



# Resilience in a crisis: a manufacturer's perspective

June 2021



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Awards and media coverage

As of this writing, the pandemic continues to evolve with rising numbers of COVID-19 cases in certain parts of the world. We are grateful to all Flex stakeholders – from our employees to local health officials – for their vigilance in helping us create a safe working environment and enabling us to maintain business continuity. We look forward to sharing additional learnings about resilience as we continue to navigate the pandemic.

# Case studies

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## CEO foreword

More than a year ago, a respiratory disease rapidly escalated into an unprecedented global health and humanitarian crisis, changing us indelibly and forever.

Some 16 months later, COVID-19 continues to challenge us, with the medical community continuing to battle the disease while tackling new variants of the novel coronavirus. At Flex, more than 145,000 of our team members show up every day at our factories, masked up and physically distanced, ready to build and ship products that keep the world running and functional. Meanwhile, we continue to grapple with the commercial aftershocks of COVID-19, including a disruptive, global logistical logjam and shortages in all kinds of critical inputs from semiconductors to lumber.

### Resilience: the watchword in the next normal

Like many other organizations, our actions during COVID-19 and the big learnings from this period are helping us become better and stronger. Indeed, in the wake of the pandemic, resilience has landed on top of the corporate agenda and is now regarded as an integral part of the strategy of every business. Beyond business continuity plans, we must develop the capacity to address fast-moving and unpredictable events, spring back from major disruptions, and emerge stronger to drive greater success.

As we expect more critical threats in our future, businesses will be tested for their ability to stay the course and deliver for their stakeholders. We are publishing this briefing to share our perspectives and learnings as a manufacturer during the challenging days we lived through. We hope to highlight the takeaways that are pivotal to creating resilience so we can contribute to a strong ecosystem in which we can all grow.

### United by shared goals

There was nothing more important than our mission and purpose to guide our way through the pandemic. In adapting to the realities of the pandemic, we focused on keeping our colleagues safe and staying connected to each other. As we considered the needs of our employees and prioritized safety above everything else, COVID-19 tested our moral character and scope for empathy, challenging us to rethink what it means to be effective managers.

We are at the center of an interconnected ecosystem of partners that provide critical support and expertise. As we closed our fiscal 2021 books reporting solid results, we would like to thank all of our partners for staying the course to achieve our shared goals during this challenging time. In looking back at how we adapted then and now to meet our commitments to our stakeholders, I believe our solidarity and collaboration were critical in helping us successfully navigate the most difficult global crisis we've ever experienced. Our capability for resilience developed over the past 51 years has also served us well.

We also appreciate our customers' recognition for the ways we came together to support them during the COVID-19 crisis, as reflected in the latest customer satisfaction scores. These show not only a trend of increasing satisfaction with Flex over the last five consecutive quarters but also successive record scores in each of these quarters.\*

\*Latest scores are based on data collected in the quarter ending March 31, 2021

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## From the unique perch of Flex

As one of the world's largest supply chain and manufacturing partners serving more than 1,000 consumer and industrial brands, we look at the world from a unique perch. Our footprint spans four continents, affording an unparalleled view into how a large manufacturer continues to meet its customer obligations.

Because the majority of our 160,000 team members work on the front lines of production, managing a crisis like COVID-19 takes on great complexity and ensuring the safety and well-being of a vast workforce is our top priority. Moreover, with China being one of the sites of our largest operations, we were in the eye of the hurricane from the beginning. I believe our experience in juggling all the moving parts and unknowns during the pandemic well positions us to share valuable lessons with our community of customers, partners, and peers. After all, it is a certainty that we will face more large-scale disruptions and challenges as growing complexities in the world give rise to greater risks. In this kind of environment, we benefit by helping each other prevail and thrive. A year on, big learnings have emerged from the pandemic and sharing them helps us reimagine how we operate in a world in which nothing can be taken for granted.

## Mature, innovative and nimble

We've been around longer than most S&P 500 companies and while we are certainly big, we are nimble and quick to respond. Our teams in diverse regional markets around the world are well-equipped to bring our customers' products to market with speed – after doing this for half a century, this is deeply ingrained into our DNA.

We are also well-prepared for disruptions as evidenced by our robust crisis management program, including business continuity and risk mitigation. We are vigilant with our supply chain; we optimize capacity and utilization models and we maximize our cost savings initiatives while prioritizing our CAPEX and resources. The takeaway here is we know how to adapt and all of us – no matter what business we are in – need to be ready to change how we work and be creative to solve new challenges.

We make every effort to deliver for customers – even in the most extraordinary of circumstances like COVID-19. During this time, we supported many essential industries like healthcare, communications and energy. Our customers counted on us and indeed, we had a duty to use our know-how to quickly ramp and build products that contributed to the solution.

Once we commit to our customer, we are quick to adapt and mobilize action as fast as any startup. When we signed on to produce ventilators during the height of COVID-19, for instance, we had no previous experience with this type of medical device. But we wanted to help mitigate a critical shortage, and if anyone could step in on short notice to manufacture ventilators at scale, it was us. So, we ramped production in record time.

## Culture as a resilience lever

As the ensuing months unfolded with mounting tolls, we were battle-tested as never before. I saw our teams reach into the deep wells of ingenuity and compassion to solve problems, closing the gap on component shortages, meeting demand surges and working as smart and hard as though their own lives depended on it.

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Meanwhile, we were operating at unfathomable speed in every corner of the business, be it critical path decision-making or identifying logistical solutions. I saw extreme 24/7 teamwork showing so much resilience in support of one another, our customers, suppliers and other partners. Team members supported one another not only as coworkers but also as friends. In these moments, the calling of Flex values and purpose served as our compass.

**“Flex culture places a high premium on collaboration. During the pandemic, it was not only extreme collaboration between our teams but also with customers, suppliers, governments and other partners that made all the difference.”**

As managers, we have many levers of resilience at our disposal that we can maneuver, including our organization, strategy, technologies and processes. In the end, culture, people and collaboration were the levers that gave us incredible mileage. It was our colleagues and their extreme collaboration not only with each other but also with customers, suppliers, governments and other partners that made all the difference during a difficult time.

Collaboration led to some extraordinary outcomes. From producing ventilators across seven sites around the world in record time to getting thousands of our team members connected to VPN in short order, these feats were only possible because we were joined at the hip working in unison.

While we can’t plan for every disruption, culture can lay a strong foundation for our response. To this end, our core values and the purpose served by our work were among our most critical success factors. What follows in these pages are stories of how we maintained resilience and kept our operations running to manufacture essential products through grit, collaboration, dedication, and personal sacrifice. Compassion was on display as we pulled each other through. As teams packed months' worth of work into weeks, many worked nights and weekends through sustained periods.

We hope you will find inspiration in these pages to help you develop an organization that can navigate future disruptions with success. Together, we can build a strong operating environment in which all of us can thrive.



**Revathi Advaiti**  
CEO  
June 2021

# Plan and prepare for a riskier world

We recognize that we thrive when our connected ecosystems thrive. In this spirit, we share the key perspectives about resilience as experienced by an organization of our breadth.

Business interruptions represent the top risk for companies today, according to the 2021 Allianz Risk Barometer.<sup>1</sup> From natural disasters to cyberattacks, the frequency and intensity of disruptions have been on the rise in recent years and this trend is almost certain to continue.

Apart from the human tolls, the economic effects are also staggering: disruptions can wipe out at least 45 percent of a year's worth of profits or more over the course of a decade.<sup>2</sup> By the same token, a large enterprise could spend up to 45 percent of one year's profits in resilience measures and still come out ahead over the next ten, according to one analysis.<sup>3</sup>

The economic havoc wreaked by COVID-19 has sparked conversations about resilience becoming a key metric for measuring corporate performance. Whether stability rises to the level of environmental and social impact as a dimension of performance like environmental and social impact remains to be seen. What is clear is that businesses would be well served by preparing for and mitigating the impacts of wide-scale disruptions.

## De-risking our operating environment

The tests we have faced as an organization by operating in some of the areas of the world hardest hit by COVID-19 underline the importance of preparation. Yet the pandemic is only one of many serious disruptions we will face in our lifetime. Past disasters have taught us to invest in advanced planning so we can better cope, adapt and recover.

## What is resilience?

An organization's resilience can be measured by its capacity to fulfill commitments to its key stakeholders in times of crisis.

Accordingly, the ability to maintain business continuity or recover from disruption and thrive in the next normal, is a hallmark of an organization's resilience. A strong leadership is required to develop resilience strategies that successfully harness an organization's resources and processes over time and adopts productive ways of working and proven practices.

## Sources:

<sup>1</sup> [2021 Allianz Risk Barometer](#)

<sup>2 3</sup> [Why investing in supply chain resilience pays off](#)

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# Resilience anchored in scale and breadth

As one of the world's largest manufacturers, Flex offers solutions across the entire value chain and product life cycle spanning everything from initial design through ramp-up and volume manufacturing all the way to end-of-life and circularity offerings.

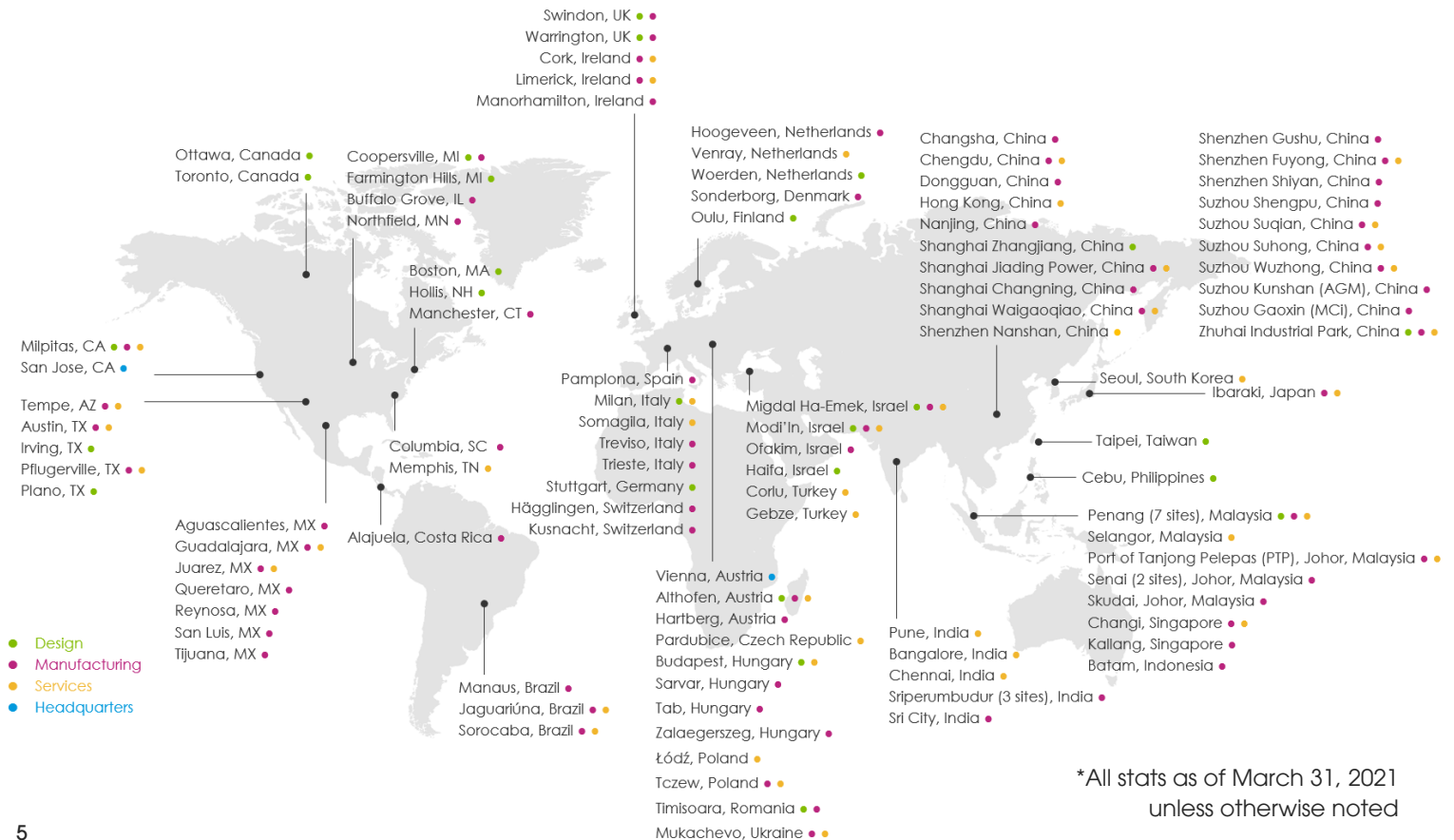
Over our 51 years of operating history, we have developed a strong capacity for resilience. Our scale and history position us to offer unique perspectives into how a massive organization can mobilize quickly and maintain resilience to meet customer commitments in the face of a major crisis.

