed broadband.

Damoff identified the last mile of connectivity as a key challenge in access. "Bringing the infrastructure into the community is one thing, but we must ensure people within the community can connect." However, even in households with the requisite hardware and connectivity, it's important for people to have a digital foundation. Lower literacy skills and particularly lower digital literacy skills further contribute to the widening digital divide, with many students experiencing a gap in learning and senior citizens increasingly facing accessibility problems.[29]

With the onset of the COVID-19 pandemic and subsequent necessity to stay at home, these have been exacerbated. Doug Brake, Director of Broadband and Spectrum Policy from the Information Technology & Innovation Foundation (ITIF) explained that the pandemic has created a surge in internet traffic going up by ~20-40%—a year's worth of capacity growth in the internet was seen in about a week.[30] While the performance of broadband networks has been sufficient despite the increased demand, the core issue of a gap in access and digital literacy still remains and which requires the most amount of action from multi-stakeholder groups.

Pam Damoff, Parliamentary Secretary to the Minister of Indigenous Services for the Government of Canada addresses the digital divide in Indigenous Communities during a Digital Empowers virtual forum with the Canadian Council for Aboriginal Business.

The digital divide is a complex issue that affects a diverse group of people, and similarly, requires a multi-faceted approach to solutions that include building infrastructure and capacity, creating affordable devices and internet access, developing human capacity, up/reskilling and facilitating foundational learning. It is therefore important for policy makers to develop a comprehensive strategy involving a multi-stakeholder approach that takes into account the full spectrum of issues that perpetuate a digital divide within communities.

Bridging the Digital Divide: Public, Private, and Social Sector Driven Action

Accessibility

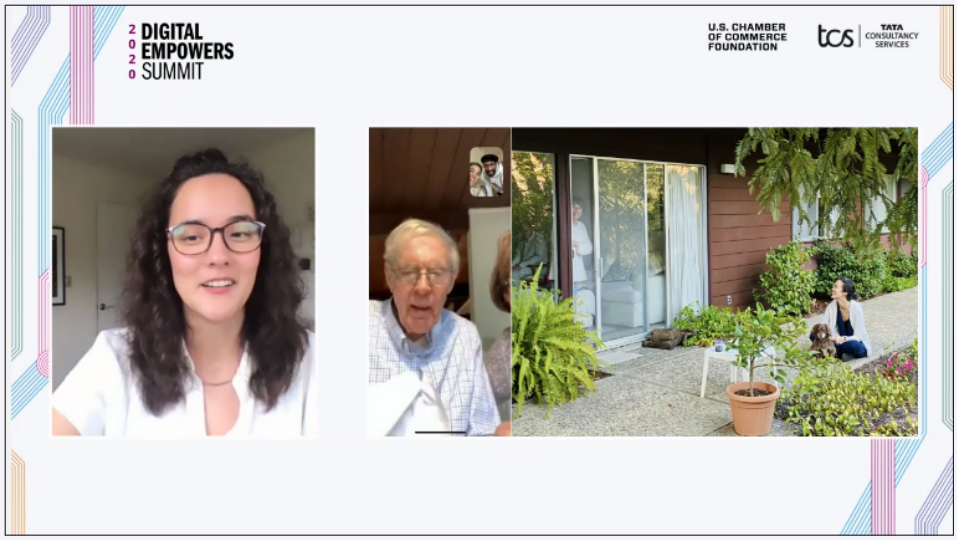
An example of a multi-faceted approach to addressing digital access and adoption is through public-private partnerships, which combine the public reach of government with the technology and innovation expertise of the private sector. The U.S. Department of Agriculture's ReConnect Program, for example, provides financing to private sector companies such as DoveTel Communications, Tallahatchie Valley

25 https://www.iberdrola.com/social-commitment/what-is-digital-divide
26 https://whatis.techtarget.com/definition/digital-divide#:~:text=Digital%20divide%20is%20a%20term,personal%20computers%20and%20the%20Internet.
27 https://www.fcc.gov/reports-research/reports/broadband-progress-reports/eighth-broadband-progress-report
28 https://www.ntia.doc.gov/legacy/ntiahome/fttn99/introduction.html
29 https://www.nngroup.com/articles/digital-divide-the-three-stages/
30 https://www.youtube.com/embed/NL78W4-WPx8

Electric Power Association, Easton Utilities Commission, and Pioneer Telephone Cooperative to facilitate broadband development in rural areas of the U.S. that lack sufficient access to networks.[31] Since its inception in 2018, the program has invested $600M to expand broadband rurally through loans and grants.[32]

The U.S. Census Bureau Open Innovation Lab's "The Opportunity Project" similarly encourages scalable solutions through initiatives led by cross-sector teams from academia and the private sector. Teams compete to create data-driven, digital solutions that address specific challenges through 12-week long innovation sprints. After a soft launch of the solutions, participants incorporate expert feedback provided and then work towards effectively implementing these on ground to ensure that the solutions reach end users.[33] One such challenge was focused on the 2020 Census, and how the government can more effectively account for Americans who lack access to broadband, which will ultimately help government organizations build a more informed approach and develop policies and solutions focusing on solving for this core need.[34]

Private sector solutions and partnerships have also contributed to developing strategies aimed at reducing the digital divide in the country. During the Digital Empowers August 2020 forum, Michael Daniels, Director of Federal Government and Industry Relations at Land O'Lakes—one of America's largest member-owned cooperatives that span agricultural production to consumer foods—showcased company's investments to create access for all stakeholders. During the start of the pandemic, Land O'Lakes activated WiFi services through their facilities and made it available to the public at no cost through their American Connection Project, a business consortium advocating for better broadband access in rural communities. As a result, farm cooperative members could utilize this access in rural areas where broadband is lacking allowing them to connect and collaborate during a time when digital access was the only channel to do so.[35]



Madeline Dangerfield-Cha, CEO and Co-Founder, Mon Ami shares how she has been supporting vulnerable populations during the pandemic and bridging the digital divide across generations.

In addition, the project advocates for more investment in infrastructure supporting high-speed internet as well as access to resources, through public and private investment, that facilitate remote education, telehealth and employment services, and more.[36] The resulting impacts of this coalition on advocacy and community resources, including providing access to WiFi, hardware and devices, and investment in programs, is a great example of why there is strong value in leveraging multi-stakeholder partnerships as a driver for change.

Affordability

Affordability is an additional barrier to adoption for many low-income households which has perpetuated the access divide. Comcast NBCUniversal is one such organization working to reduce the affordability strain among low-income Americans through their Internet Essentials Services program. During the Digital Empowers August 2020 forum in the U.S., Alicia Matthews, Vice President of Government Affairs and Strategic Initiatives at Comcast NBCUniversal spoke about the importance of supporting internet adoption through affordability. The Internet Essentials program provides two free months of internet access to qualified customers, while partnering with local community-based organizations and city leaders to create 1000+ safe spaces across the country for students to connect to the internet for virtual learning, to reach the last mile of connectivity.[37]

Comcast NBCUniversal has also been working with Massachusetts Broadband Institute (MBI), since 2015 to help them build out services to 40 of the region's 53 underserved communities, reaching even more homes than the project initially anticipated.[38]

31 https://www.usda.gov/reconnect/round-two-awardees
32 https://www.rd.usda.gov/files/ReConnect%20Program%20.pdf
33 https://opportunity.census.gov/
34 https://opportunity.census.gov/assets/files/2020_Census_Problem_Statements.pdf
35 https://www.youtube.com/embed/NL78W4-WPx8
36 https://www.landolakesinc.com/Press/News/American-Connection-Project-Broadband-Coalition
37 https://corporate.comcast.com/covid-19
38 https://www.youtube.com/embed/NL78W4-WPx8

Digital Literacy

Closing the digital divide is directly linked to digital literacy, which, in turn, is an imperative for creating equitable access to employment opportunities and growth within communities. However, an additional challenge that exists in the adoption and integration of digital technologies is ensuring that those who do have access are also equipped with the knowledge on how to use it. During the Digital Empowers forum in Charlotte, North Carolina, government stakeholders, business and community leaders, and innovators convened to discuss key issues concerning industry and technology, with digital inclusion emerging as one of the priority areas for social impact.