## WE OPERATE AT SCALE\*



Our operations is distinguished by the fact that 75 percent of our workforce are on the front lines of manufacturing and must perform their work onsite at our facilities. In times of heightened health risks, ensuring our people's safety and security takes on increased complexities.

We are proud our facilities have been held up by government authorities worldwide as models of COVID-19 workplace safety.





### WE SERVE MANY INDUSTRIES



**Automotive**



**Healthcare**



**Cloud**



**Communication**



**Energy**



**Industrial**



**Lifestyle**



**Consumer devices**

### FLEX OPERATES ONE OF THE WORLD'S LARGEST, MOST DIVERSIFIED SUPPLY CHAINS

**1K**

Customer supply chains we manage

**16K**

Direct suppliers

**25K**

POs executed daily

**1M**

Component SKUs

**\$20B**

Annual direct material spend

**\$500M**

Annual freight spend

**10K**

Supply chain professionals

### RESPONDING TO COVID-19 IN 2020\*

**1K**

capital equipment moved to rebalance capacities involving 80 sites

**20%**

reduction of downtime because of our predictive maintenance models

**150+**

automation projects



**5x**

infusion pumps



**10x**

diagnostic testing kits



**3x**

ICU medical beds



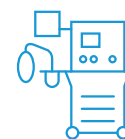
**85M**

face masks produced to protect our frontline employees, donate to our employees' families and communities, and provide to customers at cost



**4x**

patient monitors produced



**4**

ventilator programs completed

\*All stats as of March 31, 2021 unless otherwise noted

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# Legacy matters

## 51 years of operating history

Scale and performance do not materialize in months and years. It takes sustained and focused investments over time to build quality products on-time and on-budget. There's simply no replacement for the experience that has been developed over decades.

In facing a challenge like COVID-19, we capitalized on our experience as an organization that has honed its practices over half a century. Over this long period, our tools and processes have been optimized both incrementally and by leaps, all made better by the talent, customers and partners who have touched them.

Though we are a mature organization, we continue to grow and evolve as we set ever-higher standards and solve new challenges. We are helped by a foundation of legacy that enable us to respond to both opportunity and adversity.

### Q&A with François Barbier President, Global Operations and Components

François Barbier leads Flex's global operations, focusing on scaling modern manufacturing capabilities and optimizing the company's operational footprint to further drive efficiency. Since joining the company in 2001, Francois has seen Flex evolve over the last 20 years through both good and challenging times. We turn to this seasoned veteran to get his perspective on managing through a crisis.



"The pandemic was a big reset and forced us to get back to the fundamentals. COVID-19 is a humility lesson for humanity. At the end of the day, it's all about people."

François Barbier  
President, Global Operations and Components

#### How is Flex positioned to deal with crises on a global scale?

The good news is we have robust systems in place throughout our operations and they're managed by a network of people who contribute from different angles. Our specialists from site security, supply chain, employee services, IT and resilience teams are all pitching in.

You also have to know what your goal is. For us, we were always guided by one thing: how to protect our people. This set us up to understand and create the best processes to ensure the safety of our people.

#### What most surprised you about how we managed through COVID-19?

In the beginning, a lot of people expected the virus to be contained to Asia so it didn't create a lot of concerns. But we had 40,000 people we needed to keep safe in China. This means we had to quickly create robust safety protocols such as mask-wearing, temperature checks, physical distancing and factory-wide sanitation.

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We also had to procure a lot of masks especially since we were mandating mask replacements in each shift. This actually ended up positioning us well to deal with the global scope of COVID. With our protocols already established for China, we could leverage that model across the rest of the world at speed.

**You've seen a number of crises unfold over your tenure at Flex. Was there any common ground in our response?**

During my 20 years at Flex, I've dealt with two major economic crises, first with the dotcom bust, then the subprime mortgage crisis. This pandemic is much more difficult because of the human toll including the lost lives. But beyond that, I would say when we make a decision, we follow up with disciplined execution.

**What were the other key success factors in how we navigated the pandemic?**

Protecting our people was always our guiding light. So, while we could mandate people to wear masks, we also need to have secure personal protective equipment (PPE) supplies. We very quickly made the decision to make masks ourselves and once we made that decision, we moved very quickly to get our production underway.

**Any other examples?**

We also saw how quickly we moved with our tiger teams to resolve escalations. For instance, we needed to get our arms around the supply chain shocks that were happening because there were a lot of delayed reactions throughout the chain.

We shared our safety best practices with our suppliers to help them get back online and operate safely. This was greatly appreciated.

**Looking back at the COVID-19 crisis a year later, was there anything you think we could have done differently?**

Most people did not anticipate we would still be living in a pandemic a year later. So, many of us thought we would be back in the office in a few weeks or maybe months. We had some staff who found it difficult to work at home; they didn't have a monitor, or a home office. We could have made better preparations to ensure everyone was equipped to work remotely indefinitely.

**What was your biggest lesson from the pandemic?**

I like to say COVID-19 is a humility lesson for humanity. The pandemic was a big reset and forced us to get back to the fundamentals. At the end of the day, it's all about people. So being compassionate and supporting our team has never been more important.

I spend a lot of time in one-on-one meetings now, more than I've ever done. Our people made contributions to help Flex become successful, and it's our obligation to protect them. We are all in this together, delivering for the business, for our customers and together we'll look to the future – and we'll come out of this stronger.

# Levers of resilience

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Given the nature of our operations and business, resilience has always been a dominant theme in our operational playbook. The capacity to maintain our operational stance is paramount, especially when our manufacturing portfolio includes medical devices and other products that are essential to supporting critical infrastructure.

## Prioritizing safety

How Business Leaders Can Prepare for the Next Health Crisis, recently published in the Harvard Business Review, assesses business continuity readiness based on an organization's ability to keep people safe. Those organizations considered well positioned to exceed business continuity requirements are said to have achieved "immunity" and Flex was cited by the authors as having reached this state.

We employ a variety of levers to develop organizational resilience and during COVID-19, we leveraged everything in our toolbox to meet essential needs such as employee safety. Scale, resilience, and performance are not built overnight and require ongoing investment. We continue to improve our readiness strategies and capabilities as we expect more disruptive events to occur in the future.

The case studies in these pages shed light on how we used different levers to anticipate, adapt and recover in a health and humanitarian crisis that was unlike any other we've ever experienced.

Arguably, the most important success factor in navigating the pandemic was our people and culture plus our deep collaboration with all of our stakeholders which include our colleagues, customers, suppliers, and other partners.

## Resilience Levers

### People and culture

### Organization

### Strategy

### Technologies and processes

### Collaborative partnerships

- Customers
- Suppliers
- Governments
- Other partners



# Resilience lever: People and culture

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# The invisible – and incredible – hand of culture

People and culture are central to Flex’s resilience. In 2020, we launched our [Flex Forward](#) growth strategy which dovetailed with a refresh of our mission and values.

## Q&A with Revathi Advaiti, Flex CEO

In a recent conversation with Flex CEO Revathi Advaiti, we discussed the importance of culture and how it’s core to how Flex operates.



"I am a big believer in a collaborative work environment. I love coming to work and being in an environment where we have sharp debates and trust is the cornerstone of our relationships. This is how we'll make everyone feel safe about airing their ideas and make the work fun."

Revathi Advaiti  
Flex CEO

### Why is culture so important?

A strong culture will make us work better and become a great company. Flex has always been distinguished by our people and what binds us is our incredible culture.

Together we are building a culture that knits together our team of 160,000 people, our passion and talent across the world into a cohesive and high-performing organization. Our purpose is our north star and our culture is our compass.

### How does culture drive performance?

We recently launched our ways of working to recalibrate the way we work for better outcomes. We have an incredible opportunity to collaborate given our breathtaking network of experts and it’s never been easier to reach across the world and tap this network. I always encourage our team to go find people who can help you do your best work. Brainstorm with passionate teammates wherever you find them to inspire new approaches to old problems. Replicate the success you see – and perhaps do it even better!

### How do we know our culture is making a difference?

Our culture of collaboration and purpose fueled us to develop effective and engaged responses to COVID-19 challenges. We were always guided by our value of doing the right thing always. So this means taking responsibility for our people and taking care of them and being accountable to our customers.

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The superhuman feats we achieved over the pandemic were a testament to our culture and values. We earned more trust from customers, suppliers, governments and other partners as a result of our commitment to our purpose.

Because of all that we have navigated together in the past year, we have become a stronger and better team. We are more committed to each other and to our mission than ever.

**In March 2020, the Flex leadership team launched Flex Forward, our new growth strategy. Part of this strategy involved a reset of our purpose and values. Why did we take this on at the height of the pandemic?**

The transformation we envisioned necessitated a refresh of our purpose and mission through which we would anchor our decisions and actions.



The refresh helped us be purposeful about the kind of growth we want to pursue. How and where we engage in the market has to align with our core purpose, which is to make great products for our customers that create value and improve people’s lives.

It was actually the right time to relaunch our purpose and values. We support each other as we strive to find a better way. We move fast with discipline and purpose. We do the right thing always. We put people first, above all else. We showed courage; our leaders showed empathy. This was more than a health crisis; we were all hurting because of the people we lost. It was about taking care of each other as we all knew people who experienced hardships or lost family and friends.

**Do you have other advice for how we can work better together?**

I always tell our people to be wary of falling in love with a fixed way of thinking. The world is changing so fast that we must be open to new ideas. We must challenge each other, and most of all, ourselves.

I want us to break what we did yesterday and embrace the possibility of a better way. We help each other to find new solutions, and in the process, become high performers. If we all did this, it will lift the entire organization and break us away from the pack.

It’s never been easier to connect with each other and collaborate. The world is shrinking with all the tools that bring us to together. So, let’s use each other to expand our thinking and build networks and tap into them to help us innovate.

To me, culture creates the possibilities for us to be excited to come to work each day, rethink what is possible, and look forward to engaging and debating with our colleagues who inspire us.

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## Decision-making in times of uncertainty

From the moment the pandemic took root in January, it was important to get out in front with decisiveness, integrity and transparency. As the crisis extended from weeks into months with no end in sight, we came together and led each other through uncertainty and ambiguity.



### People first

At the pandemic's outset, there were varying opinions about its severity. One popular view was that COVID-19's impact would be contained to Asia broadly and China in particular. After all, the SARS outbreak, this century's first deadly infectious disease, was also caused by a then-novel coronavirus with a majority of the cases reported in Asia. By July 2003, months after the initial outbreak, SARS had been contained.

We chose not to bet on history. As we were seeing a new disease, we maintained the course to make decisions in keeping with the fact that we were in uncharted territory.

Facing the unknown, we turned our attention to what we could control. The most important was our colleagues, and this includes how to protect them and creating a safe environment for them to return to work. This set us on a path to deploy rigorous safety measures, review relevant data continuously and determine how to best ramp and operate to minimize health risks.

As the well-being of our employees remained at the forefront, we actively monitored the situation to develop appropriate responses while preparing ourselves for the prospect of a protracted shutdown and economic slowdown as the pandemic evolved. There were moments we acted in dramatic fashion, taking steps to de-risk and absorbing the costs to offset those risks. For instance, we retained physicians and epidemiologists to advise and help guide our response.

### Building trust with our team

When our frontline teams show up every day on the shop floor to produce essential goods, we owe them the assurance that we have taken every precaution to ensure their safety.

This means we must instill confidence in our teams that the recurring safety measures will occur with rigor, whether it is daily site sterilization or COVID-19 screenings that are conducted without fail at our facilities. We have made investments in taking additional precautions. For instance, we increased our transport capacities by operating additional shuttles to allow people to sit in marked seats, safely distanced from one another. We have also appointed a leader on our shuttles to ensure full compliance with our safety measures. In high density areas like cafeterias, we have erected barriers wherever possible; for instance, we put up Plexiglas shield walls help to minimize contact between food service staff and employees.