The Charlotte Regional Forum explored Informative Technologies, a social enterprise's contributions in closing the digital divide as well as improving digital literacy among students, educators, and families. The organization uses open source software, sustainably sourced hardware, and community-based partnerships for creating unique solutions as part of its vision of community empowerment through knowledge. Informative Technologies works with students, school systems, and families to not only provide them with access to affordable computers through the company's e-Waste collection service but also provides the hands-on STEM training and skills training needed to repurpose and utilize their new devices.

Digital literacy among aging populations is notably less than among younger ones who grew up utilizing technology in nearly all aspects of life. To help address this issue, Mon Ami—a tech enabled startup that connects seniors with companions—was featured during the Digital Empowers 3rd Annual National Summit in October 2020. Mon Ami has created virtual groups and support services for seniors and other vulnerable populations. The app's user-friendly design takes into account the user's level of digital fluency, with volunteers working with senior companions to increase levels of literacy thereby helping to bridge the digital divide across generations.

Digital literacy among aging populations is notably less than among younger ones who grew up utilizing technology in nearly all aspects of life.

Conclusion and Key Takeaways

With the COVID-19 pandemic forcing countries around the globe into lockdowns, working from home and virtual learning have become a new reality and brought the issue of the digital divide into sharper focus. While many public, private, and nonprofit organizations have actively addressed this issue and made great strides throughout this past year, it is clear there is more work to be done to ensure there is equitable access, affordability, and adoption of broadband internet throughout all populations. Key learnings and takeaways from exploring this issue with a multitude of stakeholders include:

The onset of the COVID-19 pandemic created a surge in internet traffic and a years' worth of capacity growth in just one week, but simultaneously revealed a lack of rural infrastructure, adoption rates, affordability, and digital literacy, key pillars that need to be addressed in order to see widespread uptake of digital connectivity.

There is strong value in multi-stakeholder partnerships. **Public-private collaborations can ensure best in class products, technology, and processes are easily made available to bridge the divide and address digital literacy.**

Private sector organizations, especially service providers, **can address the affordability issue by partnering with local community-based organizations to develop unique solutions to reach the last mile of connectivity.**

There is a need for significant federal investment in broadband to improve federal broadband mapping, **increase rural infrastructure and affordability,** and create better coordination between federal and state agencies to work together on the digital divide issue.

Explore the key insights and interact with the report on https://on.tcs.com/Catalyst

Mental Health

Mental health is a critical pillar of community wellness and vitality, and the stigma once associated with seeking help is being replaced with positive awareness campaigns, resources, and support. This shift in perceptions comes in part from an increase in normalization of mental health issues with more individuals reaching out and asking for help over the last few decades.

While advancements in communications have helped bring awareness to mental health issues and alternative methods of support, our new cultural reliance on technologies and personal devices has increased isolation, contributing to a decline in mental wellness. A survey published in the *Journal of Abnormal Psychology* saw the rate of individuals reporting symptoms consistent with major depression in the last 12 months increased 52% in adolescents from 2005 to 2017.[39] This dramatic increase in mental health issues has been attributed, in part, to an increasing reliance on digital communications and limited social interactions among this age group, which in turn has had a significant effect on mood.[40]

The onset of the COVID-19 pandemic has exacerbated this issue further. The World Health Organization has stated that the pandemic has disrupted or halted critical mental health services in 93% of countries worldwide, despite the increasing demand for mental health support.[41] In response to this gap between professional service providers and patients, the number of secure, virtual, and much needed mental health resources from the tech and startup worlds have ballooned. Through Digital Empowers, there was a recognition for the need of technology-based offerings even before the pandemic, and through the program, catalyzed conversations with experts to understand the market and how technology is working to better serve consumers and address the main barriers of affordability, access, and stigma.

Dr. Laura Hamill, Chief People Officer, Limeade & Chief Science Officer, Limeade Institute discusses the importance of putting inclusion at the forefront of design and development, and how Limeade leverages technology to create more human work experiences.