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## Leading with conviction

Resilience is a byproduct of leadership that is willing to make hard and even unpopular decisions. Tough decisions, in turn, are themselves a difficult balancing act. During COVID-19, our senior leaders engaged in their share of weighing trade-offs when making difficult calls. In these times, personal resilience of top leaders is tested and how they lead sets the tone for how the organization responds.

As the pandemic stoked economic uncertainties, our teams did their best to address customer concerns and sometimes CEO-to-CEO escalations were necessary.

For instance, a customer demanded our lines to continue operating, but we were still in the throes of implementing safety measures. This customer was later thankful we toed our line.



“Tough calls often have tradeoffs. Not every decision will be popular. However, when you trust your data and the expertise of your team, you can lead with conviction and rally the team to move forward.”

Michael Hartung  
President, Agility Solutions

## Data privacy vs public safety

To protect our frontline employees, we make every effort to identify COVID-19 risks at our facilities' entry points. Our screening practices include temperature checks and information collection that asks people whether they have traveled abroad or come into contact with people with COVID-19 infections.

In Europe, however, health data is widely considered to be personal and private. Hence, the temperature-screenings at our facility entry points went against regulations that had not yet caught up with the new realities of the pandemic.

We made a judgment call that ensuring people's safety was more important than a slight invasion of privacy rights in screening their temperatures. Later, our decision was vindicated as governments changed the regulations to allow such screenings.

As COVID-19 was raging in certain European countries in the first half of 2020, we were asking our staff where they had traveled to help us gauge whether it was safe for us to allow them entry to the premises. Based on whether they came from risk areas with high infection rates, we requested a quarantine period before they returned onsite.

We were faced with a choice between a slight potential violation of privacy rights and protecting the health and safety of our team members. If we had chosen privacy rights over safety, we would have risked the health of our team members.

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In Europe, our legal team moved fast with purpose to striking a balance between protecting public health versus protecting individuals' privacy related to their personal data (e.g., body temperatures).

With thousands of employees ready to work, we didn't want them exposed to the risks of the novel respiratory disease if we could prevent this in any way. So, we made the decision that health and safety supersedes a small sacrifice of data privacy.

Italy, which was hit hard by COVID-19 in February 2020, was the first country to raise data protection concerns. In many regions, the government issued decrees every two to three days, requiring us to shut down. In response, our team had to first read and understand these orders then explain our role in essential manufacturing. After all, our services were critical to providing infrastructure equipment to telecom, broadband and other related communications company.

Our customers which included some of the biggest names in telecom and data center operations stepped up to validate our essential role. Moreover, we had been recognized worldwide for our safety and sanitization measures to provide the safest working environment for our employees.

As other EU countries went through the same line of questioning, they began realizing the scope of COVID-19 which began taking immense health and humanitarian tolls. Within weeks, EU regulators began to change their view allowing us to operate without overhang.

**Lesson learned: Move fast with balance and conviction**

Our journey through these long weeks working with regulators and customers was an exercise in doing the right thing in a balanced way to make the right decisions. Our legal team had to move very fast in uncharted terrain with no precedent. We approached this with purpose, working collaboratively with no protracted debates to slow us down. We made ad hoc calls to each other every day for weeks on the order of five to six times a day.

With no single decision maker, we operated by checks and balances. This proved to be priceless as each of us could make hasty decisions when we act alone and are pressured to respond in a matter of hours.

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## Towards financial resilience

To prepare for the demand swings of our customers and the unknowns of the pandemic, we needed to preserve cash by making cost cuts. Meanwhile, our leaders were committed to maintaining as many jobs as possible and to continue making the necessary investments to grow our business.

To achieve a balanced approach, we implemented a combination of furloughs, reductions in discretionary spend and graduated salary cuts with those most senior in the organization absorbing higher percentage cuts. These actions were challenging but helped to minimize layoffs; moreover, they were designated as temporary measures which our leaders would evaluate in six months. Three months later in July, our austerity program was bearing fruit. In October, we restored full compensation and reinstated our incentive plans for affected employees.

## Tapping outside perspectives

Even as senior leaders are surrounded by hyper-competent people, being the captain of a large ship steering through uncharted waters can feel daunting. Sometimes it helps to tap an external community to find that leadership solidarity. In Revathi's case, she compared notes with her peers on the Business Roundtable while others such as Flex CIO Gus Shahin tapped a network they have built over the years.



“I networked routinely with other CIOs, and during COVID, I had many conversations with my peers. We share experiences and learn from one another and in times of crisis, these connections are very helpful. We all need sounding boards to gut-check and validate our approach and decision-making. I urge everyone to build a strong network outside of the walls of your organization.”

Gus Shahin, Chief Information Officer

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## Leading with compassion

The pandemic has redefined leadership and part of this reset is putting people first. As leaders everywhere gravitate towards greater understanding and patience, there are many ways to express this. Below, we shine a light on how our leaders at global and local levels are trying to nurture and support our teams.

### Pivoting towards empathy

The pandemic has reshaped what it means to go to work. Frontline workers are concerned for their safety while women, in particular, tend to take on additional roles such as caretaker and teacher. That some employees feel strained and stressed should come as no surprise.

At Flex, we are committed to supporting our employees' well-being in impactful ways. We hosted regular forums featuring experts who shared their guidance and tools designed to help people meet challenges in mental health, personal finance, stress, childcare and more.

While these webinars and other initiatives are standard across the Flex organization, others are developed and executed by our regional human resources teams who are attuned to the needs of the sites they manage and local labor regulations.

In parts of Latin America and Europe, we offered greater flexibility to our frontline workers who face challenges related to childcare and caregiving responsibilities. In doing so, we learned that we can be more flexible than we thought. In a number of countries, we offered counseling services provided by onsite psychologists.

At other sites, our HR leaders took surveys to understand how employees were feeling about their safety and explore constructive measures we can further take to help them.

"We have been guided by our value of doing the right thing always. At a time when people were worried for their health and the health of their families, what is the right thing to do? We had to tell our customers that we needed to suspend our operations in keeping with government orders and passing their audits to validate we were operating in a way that was safe for our people and our communities.

Like many of my peers, I've always been results-driven and accountable for my decisions. But the pandemic is making us rethink what performance means. We have to put compassion, kindness and empathy at the forefront because it's more important to help people get through these tough times. If we do this, all the rest will follow."

Revathi Advaiti, Flex CEO



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## Maintaining transparency

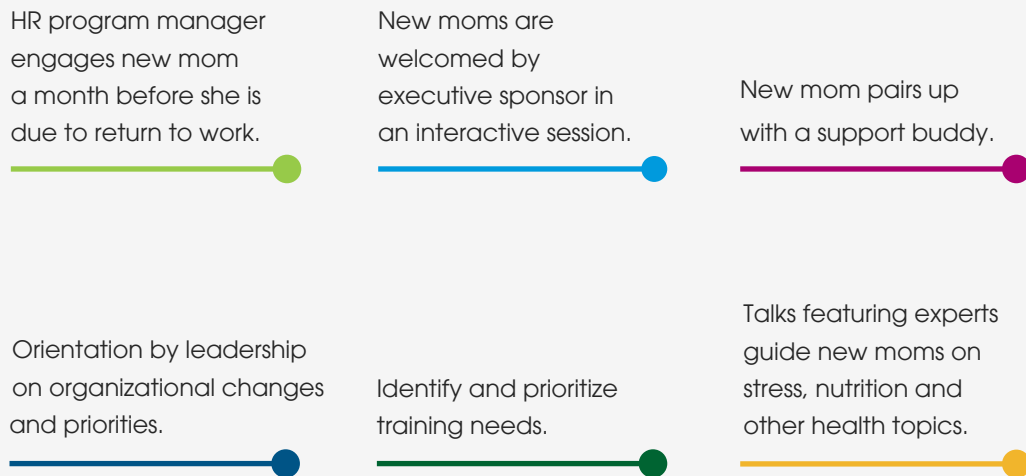
During a crisis, frequent communication is vital even if not all the key facts are known. Flex leaders shared information at a consistent cadence about our evolving knowledge of the crisis. They described how we were using this knowledge to inform strategy and next steps, including protecting our team. We encouraged managers to engage their teams and address their concerns. We also sought to share safety information about the pandemic when there was consensus on the science among the WHO, CDC and other trusted authorities.

## Staying connected

Apart from ongoing all-hands meetings and leadership presentations, we also took steps to ensure engagement at a more personal level. For instance, our regional and executive leaders connect regularly with our frontline teams speaking to them as they walk through the factory floors virtually.

We constantly strive to build community to make our vast organization feel smaller and more connected; this was acutely important for some of our team members who worked remotely.

For an example of community-building, we look to Chennai and Pune where our HR team created the “Mom’s Nest” program in April 2020 to help new mothers on the GBS team transition back to work. In launching this program, we understood that returning to work is never easy for new moms, and even more so in the middle of a pandemic. Here’s a brief overview of “Mom’s Nest”:



Throughout the three-month program, we provide a platform to refresh both soft and hard skills. For instance, we offer talks on confidence building while providing training in areas like data and analytics. As of March 31, 2021, 45 new moms had participated in this program.

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## Many faces of resilience

For being a mammoth organization, Flex has relatively little hierarchy. Being flat has its advantages: people can move fast when they don't have to ask for permission to solve problems. It lets us collaborate easily and spontaneously. In this environment, people can step up and lead others to find a solution.



### Our values in living color

In the shadows of COVID-19, we saw inspirational moments of our teams coming together acting with purpose and doing the right thing.

### Grassroots innovation

As COVID-19 gave rise to all kinds of challenges, many team members went into overdrive to solve them. An inspirational team effort of this kind occurred at one of our European sites where one team devised an ingenious way to sanitize our production environment.

A team of 10 people including automation engineers, mechanical designers and tool shop technicians sought to create a sanitization solution that could:

- Help protect employees by disinfecting exposed surfaces
- Deep clean the factory floor in hours instead of days
- Avoid the unknown long-term effects of aerosol disinfectant on circuit boards.

The solution the team landed on was a novel way to disinfect the factory floor using a combination of ultraviolet-C light (UVC) and autonomous vehicle technology. In just one week, the team had designed mounted tubes with UVC light for use in an autonomous vehicle for cleaning the factory production floor.



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Effectively, they had created a disinfecting robot complete with eight UVC light tubes. They called it the Autonomous Germicidal Vehicle (AGV). Ultraviolet-C light is known to be effective in killing bacteria and viruses including the novel coronavirus SARS-CoV-2. The AGV is only in operation when people are not present on the production floor and its use can be monitored continuously.

This self-initiated project amplifies all the Flex values: striving for improvement, moving fast with discipline and purpose, doing the right thing. Above all, it was the intense collaboration of people from different disciplines who brought their expertise to solving an urgent issue with speed and a hands-on approach.

Thanks to the ingenuity of this innovative and committed team, we have a faster, better way to disinfect the factory production floor and help protect our employees.

### Going above and beyond

Some of our teammates went many extra miles to pitch in, making personal sacrifices. For instance, handful of Flex experts in medical product line transfers traveled to the United States from Mexico at the height of COVID-19. On returning to their home countries, they quarantined alone for two weeks, away from their families.

In April 2020, Tijuana was overwhelmed by a local COVID-19 outbreak. One of our security managers volunteered to leave his home base of Guadalajara to support the site. For 14-16 hours a day, he performed contact tracing and investigated cases to mitigate the situation as much as he could.

### Developing an IT emergency response

As the shelter-in-place mandate was in place in China over February 2020, our IT team at Flex Zhuhai helped to devise ways to keep our teams safe ahead of their return to the campus.

The team developed a QR code that was shared with employees through the WeChat mobile app. This code enabled Flex to locate employees who had traveled to areas hardest hit by the pandemic during the Chinese New Year holiday. As the QR code captured this information, our HR team could report the data to the government as was required. We also modified existing employee ID cards to gather critical information required on behalf of the government to help keep workers safe.

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## Creating connections

During these challenging times, our team members rallied around each other. In Mexico, a group of people started an employee resource group (ERG) in November 2020 for working moms; this demographic has faced outsized responsibilities during the pandemic, adding unpaid work like taking care of children and elderly parents to their responsibilities.

At this writing, about 85 people in Mexico are part of this ERG and they meet once a month in support of one another.

## Supporting our communities

The Flex Foundation, our nonprofit charitable organization, has donated more than \$1 million in funding to local and global relief organizations. It has also managed the donation of more than one million masks. Beyond these efforts, Flex employees have found ways to help their communities stay resilient.

Throughout India, our teams in Bangalore, Chennai, Hyderabad, Pune and Sriperumbudur pitched in alongside NGOs. From delivering groceries to providing sanitation supplies to the police, no task was too small. All told, our relief distribution efforts that took place between April and June 2020 touched more than 4,000 people.

In the United States, the Black Flex Network (BFN) focused their efforts on communities disproportionately impacted by COVID-19. Some BFN members mentored students while others distributed hygiene kits at their local shelter. Collectively, BFN worked with the Flex Foundation to provide donations to local partners that offer food, housing, and other essential goods and services to underserved communities in Detroit, Austin, and Silicon Valley.

At Flex, 3D-printing is applied to solve a variety of challenges, from rapid prototyping to manufacturing low-volume functional parts to close the gap on parts shortages.

In March and April of 2020, multiple teams 3D-printed face shields and donated them to their local communities. For instance, colleagues at Sorocaba's Flex Institute of Technology produced and donated dozens of face shields to a local hospital; the US-based corporate innovations team did the same for a nursing home.



Flex colleague tries on a 3D-printed face shield produced by the corporate innovations team.



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## Sharing our COVID-19 safety practices

In March and April 2020, many businesses did not fully grasp the extent of the safety measures required by the government. In collaboration with our legal team, we shared our [COVID-19 Flex Resiliency Overview](#) with various regional small business communities throughout Mexico.

Additionally, the west chapter representatives of Mexico's Manufacturing Industry Association (INDEX) reached out to our Guadalajara team in April 2020. They asked to visit our facilities to capture footage to highlight the safety measures that businesses in the area should take to ensure health and safety. We opened our doors to allow filming in areas where we didn't compromise our customer's confidentiality.

## Operating outside of conventional business norms

At the height of COVID-19, we shared a common goal with our partners and customers: get products to people who urgently need them to save lives. As this became our compass, we did not always hew to convention, for instance:

We signed on to help medical companies build acute care devices. In one case, our team dived in and started the planning process before the contract was finalized as saving lives was the order of the day. In fact, the paperwork was not signed until we shipped the first units.

A medical device company working with a Flex competitor asked for our help when they experienced problems securing about 100 different parts. While our supply chain team was busy clearing backlogs, we agreed to help since these parts were required for building life-saving ventilators. Our team members went about searching for parts, identifying supply sources, sharing our documentation about possible alternatives and even looked for spares internally.

One of our customer's automotive production was bottlenecked by a supplier that was unable to access PPE. This supplier, a niche manufacturer, was a potential competitor. However, because we had a robust supply of facial masks, we were in a position to unblock our customer's production bottleneck. We decided that supporting our customers came first so we shipped the masks to this manufacturer at cost. With proper masks and other PPE in hand, they were able to resume operations and our customer could call back their frontline workers.

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# Producing face masks to protect our employees

In February 2020, the world faced a huge shortage of face masks and other PPE as governments placed export restrictions on PPEs. Given our large global contingent of frontline workers engaged in essential manufacturing, we needed a reliable supply of high-quality masks to keep employees safe that did not disrupt supplies for healthcare and other essential workers.

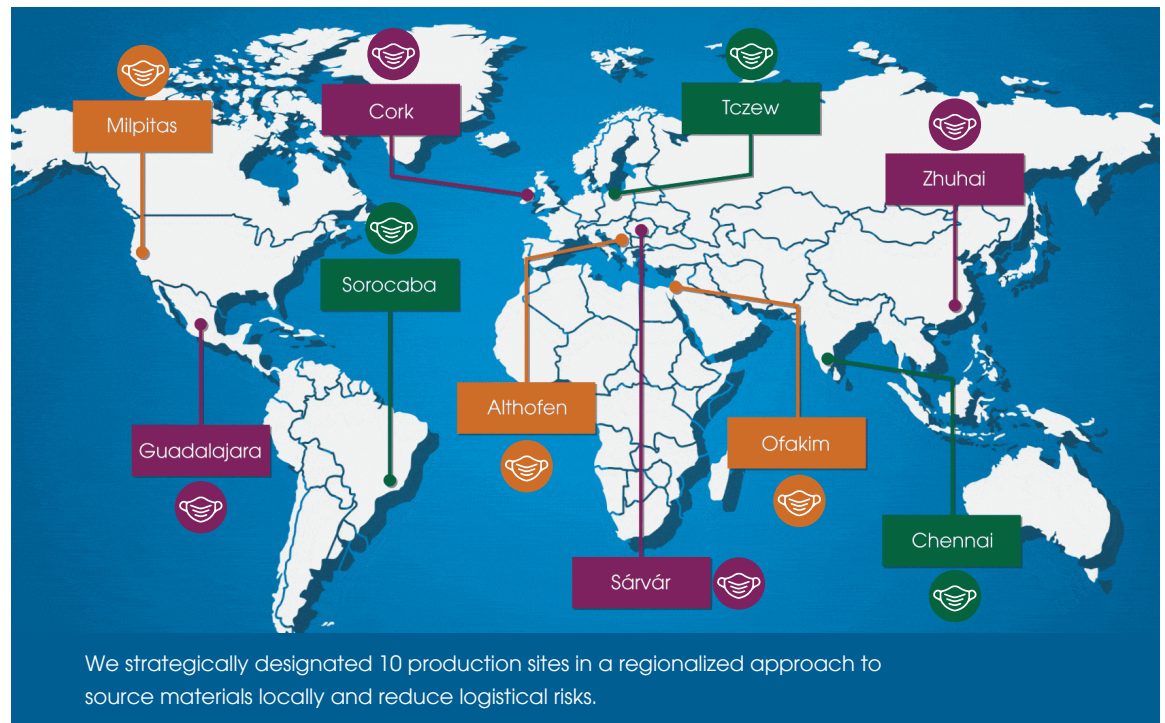
Our solution? Launch a program in March 2020 to make protective masks for our frontline team even though we had never made one in our 51-year history.

COVID-19

PPE supply constraints

PPE import and export restrictions

Reduced air capacity



**Design**  
Flex Advanced Manufacturing Engineering designed our masks using materials that meet the standards for EN14683 testing and biocompatibility ISO10993.

**Supply chain**  
The capital equipment and indirect procurement teams quickly identified, qualified and onboarded non-traditional players in a challenging market. The high-quality materials helped to ensure successful ramping.

**Manufacturing**  
As we had never made masks, the production teams experienced a steep learning curve. The Zhuhai team was the first to produce masks since the production machinery and materials

were sourced from China for our pilot runs. As everyone got up to speed, they consistently shared their learnings with each other.

**Testing**  
We put our finished masks to rigorous testing for performance and quality – the kind of third-party lab testing required for securing certifications. We sent every combination of the materials we would be using to the third-party testing labs and chose the highest-scoring combinations of materials.

**Logistics**  
Given the logistics constraints from China and reduced air capacities, we sourced creative logistics solutions to move the equipment around the world.

[Go behind the scenes in our movie: The Story Behind the Mask >>](#)

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## A race to the finish line: Our mask-making timeline versus normal cycles



### A team effort



**85M**

Masks produced

**19M**

Masks donated to employees' families and local communities and provided to Flex customers at cost

**160k**

No. of our employees receiving Flex-donated masks

\*All stats as of March 31, 2021

### Success factors

- Intense collaboration and knowledge sharing
- Creativity and ingenuity
- Dedication and fast footwork, united by purpose to keep our frontline teams safe

We continue to make improvements such as updating our fabric and adopting new techniques for greater efficiency. The teams still compare notes on best practices including how to optimize material cost, headcount and tooling.

“Even though we’ve never made a single mask in our 51-year history, we made the decision to make our own masks to mitigate the risks of PPE shortages. Our size and scale put us in a position to succeed and to pull critical resources together quickly. Not many businesses can size up, secure and configure the physical space and train the manpower required to turbocharge PPE production.”

Paul Baldassari, EVP



MLA for outstanding achievement in Collaborative Innovation.



# Resilience lever: Organization

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Perspectives and case studies

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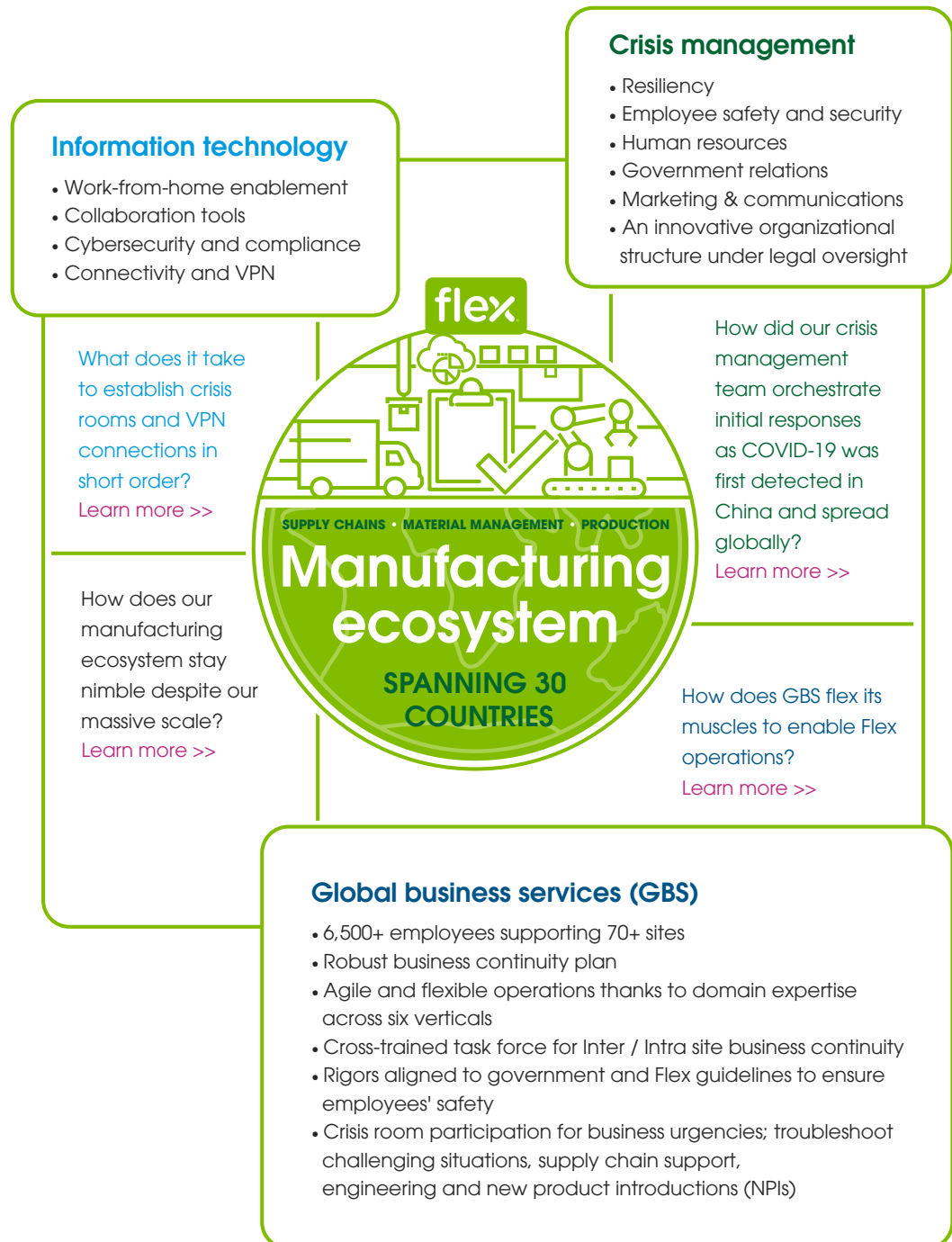
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# A robust operating model

## Organized for opportunities and challenges

Flex is organized to respond to both opportunities and disruptions and resilience is built into our operating model. We organize ourselves to:

- Drive speed and flexibility
- Adopt standards – whether deploying new technologies or standardizing processes
- Leverage programs and processes designed to produce disciplined and consistent execution
- Collaborate with each other and with partners
- Continuously improve processes and solutions

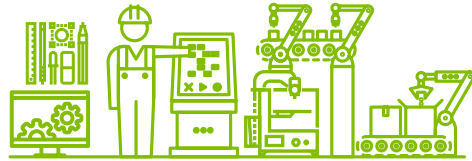


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# A resilient manufacturing ecosystem

Flex operates one of the most sophisticated manufacturing ecosystems in the world. Built on a foundation of best-in-class tools and processes fine-tuned over decades of innovation, our operations span more than 100 facilities in 30 respective countries.