Addressing Mental Health: Private and Social Sector Driven Solutions

Since 2018, Digital Empowers has seen an effort to support employees during the pandemic, with employers ramping up efforts to address mental health and create a culture of well-being. During the Digital Empowers 3rd Annual National Summit in October 2020, Limeade's Laura Hamill, Chief People and Chief Science Officer, emphasized the importance of designing products with inclusion and wellness in mind. Limeade, an employee experience software company, leverages technology to create more human work experiences, focusing on the whole person—their physical, emotional, and financial well-being. The algorithm behind the company's innovative platform is based on extensive research conducted by its Limeade Institute about the science of well-being and engagement—and how the two are closely connected. Employers recognizing the importance of an engaged and supported workforce are also beginning to use apps such as TalkSpace.

The Digital Empowers Mental Health Teletalk, held at the start of the pandemic in April 2020, explored how apps such as Talkspace are helping individuals tide though isolation and anxiety and are, at the same time, helping large scale organizations re-think their wellness models. As a solution, Talkspace provides users with access to licensed and credentialed medical professionals at the touch of a button and at more affordable price points than traditional clinics, addressing some of the main barriers patients experience when accessing mental health support.

Roni Frank, Co-founder and Head of Clinical Services, explained the problem Talkspace addresses, stating that "two out of three people diagnosed with a mental health issue have no access to care. This equals tens of millions of people who can't access necessary healthcare services."[42]

While the concept of telehealth services is not novel, Talkspace is going a step further by utilizing AI and machine learning to potentially identify early warning signs for mental health episodes and provide better

39 https://www.sciencedaily.com/releases/2019/03/190315110908.htm
40 https://www.sciencedaily.com/releases/2019/03/190315110908.htm
41 https://www.who.int/news/item/05-10-2020-covid-19-disrupting-mental-health-services-in-most-countries-who-survey
42 https://www.youtube.com/embed/vw4UJFVOnTQ

support through therapist feedback.[43] Similarly, Ginger.io, a mental telehealth platform, founded by scientists from MIT's Media Lab, saw the potential of utilizing smartphone-based technology to identify patterns of anxiety, stress, and depression to support patients. Karan Singh, Co-Founder and Chief Operating Officer of Ginger.io recently completed their annual Workforce Attitude Report, surveying employees across the country, and found that nearly 70% of workers across all generations claim that COVID-19 has been the most stressful time of their career.[44]

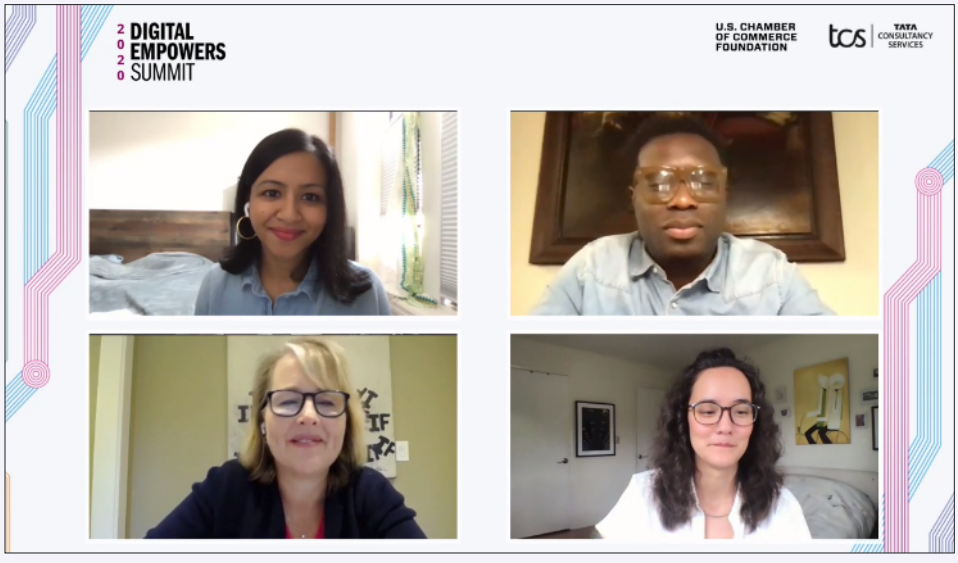
> "Two out of three people diagnosed with a mental health issue have no access to care. This equals tens of millions of people who can't access necessary healthcare services.
>
> Roni Frank
> Co-founder and Head of Clinical Services, Talkspace

> Backed by ethical data aggregation and AI, the digital personalization of these services has proven critical to providing customized and effective care while addressing the needs of a diverse community.