Across this vast ecosystem – from supply chain to last-mile delivery – our operational framework embraces responsive and resilient risk management capabilities while our teams use innovative techniques and tools to stay agile and flexible.



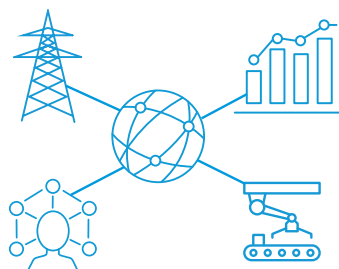
## Regional expertise and nimble factories

While Flex’s executive leadership team provides strategic direction, our regional teams are well-tuned to adapt to dynamic conditions in their respective markets.

At the site level, we configure our manufacturing floors and production lines to enable adaptable, nimble factories with wide-ranging capabilities including:

- High-mix products from the lowest volumes to full-scale manufacturing
- Extensive experience ramping large-scale, high complexity programs
- Optimized backend processes for specific products
- Flexible production lines that allow for fast changes in product mix

We demonstrated this capability in working with our government and commercial partners to produce ventilators to support the COVID-19 response. In just weeks, we ramped up seven production lines and delivered mass volumes at a record pace thanks to our talented employees, experience and agile operations.

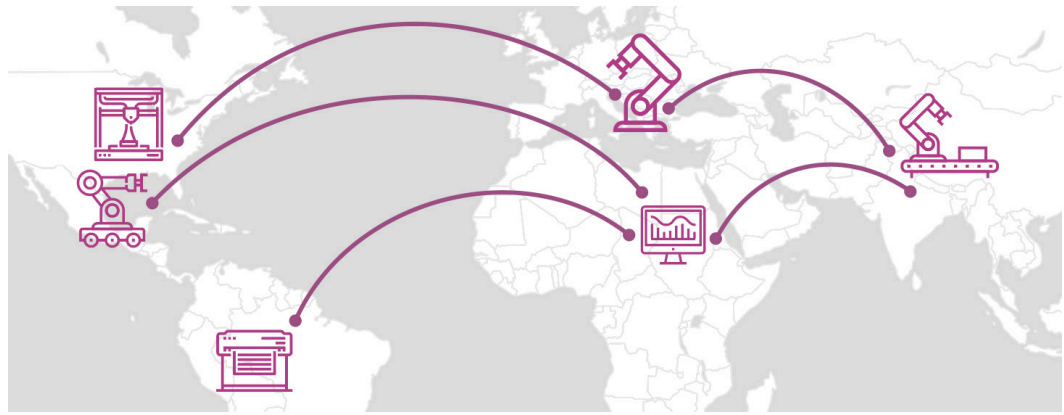


## Lean, mean, digitized and automated

We use proven tools and processes to deliver for our customers. As digitization and automation are transforming manufacturing and bringing new opportunities to the value chain, we are investing in more supporting tools to bring the benefits of efficiency, collaboration, visibility and transparency into our operations.

We use Flex Lean methodology to improve our sites’ performance, reinforced by ongoing Lean Six Sigma workshops to continuously improve the results and share best practices. In our current world of remote work, we continued to catalogue our best practices and data in the cloud.

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## The right tooling at the right place, right time

Just as our supply chain and manufacturing techniques are unique, our asset management methods are also in a class of their own. We utilized our scale and resources to invest in specialized capital equipment so we could quickly respond to the healthcare crisis; we ramped products in months that would typically take months and even years.

In any normal year, we transfer production equipment between our sites. This is just part and parcel of our asset utilization program to rebalance capacities and ensure full optimization. In 2020, we moved a record volume of equipment in response to our production requirements arising from the COVID-19 impact. From engaging sheer manpower for moving heavy equipment to managing the logistics of quickly moving around heavy equipment at a time when transport capacities were constrained took armies of dedicated people working around the clock.

## Fulfilment and logistics



Our regionalized organization positions us to support our customers through value-added fulfilment, logistics, repair, refurbishment and recycling services. Offered through Flex Global Services & Solutions (GSS), these aftermarket services help our customers manage how their products navigate the world. Through our logistical solutions, we can provide the experience of a resilient, end-to-end supply chain solution that delivers visibility and transparency, predictive capabilities and adaptability in a complex, volatile globalized environment.

During the pandemic, we helped many customers supply products needed in the shift to remote work, fulfilling and shipping massive volumes of electronics for the home office including mobile devices, computer keyboards and coffee makers. In 2020, we set up a complete end-to-end postponement supply chain for one of our largest electronics customers, enabling rapid movement of inventory across the globe and reacting faster to end-user demands in a fast-changing global environment.

As people shopped online during the pandemic, this exponentially raised the volume of our business-to-consumer shipments by as much as three times normalized volumes. Learn how our team in an area of Italy hit hard by COVID-19 infections rose to provide logistical support to one of our top customers. [Learn more >>](#)

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# Supply chain resilience

## De-risking supply chains: A C-suite agenda item

The pandemic has unleashed one of the biggest supply chain shocks since economies globalized decades ago. In the process, COVID-19 exposed the vulnerabilities of a global supply chain. Learn how Flex addresses today's supply chain risks.

[Read Flex CPO Lynn Torrel's resilient supply chain series. Read more on flex.com >>](#)

[How did our tiger teams meet COVID-induced supply chain challenges? >>](#)

[How does Flex Pulse® build our supply chain resilience? >>](#)

[Learn how we navigated the global logistical logjam. >>](#)

## COVID-19 exposed supply chain vulnerabilities and challenges



### Single points of weakness

Critical products relying on single sources of supply and/or assembly



### Geographic over-concentration

Dependency on specific countries for scarce commodities and talent



### Poor visibility into 2nd/3rd tier supply

...and wide variance in their capabilities and financial strength



### Inflexibility to demand surges

Months of lead time for urgently needed products like medical equipment



### Unprecedented government involvement

Patchwork of local / national responses...lasting regulatory changes are likely



"The pandemic accelerated many customers thinking about regionalization that initially started over a year ago due to trade policies. Companies are actively exploring the idea of de-risking manufacturing and producing products closer to their customers. Regionalization can enable simplification and possible critical time-to-market advantages. We have learned that the pandemic has amplified risk aversion and the need to create multiple areas of presence. At Flex, over the last year we've worked closely with several customers on risk mitigation through regionalization across many programs. The scale of our operations in so many geographies with a full suite of services allowed for greater supply chain resiliency."

Michael Hartung, President, Agility Solutions



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## Flex's approach to supply chain resilience

Flex manages one of the most complex supply chains in the world with more than 16,000 direct suppliers and one million SKUs. Our global footprint positions us to help our customers develop resilient supply chains anywhere in the world. Below, we outline some of our tools to proactively drive resilience in our supply chain.



### Visibility

#### Flex Pulse®

Cloud-based platform Real-time visibility down to part number by customer

#### Cross-Industry Insight

Scale across multiple industries – We see trends ahead of the market

#### Foresight

Dedicated market intelligence teams, what-if scenario modeling



### Execution

#### Automation

MRP and ERP purpose-built for Flex needs

#### Planning (S&OP)

Robust processes optimized for time to market – tested and honed by past crises

- Component shortage escalations
- Inventory redistribution
- Alternative supplier identification
- Premium freight expedite
- Clear-to-Build Impact Analysis



### Experience

#### 24/7 Team

Truly global workforce – 100 percent equipped for remote work

#### Relationships

Decades of experience and privileged relationships with customers and suppliers

#### Culture

Move fast with discipline and purpose

## Optimized for speed, while being proactive + responsive to external risks:

#### Unforeseen impacts

- Natural disasters
- Climate change
- Epidemic/pandemic
- Infrastructure failures

#### Macroeconomic

- Economic shocks
- Geopolitical tension
- Tariffs
- Border restrictions
- Regulatory changes

#### Compliance

- Terrorism
- Cybersecurity
- Corruption & illicit trade
- Theft, including IP theft
- Counterfeit
- Fraud

#### Supply chain risks

- Fragile supplier
- End of life parts
- Disruptive technologies
- Labor unions

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# Mobilizing vast resources to quickly mitigate supply chain risks

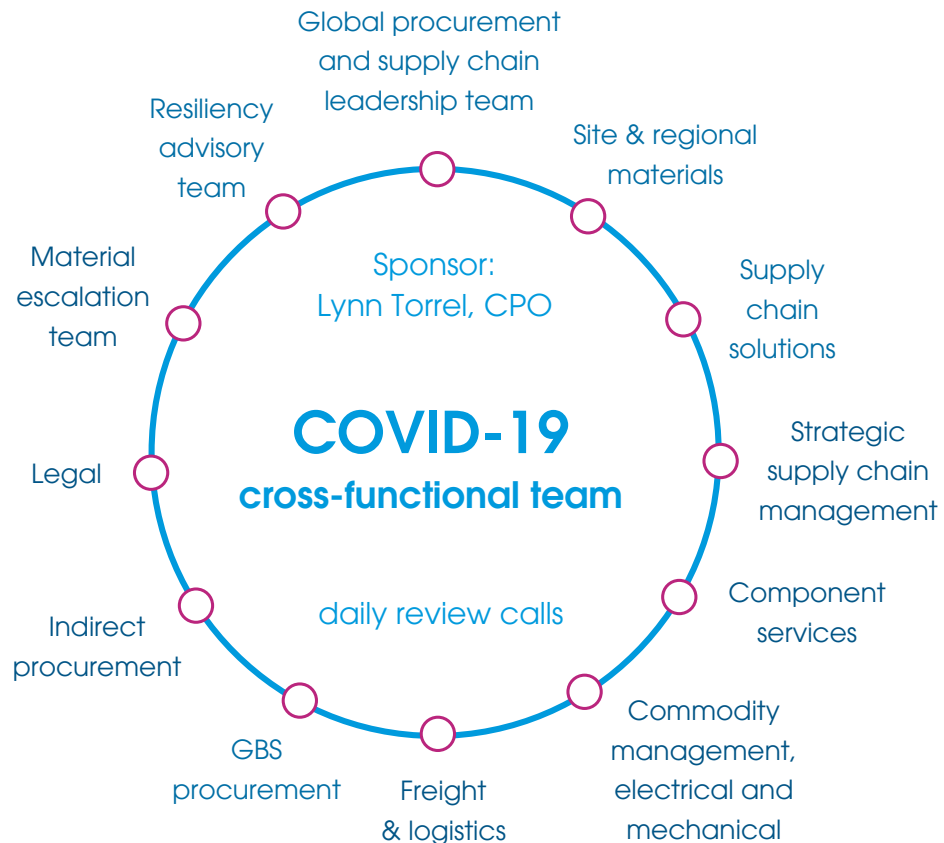
Managing a supply chain that serves large customers across diverse industries is complex even in normal times; in the chaos of an unparalleled crisis, our strategy and capabilities were tested. One of our immediate priorities was to evaluate our operating environment, then understand our customers’ demand against our suppliers’ capacity to align. We mobilized cross-functional and tiger teams to support this effort, drawing specialists from our global organization.

## Cross-functional orchestration

In January 2020, no one could predict the scope of the pandemic first observed in China, but we knew our business would be impacted as many of our suppliers and logistics operations are based there.

To optimize decision making, we immediately assembled a cross-functional task force to aggregate input and build the broadest view of what was happening at global, regional and local levels. The task force met every day for months. The daily rigors of the calls focused us to continuously gather and share information from customers, suppliers, partners in government and news reports to enable decision-making.

To supplement this information, we culled data from our systems, including Flex Pulse®, our digitized supply chain ecosystem.



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### Actions taken

- Established 24/7 supply chain tiger teams: Direct, Indirect, Freight and Logistics
- Managing customer demand and safety stock requirements
- Tiger teams on purchase order reconfirmation
- Working on clear to build (CTB) improvement for all regions and customers
- Flex shortage escalation tool and process to manage critical parts
- Reconfirmed lead times with suppliers
- Executive engagement with specific suppliers

### Making spot decisions

During one of our calls, we discussed how potential border closures in Europe could delay the movement of our goods. In the moment, we decided to move our PPE supplies out of our warehouse in Hungary and distribute them across our European sites before the borders closed.