Holistic healthcare including mental health and well-being is becoming the way forward not only for employers, but also for organizations within the healthcare sector. In an effort to support mental well-being in a proactive way, health insurance companies Vitality and Discovery, located in the UK and South Africa, have gamified wellness to support better health outcomes for their customers. During a Digital Empowers virtual forum in the UK, Kris Tokarzewski Chief Technology and Information Officer at Vitality UK explored the role of incentivized physical activity and wellness exercises. It is widely known that an increase in physical activity supports mental wellness and through incentives for productive behavior, Vitality and Discovery are able to leverage a positive reinforcement model to create efficiencies. During the COVID-19 lockdowns, the organizations pivoted the benefits to address more immediate requirements such as at-home wellness services and fitness equipment to promote positive and healthy choices.

A growing number of ventures have also realized that solutions need to be designed that keep the user's intersectional identity in mind, in order to create sustained and holistic solutions to mental health challenges. Backed by ethical data aggregation and AI, the digital personalization of these services has proven critical to providing customized and effective care while addressing the needs of a diverse community. One such example of this specialized care, featured during the 2020 Digital Empowers National Summit, was the teletherapy company, Ayana Therapy—an online platform that makes mental health therapy customized and accessible to people of color and other minority and marginalized groups. The platform's mobile app increases access, creates awareness, and enhances affordability to providers. What is most notable, however, is its novel algorithm that matches users to licensed professionals based on their culture, ethnicity and experiences, to reduce stigma and increase cultural competencies.

Similarly, Mon Ami, is working to address sections within the community which may otherwise be overlooked. While they're working to bridge the digital divide across generations, Mon Ami is simultaneously addressing mental health issues including loneliness and social isolation during the COVID-19 pandemic. The platform allows volunteers to connect and engage with seniors in a secure digital environment, to provide companionship, reduce isolation, and ultimately reducing the mental health implications the pandemic has induced.[45]



Through the lens of civic engagement, wellness, and workforce development, panelists address the importance of creating for the user, combating bias, and providing for all in the new tech age.

43 https://www.bloomberg.com/news/articles/2020-05-12/talkspace-using-ai-for-therapy-during-mental-health-crisis
44 https://go.ginger.io/hubfs/200626_Ginger_Report2020.pdf
45 https://www.psychiatryadvisor.com/home/topics/general-psychiatry/costs-of-social-isolation-loneliness-covid19/

While increasing access to resources can help overcome a major barrier, affordability is still a primary concern. Directly addressing the affordability barrier to mental health support is 18percent, an online support community facilitated through Slack. 18percent has been instrumental in providing support to thousands who cannot afford traditional mental health support through its free, peer-to-peer platform. David Markovich, Co-Founder of the Slack-based community support group referenced how the pandemic has played a unique role in reducing the stigma associated with mental health issues and how colleagues and clients are now more open to sharing their experiences and personal challenges. This shift in mindset, an understanding that it's okay to not be okay, is an important step to having more people freely access available mental health resources through a community-based approach to support networks.

Conclusion and Key Takeaways

Mental health and wellness have become a priority for employers, healthcare providers, and individuals, suggesting this upward trend will continue due to the pandemic's long-lasting impacts. As such, the demand for effective and affordable technologies to support novel solutions in this space will also continue to grow. The National Institute of Mental Health suggests there will be continuing research into tech-enabled behavioral therapy, AI and machine learning for early intervention, as well as new technologies for support and management of a wider range of disorders, including schizophrenia and autism.[46] The market for digital technology-supported mental health solutions will continue to grow in the years to come, with solutions to the key barriers of access, affordability, and stigma. Key learnings and takeaways include:

The pandemic has had both positive and negative impacts on mental health. On a positive note, the perception of mental health has shifted with a reduction in the perceived stigma associated with it. Negatively, the pandemic has exacerbated many mental health issues by creating an environment of isolation and uncertainty, as well as disrupting or halting many traditional forms of in-person mental health services.

Startups are meeting the new demand for services by offering digital solutions including symptom tracking, support groups, self-assessments, and wellness training to offer **inclusive resources that are affordable, accessible, and inclusive.**

Organizations have begun to play a unique role in promoting comprehensive well-being by incentivizing physical and mental health as a proactive approach to reducing negative health outcomes.

AI and machine learning research is being applied to better assess users mental state, to predict mental health episodes, and offer more effective support via customized therapist feedback.

Private sector organizations are beginning to recognize the link between employee wellness, engagement and retention. As a result, many have started introducing measures and tools to support employee's mental health. Additionally, organizations are working to ensure frequent and more transparent and collaborative communication with team members. Using internal channels, organizations are now keeping employees updated on information and access to digital tools and resources like TalkSpace, Ginger.io, and 18Percent as well as tips to enhance well-being, investing in an employee's overall wellness journey.

Explore the key insights and interact with the report on https://on.tcs.com/Catalyst

46 https://www.nimh.nih.gov/health/topics/technology-and-the-future-of-mental-health-treatment/index.shtml

Conclusion

It's clear that technology will play a role in enabling social impact improvements in our increasingly digital world. However, what we've uncovered through Digital Empowers and as a key takeaway from this report, is that, in addition to developments in technology innovation, it is the unique abilities and insights of people that will be more important than ever to solve social problems. Human-centered engagement—be it through shared value or human-centered design—is critical to success. Digital Empowers revealed that cross-sector collaborations that highlight human integration in technology are essential to create shared value and accelerate social good. Whether responding to disasters, addressing social inequity, improving education and skilling, or other challenges, innovation and collaboration are how all sectors will continue to make the world a better place.

> "Analytics, cloud computing, Internet of Things, and more can be utilized to improve the effectiveness of social programs, quicken the pace of societal discovery, transform philanthropy and social good to respond in ways that guarantee technology is properly used to reduce the disparities that exist currently.
>
> We can develop, test, and refine new interventions that use technology such as mobile apps, gamification, big data, and in aiding disaster recoveries and ensuring public safety.
>
> Surya Kant
> North America Chairman, Tata Consultancy Services

Through in-person and virtual forums, Digital Empowers has evolved to understand how technology solutions for community-based social impact challenges can be scaled and incubated in locations around the world. Over the next years, Digital Empowers will continue to uncover these opportunities, break the silos that exist in terms of access to technology and the knowledge of how to utilize them to power solutions, ultimately connecting experts across the globe with those that will benefit from their experiences.

We invite you to join in the conversation by visiting our website to stay up to date on convenings, insights, and forums on tech for social impact.

Digital Empowers, an initiative launched by TCS in partnership with the U.S. Chamber of Commerce Foundation, is aimed at **accelerating innovation for social impact**. The overall goal of Digital Empowers is to **facilitate the generation of new ideas, foster the spread of these ideas while facilitating action through a cross-collaborative process**. Since inception, Digital Empowers has engaged with thousands of experts to create and expand the knowledge base, explore technology solutions that have exponential impact on the most pressing problems - all of which have cross-sections and applications around the world, and to create an ecosystem of vital cross-sector partnerships leading to collaborative social impact solutions. The program has also opened doors for social entrepreneurs and changemakers to **ideate and collaborate with business and technology leaders to bring novel social impact innovations to the community**.

TATA CONSULTANCY SERVICES

TCSEmpowers

We are building greater futures by connecting people to opportunities in the digital economy. Through innovation and collective knowledge, we will create equitable, inclusive pathways for all, especially women, youth and marginalized groups.

Visit **www.tcs.com/corporate-social-responsibility** and follow **#TCSEmpowers** across social media.

About Tata Consultancy Services (TCS)

Tata Consultancy Services is a purpose-led transformation partner to many of the world's largest businesses. For more than 50 years, it has been collaborating with clients and communities to build a greater future through innovation and collective knowledge. TCS offers an integrated portfolio of cognitive powered business, technology, and engineering services and solutions. The company's 500,000 consultants across 46 countries help empower individuals, enterprises, and societies to build on belief.

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