## COVID-19 supply chain task force roles and responsibilities

#### GPSC LEADERSHIP TEAM

Daily review and direction and executive update

#### RESILIENCY ADVISORY TEAM

Alignment and direction

#### MATERIALS ESCALATION TEAM

Flex escalation tool (online storage tracker), fast track process with extra headcount

#### LEGAL

Legal advice

#### INDIRECT PROCUREMENT

Critical commodities risk assessment, open PO confirmation follow-up, sourcing of surgical masks and other personal protection equipment

#### GBS PROCUREMENT

Supplier letters follow-up, daily critical parts and shortage follow-up, allocation flagging, alternate sourcing, PO re-confirmation

#### FREIGHT and LOGISTICS

Alternative routes, priorities, hand carries, customs clearance, logistics strategy, follow-up with main transportation providers, capacity and cost management

#### COMMODITY MANAGEMENT

**DIRECT and INDIRECT**  
Supplier communication and escalations

#### COMPONENT SERVICES

Supply continuity

#### STRATEGIC SUPPLY CHAIN MANAGEMENT

Customer alignment and communication

#### SUPPLY CHAIN SOLUTIONS

Systems support (EDI confirmations)  
Flex Pulse dashboards

#### SITE and REGIONAL MATERIALS

Supplier follow-up, daily critical parts and shortage follow-up, load adjustment, CTB, MRP, confirmation dates collection

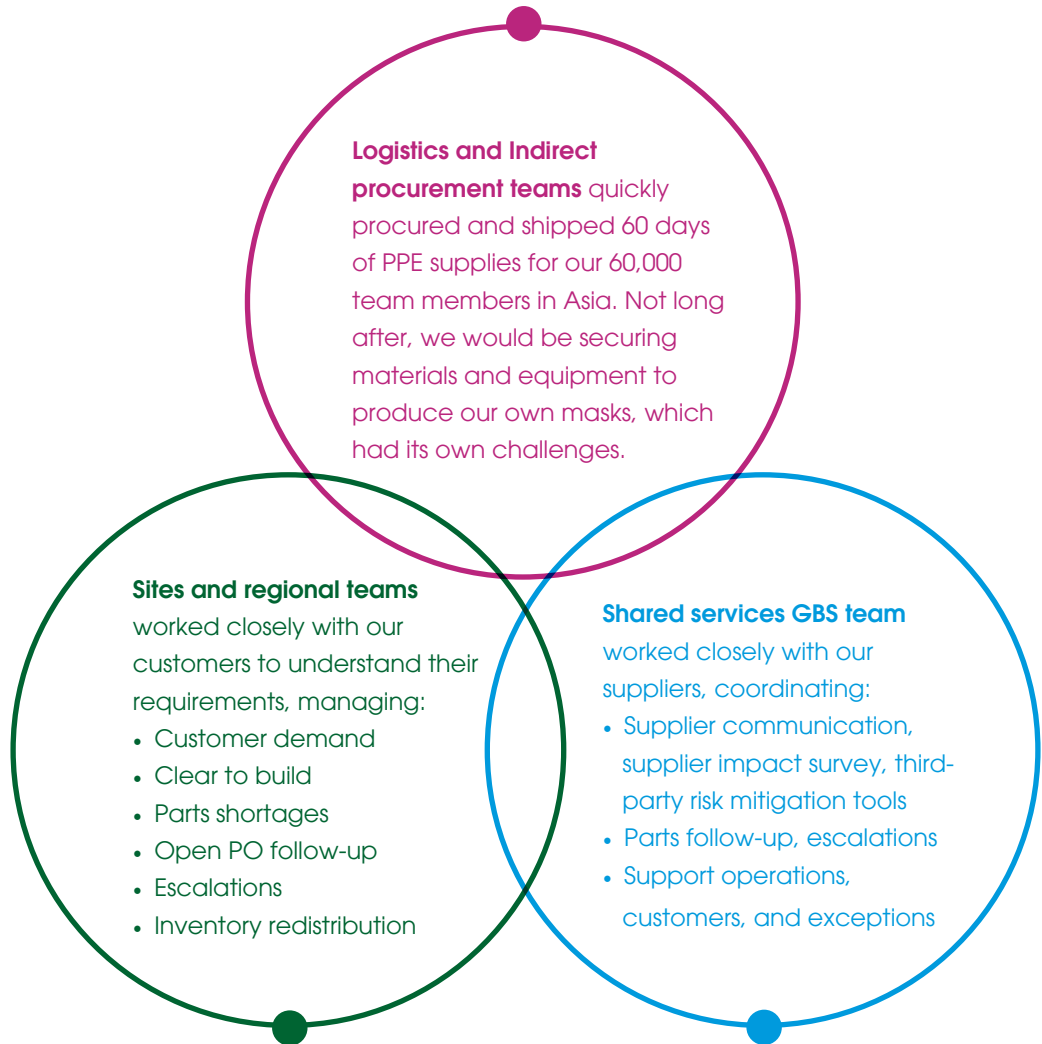
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## Assembling tiger teams

Specialized tiger teams also sprung into action involving thousands of supply chain professionals. Each day, the teams managed unique problems and reported on their progress and escalations.

Learn more about how our logistics team met the challenges of moving goods as flights were grounded.



As some of our customers saw dramatic swings in demand, we worked with them to validate their forecasts so as to not over-order inventory in a constrained market. Many of our suppliers, after all, had suspended their operations and reduced capacities.

Shared services GBS team worked closely with our suppliers to mitigate our supply chain risks.

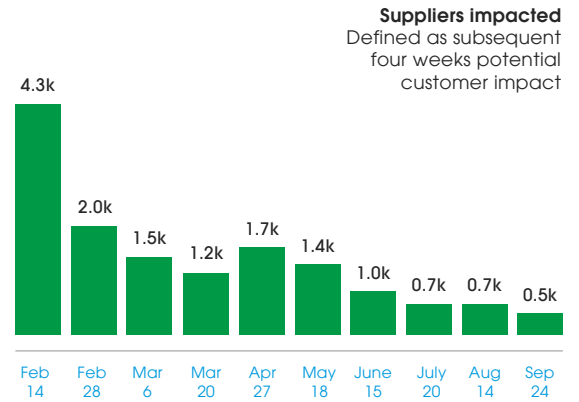
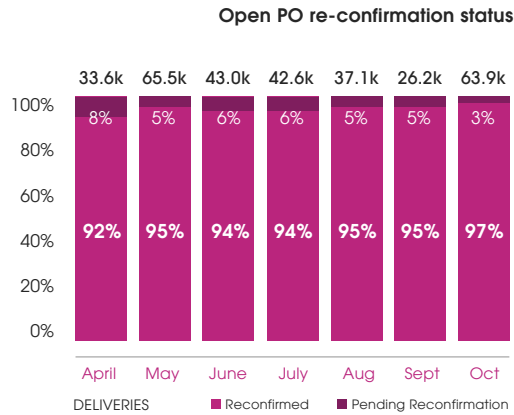
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## Tiger teams monitoring supply base and closing shortages

We requested 10,000 country-of-origin China suppliers to reconfirm our open purchase orders and asked for their assessment of the pandemic’s potential impact on their business and their risk mitigation plans.

We tracked every supplier whose constraints could impact our customers' revenue in the subsequent four weeks.



## Allocation flags

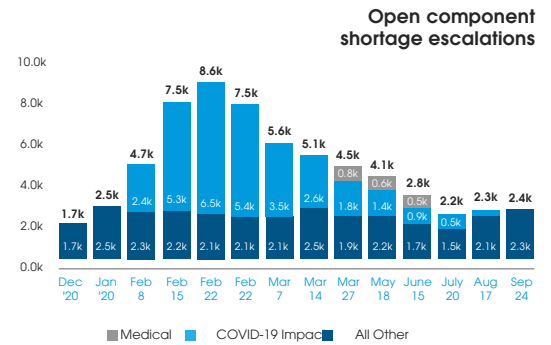
Not long after China went into lockdown:

We began identifying every component with a country-of-origin from China. We needed to revisit each of these confirmed or future orders from our Chinese supply base as some customers experienced demand spikes while others experienced dips.

We then put a flag in our system to freeze the current order status of each part, ensuring no open orders were pushed or cancelled. We set out to contact 10,000 suppliers to reconfirm our open purchase orders so we could see where we may have gaps. We did not have emergency contacts for our entire supplier base so we worked to gather this information. Within a week, we updated our SRM tool with every suppliers’ emergency contact information.

The allocation flag protocol became part of our playbook for how we came to manage our suppliers in other countries as one after another entered lockdown.

Our IT team opened crisis rooms to help us tackle shortages that escalated quickly in February. [Learn more >>](#)



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## Success factors

- Focused decision-making based on data, experience and collaboration.
- Our daily discussions also proved critical as everyone weighed in, giving confidence to our decisions.
- Our process focused on protecting our employees, offsetting the supply chain impact and allocating our resources to help produce essential products and services.
- Our access and visibility into fresh intelligence, from the data visualizations provided by Flex Pulse® dashboards and our teams on the ground immensely helped our decision-making.
- We could deploy the vast resources of not only our supply chain organization but also other teams. As a result, we could accomplish priority tasks in short order: Communicate with 10,000 suppliers to reconfirm, expedite or cancel orders, source PPE equipment and materials, and get ahead of other challenges we were facing.
- Strong relationships with our strategic suppliers enabled us to access allocations to scarce parts and materials.

Our global footprint and agile delivery model boost flexibility and performance, enabling us to be hyper responsive to our customers' needs. An example of our operational agility was our response to a specific COVID-19-induced supply chain challenge. Our customer's supply chain was disrupted due to an abrupt closure of one of our European fulfillment centers in a region with a high level of COVID-19 infections. As part of our continuity plan, we immediately shifted this fulfillment operation to an alternative center within our European network and resumed fulfilling orders within 24 hours.



“We had to move with speed in a situation that was complex and changing hourly and daily. There were many consequential changes taking place in very short time windows. Every decision we make would have implications for our business. We wanted to make intelligent decisions with the information we had but we were working with imperfect information. This made it critically important for us to discuss, debate and decide. I needed to hear everyone’s voice.”

Lynn Torrel  
Flex Chief Procurement and Supply Chain Officer

### INNOVATION STRATEGIES

## Enduring lessons from the COVID-19 pandemic

By Yossi Sheffi



A company's recovery from the COVID-19 pandemic, more attention is being paid to the lessons learned from the global crisis. The MIT Center for Transportation & Logistics asked two leaders, Lynn Torrel, the chief procurement officer and supply chain officer at Flex, and Elisha Wheeler, the chief operating officer at New Balance, to share their pandemic experiences. The executives shared much about managing supply chains in extreme adversity, and how such a crisis requires companies to be innovative.

Yossi Sheffi is director of the MIT Center for Transportation & Logistics, and the Elisha Gray II Professor of Engineering Systems, MIT. [View his bio.](#)

#### Common lessons

Flex helps enterprises to design and build products, and as such, operates in a business-to-business environment. New Balance is a manufacturer of athletic footwear and fitness apparel, and hence, is a consumer-facing enterprise. These differences give rise to different perspectives on the pandemic, yet the lessons learned by Torrel and Wheeler should resonate with most companies.

**Speeding up digitalization.** The digitalization of supply chains was underway before the coronavirus era, but in late 2019, the pandemic

this evolutionary track. An example, says Torrel, is the need to enhance the information on the status and financial health of supplier companies. Achieving this “will require trust-party partners to support us with that information” she says.

At New Balance, the crisis highlighted the importance of adopting or enhancing technologies that improve responsiveness and performance.

“It all starts with the forecast,” says Wheeler. “New Balance is investing in ERP and supply chain planning technology. Its being its demand sensing, its capture point of sale information and

Lynn Torrel shares supply chain lessons from the pandemic with Yossi Sheffi, the Elisha Gray II Professor of Engineering Systems at MIT. Click the article to read the story.

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# Managing gridlock with grit and speed

Flex team members who help us move goods around the world, whether it's parts for production or supplies for our own use, played a critical role during the pandemic. From the moment China became the epicenter of COVID-19, our logistics team have been in non-stop problem-solving mode, responding with purpose, mettle, and speed.

As China went into lockdown in February 2020, almost nothing moved. Soon after, the rest of the world began their lockdown in quick succession. Most commercial flights which provided cargo capacity in the aircraft belly were canceled, reducing air capacity drastically beyond all expectation. As the entire world was ordering and shipping PPE and later shopping online for every conceivable product, a logistical gridlock ensued. As production recovers faster than transportation networks, this logistical disruption still persists.

## Logjam in the air and on the high seas

While tight air capacities hampered the flow of goods from China to Europe and Americas, ocean transport had become increasingly challenged by the end of summer. By November, the high volume of ocean freight on the back of unprecedented demand for Asian imports began to congest North American ports, leading to delayed shipments and container shortages. In the middle of all this, COVID-19 infections rose among Southern California dock workers. All of this caused ocean freight rates to soar.

The net impact? To get anything moved from Asia, and China in particular, sometimes required patchwork solutions, creativity, constant monitoring and lots of escalations.

## Resilient approach through a centralized model

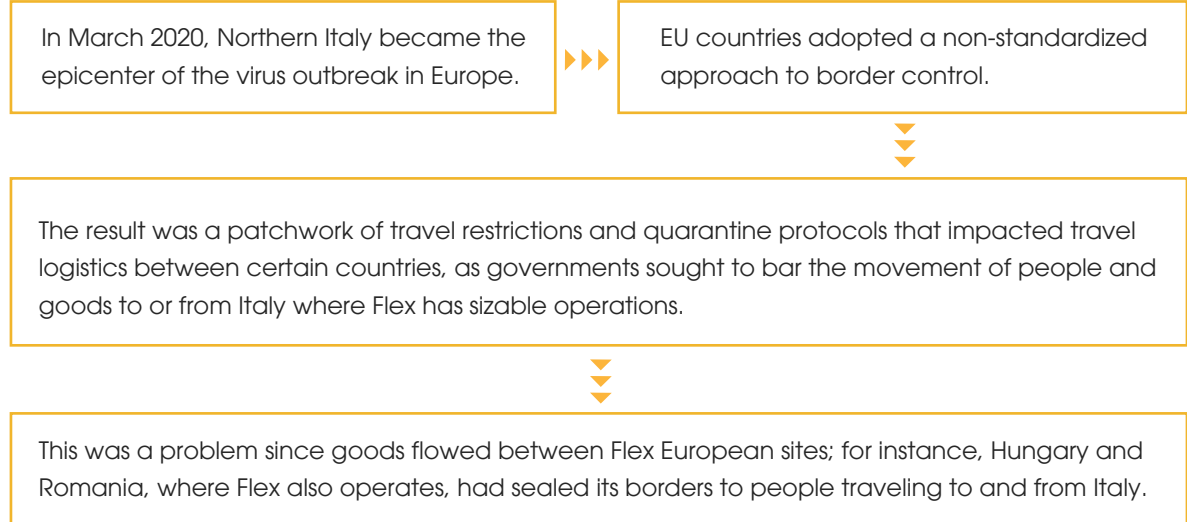
Our playbook for disruptive events calls for a centralized approach with regional coordination points to help manage capacity constraints that impact the sites in those regions.

We designed our centralized logistics network to leverage just a few highly robust, reliable global strategic transport providers. At the heart of this approach was leveraging our key vendors, never taking our eyes off the shipment activities, managing escalations and problem-solving. As we moved the operational environment to a regional command model working with a small number of vendors with global leverage, we realized these benefits:

- A central team in each region worked with site logistics leads from the production facilities to coordinate the rolling capacity requirements for the region. With this bird's-eye view of the timing and capacity needs, we were better positioned to marshal and prioritize the movement of parts primarily from Asia through the bottlenecks.
- Priority shipment processes were implemented to ensure that the secured air capacity was allocated to the most urgent shipments.
- It was necessary to closely monitor market conditions and the bellwether global air express networks to predict the air freight forwarding capacity and reliability expectations.

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## Logistical disruption



## Our solution

We immediately sourced and established temporary cross-dock hubs in countries like Austria and Slovenia.

To bring inventory from Italy to Hungary, for instance, we hired Italian drivers to deliver to a hub location in Austria where Hungarian drivers would pick up the goods and drive into Hungary. To move materials between our Romanian and Italian facilities, we set up cross dock hubs in Slovenia.

Through this intermediary point, Slovenian drivers would dispatch goods in and out of Italy while Romanian drivers did the same in and out of Romania.

We set up intermediary points in Slovenia and Austria used to move goods between Italy and European countries with border restrictions.



## Success factors

- The sustained collaboration and alignment of our teams and partners around our common goal.
- Our team’s dedication with site and regional logistics leads going the distance to micromanage priority shipments to keep production lines running. Air express networks had to be monitored continuously as their estimated transit times were often unreliable.
- Our strong relationship with reliable global logistics providers. We worked with partners with the leverage, capability and scale to navigate disruptions who could share intelligence and insights about the logistics market to help us improve planning.
- The resilience of our people in logistics and supply chain. Their stamina in dealing with challenges over months and quarters was remarkable especially considering the pressure they were under with much riding on the outcomes.



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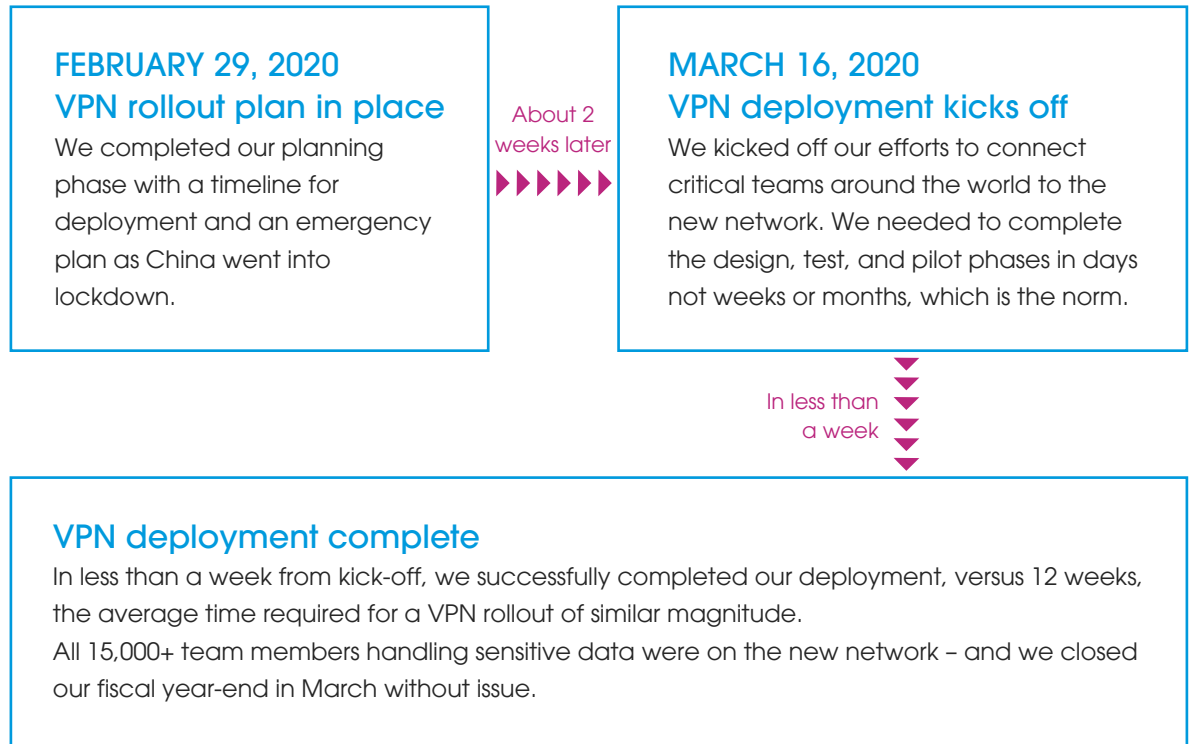
# Information Technology team moving at warp speed

## Establishing VPN connections in record time

On our IT roadmap was a plan to replace our legacy on-premise VPN with a cloud-based solution. With the pandemic risk rising in February, we needed to accelerate our VPN deployment.

As we entered March – a time when much of the world went into lockdown – we began our rapid emergency-fueled effort to migrate our critical teams to the new VPN. As businesses around the world were looking to bring their workforce into a remote work environment, it was clear our vendor was inundated with support requests. So, we doubled down on dedicated resources to help us execute and troubleshoot.

A rollout of this scale normally takes about 12 weeks; or under an accelerated timeline about four to five weeks. But we accomplished this in a record time of just six days, thanks to our speed, commitment, collaboration and vendor partnerships.



## Setting up crisis rooms for fast response

Our IT team created virtual crisis rooms to allow us to efficiently collaborate in real time.

A suite of tools and processes are integrated into a collaboration platform like Zoom and Microsoft Teams, enabling users to work together through meetings in real time and develop solutions quickly. A common set-up for crisis rooms utilizes Zoom with breakout rooms enabling teams to huddle in small groups and reconvene in a main room.

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### Addressing supply chain shortages

The supply chain team took advantage of the crisis room setup to address parts shortages that lasted about 10 weeks.

During this time, the supply chain organization partnered with cross-functional team members including Flex engineers to identify viable substitutes for parts in short supply. They also engaged finance team members to drive timely invoice payments to our suppliers. Everyone came together in the main crisis room to align on decisions and next steps.

Each day, progress was reported on canceled orders, shipments and shortages. During this escalation process, the supply chain reviewed the Flex Pulse® dashboards to help us understand the status of orders and trends in real time. Almost all critical data was stored on Microsoft Teams channel, so data is always updated in real-time and available to the broader global team.

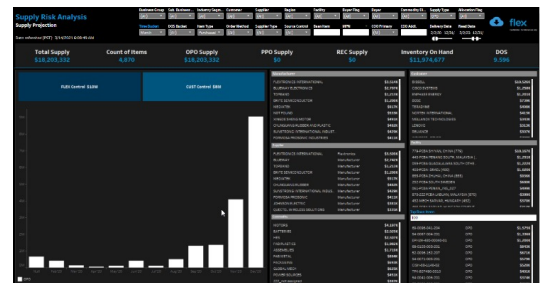
We also created a separate crisis room to help our healthcare team address medical supply chain issues.

### Dashboards built to order

The IT team also partnered with GBS and the supply chain team to build Flex Pulse® dashboards on the fly including:



PO commit dashboard



Supply risk analysis

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# IT at the forefront of innovation

## The payoffs of early adoption

At our U.S. headquarters in Silicon Valley, we are surrounded by startups developing leading edge tools and infrastructure. Our CIO, Gus Shahin, has made the most out of this unique geography of innovation. Through his leadership, we run a strategic program that enables us to tap into new technologies through a network of startups and venture capital community.

This program has helped us built a portfolio of innovative tools that are in varying stages of deployment at Flex. For example:

### oloid.ai

#### Worker safety

COVID-19 response: Flex is leveraging AI to implement contactless biometrics which use facial recognition for time clocking and access controls, reducing the risk from contact with communal surface. Additionally, we are also looking to automate temperature scanning to detect elevated body temperature using thermal cameras and computer vision to help identify workers who may present a contagion risk. We have deployed this in some regions.

Emergency exit monitoring: We are using computer vision-based object recognition AI models to identify safety hazards using regular IP cameras at all of our sites. The IP video feed is monitored for the presence of obstructions in exit paths; automated alerts help safety supervisors clear the exits in a timely and reliable manner.

## ThoughtSpot

### Return to work safely

IT and GBS are working closely to deploy Thoughtspot, a search and AI-driven analytics platform, to gain insights for COVID-19 response:

- Identify employees at highest risk of exposure to COVID-19.
- Combine this with office congestion data to maximize office space.
- Create ranking of criticality by dimensions like job functions to granularly manage office capacity and safety.

## RealityEngines.ai

Applying deep learning models into our business processes.

From cash flow to supply chain efficiency, the business case for accurate forecasts is well understood. Using Reality Engines algorithms and models, we can use historical data to help predict future demand in partnership with our customers. In testing the models using various data sets, early indicators showed improved accuracy in predicting inventory requirements, which is useful information for managing supply chain constraints.

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## Arch Systems

Collecting legacy data

We are using Arch Systems' IoT tool to extract data from new and existing machines in order to generate actionable metrics that can help us drive production efficiencies, process automation, and predictive analytics.

When the pandemic forced our corporate and back-office teams to migrate to a remote work environment, our IT team needed to ensure 40,000 people were well-equipped for productivity, connectivity and cyber-security.

We were hyper-vigilant when it came to security. As expected, COVID-19 gave rise to opportunistic cybercrimes that exploited people's fears and confusion while others targeted healthcare and other essential services.<sup>1, 2</sup> Our security was not compromised at any time, and we continue to invest in tools to mitigate cybersecurity.

We were well-prepared for work from home at scale as we have built a robust suite of productivity tools over the years. beta testing and experimenting with new applications – an approach that has served us well. In fact, we were an early adopter of Zoom, Box and Workday – all standard cloud-based tools that made our transition to work-from-home seamless.

### Sources:

1. [Exploiting a crisis: How cybercriminals behaved during the outbreak](#)
2. [Ransomware groups continue to target healthcare, critical services; here's how to reduce risk](#)

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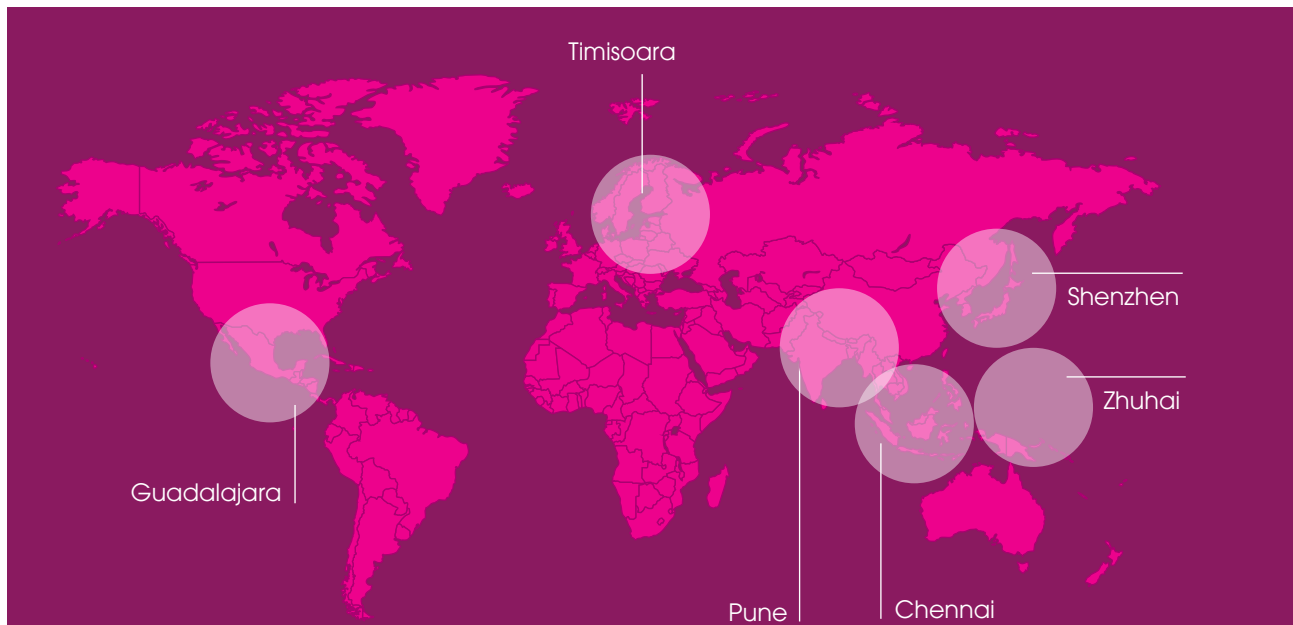
## Shared services: a study in agility

We are organized to drive speed and our shared services organization – global business services (GBS) – is the engine of our well-tuned system. They provide deep expertise across multiple domains to support the business, delivering critical services, troubleshooting, removing bottlenecks and much more. In the chaos of the pandemic, teams like IT and supply chain were stretched; with GBS as our organizational muscle, we were ready to tackle the crisis.

### GBS: 6,500+ strong

Our second largest organization by headcount after our production team, GBS forms the backbone of Flex operations. It delivers well-trained and diverse muscles to support wide-ranging functions including finance, HR, procurement, IT, engineering, program management and more. GBS resources are designed for agility, ready to be marshaled at a moment’s notice.

Shared services do not only provide muscle: a majority of our team members are trained to run cross-functional critical business processes from program management to engineering.



### Serving offense and defense

GBS provides wide-ranging critical services that enable Flex operations.

The team is everywhere we need them, with their diverse capabilities spread across both the site levels and our six GBS centers.

Because GBS has a seat within each operational team, it is well-positioned to develop the end-to-end strategy to drive cross-functional projects. Through this model, GBS is the glue that connects the different teams for optimal outcomes.

For example, GBS may oversee a process to expand the scope of a program to include design services. In this case, GBS engages finance, design, engineering, and procurement to drive the process together.

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<b>GBS PRIMARY SERVICES</b>	
Finance	Program management
Procurement & supply chain	IT
Engineering & quality	HR
<b>GBS NICHE SERVICES</b>	
Trade compliance	Arms
Records management	Real estate/
Legal	asset management

## From blocking and tackling to high-touch problem-solving

The breathtaking scope of our GBS team is a defining attribute of its high-performance.

- Supporting a wide range of services that enable resilience. For instance, GBS tackled COVID-induced supply shortages and helped to support seven new product launches at the height of COVID-19.
- GBS has well-trained manpower to deliver both standardized processes with speed (e.g., employee IT support) and bespoke processes with high touch customization (engineering change order).
- GBS handles high volumes of routine, processes. For instance, GBS handles more than 70 percent of the sourcing and procurement in any BOM with sites responsible for the balance. When it comes to indirect procurement of production inputs like labor, GBS handles 90 percent.
- GBS does it all - driving, running, enabling and fixes processes. If issues block a workstream, GBS quickly resolves the obstacles to restore operability.

## Always on: regular drills to develop muscle memory

Our GBS team conducts scheduled drills to exercise the muscles required to maintain business continuity in unusual circumstances.

Our monthly and quarterly level 1 and 2 drills ensure readiness by the backup team to support the business when a GBS center becomes non-operational.

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A few examples of how our GBS team supported our operations as we navigated the pandemic:

### Engineering support

GBS provided engineering expertise to support concurrent medical ramp across the world:

- Bill of materials setup and management for multiple medical projects including blood analyzers.
- Supported validation of the manufacturing part numbers for 1,500 parts and alternates for 30+ parts within two weeks versus a normal turnaround time of four weeks. About 50 percent of the parts were high complexity parts like integrated components and connectors.
- 3D-drawing support provided in 24 hours for 3D-printing of select medical parts
- Within five days, GBS provided a step-by-step guide containing 45 work instructions for a certain operation to be performed by line operators for our mask production. Using only videos without narration and a deck as inputs, the GBS team intuited and digested the process and developed the instructions in record time.

### Making our big company feel small

Our HR specialists in GBS continue to support a weekly outreach program that aims to check in on every single person of the 6,500-member GBS team in India and understand how Flex can help. Since the program’s inception in April 2020, the team has contacted a vast majority of the staff.

### Small victories that lead to big wins

GBS team members are ready to step in to lend a hand in a heartbeat, no matter the task. For instance, a new product launch for a critical medical device required a third-party audit of our testing equipment. We needed to download massive volumes of documentation on the order of 1,000+ files supplied by our customer on Dropbox –an unfathomable task if done manually. GBS immediately developed a script to automate the download. Since the audit was required before we could begin production, unblocking the document download hurdle was a mission-critical task.

### Never missing a beat

Maintaining business continuity was crucial as the GBS team was being counted to deliver its routine services while providing urgent support on multiple fronts including:

- Respond to an unusually dynamic supply chain environment (see page X)
- Enable seven sites to start manufacturing critical medical equipment (see sidebar)
- Close our financial books for our March fiscal year-end
- Provide our normal broad range of services

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## “Protection and promotion” deliver in times of crisis



Scott Offer,  
 Flex Executive  
 Vice President,  
 General Counsel

We were well-served in responding to the pandemic by the leadership of our Flex General Counsel Scott Offer. Besides overseeing our legal functions, Scott also looks after brand protection and security, crisis management, government relations, marketing and communications, and sustainability. This unique model has led us to affectionately brand Scott’s organization as the “Protection & Promotion” team.

This unconventional approach to consolidate these corporate functions under legal oversight was developed by Flex CEO Revathi Advaiti and Scott as they sought to integrate different viewpoints for greater synergy, collaboration and efficiency. This model enabled seamless teamwork, improving the delivery of relevant services to our employees, customers and partners.

### Why this organization works: seamless and speedy

Much of Flex’s critical response activities over the course of the pandemic fell under the oversight of the legal organization.

**Compliance.** As the brand protection and security (BPS) teams worked with site leaders across the world to protect people and keep factories running, it did so with the support of legal and other teams. This cross-functional collaboration ensured real-time compliance with lockdown orders in a dynamic, evolving environment.

**Government audits and approvals for resuming operations.** Our legal and government relations teams worked with regulators to build trust in our safety deployments. These teams also worked with our customers to document Flex’s participation in the manufacturing of essential goods like medical devices and communications products. These activities ultimately were critical to business continuity.

Flex government relations led the way on policy issues to global governments and nonprofits, including Mexico’s ambassador to the U.S. and the Business Roundtable, a nonprofit association for CEOs of the largest US-based companies.

**Sharing best practices via real-time, transparent communications.** The crisis management team (CMT) sought to communicate the effective measures deployed in China, including physical distancing, staging breaks to minimize interactions, adjusting shifts to enforce capacity limits, and modifying work areas.

CMT recruited our corporate communications team to develop company-wide resiliency guidelines and procedures, setting standards for global implementation. Our unique organization made a difference in how rapidly we could implement our safety protocols globally.



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Supported by our legal organization, corporate communications shared other timely information and messages with employees, customers, suppliers, and the media creating transparency and trust. For instance, the communications team launched internal portals that pointed employees to trusted COVID-19 information resources.

### Lending a helping hand

Flex government relations led the way on policy issues to global governments and nonprofits, including the Business Roundtable, a nonprofit association for CEOs of the largest US-based companies and Mexico’s ambassador to the United States.

Our legal team's fast footwork also enabled us to contribute to the development and practice of safety measures by third parties. As Flex became known for rigorous COVID-19 control and prevention measures taken at our sites, we were also tapped to advise other businesses on our successful methods.

The legal team also enabled the contractual framework for Flex to manufacture and donate PPEs to Flex employees and their families, as well as the community at large.

This story was the subject of [a profile in ACC Docket >>](#)



In June 2020, the Financial Times highlighted Flex General Counsel Scott Offer’s vision and pathos by naming him as one of 27 general counsel who reshaped their legal role, and by selecting Offer as one of six general counsel in the Workforce Focus category.



# Resilience lever: Strategy

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Perspectives and case studies

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# A strategic crisis response

No matter how much advance planning we do, we may never be fully prepared for the complexities of a major disruption, especially one that is unprecedented and dynamic. But having in place a crisis management strategy backed by experienced teams and robust methodology was indispensable to guiding us through our initial, immediate actions.



## Flex resiliency framework

Over the years, we have developed a resilience framework that continues to evolve with all the dimensions of our business combining three key programs:

- Crisis management
- Information technology disaster recovery
- Business continuity planning

Our worldwide crisis management team of senior leadership provides a centralized, global view of the state of Flex through a single point of strategic orchestration. These leaders are supported by regional crisis management teams (CMTs) who guide our crisis response for Flex sites and operations in specific geographies. At the site-level, we have local CMTs to execute protocols and actions. Finally, specialized teams of domain experts who focus on specific areas such as supply chains are also part of the CMT organization.

## A global approach to safety

The team oversees our [COVID-19 Global Resiliency Overview](#), a summary of safety, health and security mandates and protocols to help ensure a safe working environment at Flex sites globally. This is a living and breathing document that we update as we learn of new COVID-19 facts, sourcing the latest available science from leading institutions like the World Health Organization (WHO) and Centers for Disease Control (CDC). Additionally, Flex has retained medical experts to participate directly in designing the response protocols and protective measures being deployed to our regional CMTs worldwide.

Flex's vast global footprint and different types of facilities such as factories and offices require a framework that addresses COVID-19 eventualities with robust protocols yet provides the flexibility for sites to meet local public health requirements, government mandates and variable local severity.

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## Crisis rooms for rapid response

To form effective responses, we organized thousands of employees across the world to participate in crisis rooms set up to combat critical challenges. We addressed issues ranging from site safety to supply chain challenges to employee well-being, kicking off workstreams as teams briefed each other on progress and resolution over days and weeks.

Among our immediate actions:

- Comprehensive protocols to protect employee health and safety
- Assessing and mitigating impact on our supply base
- Close collaboration with customers to ensure business continuity and share risks
- Broad review of our cost structure
- Frequent and ongoing internal communications.

[Learn how CMT orchestrated our responses at the outset of COVID-19 >>](#)

[How did our IT team set up crisis rooms in short order? >>](#)

[How we met supply chain challenges in the aftermath of China's shutdown >>](#)

## Many dimensions of crisis preparedness

In a world that is increasingly complex and interconnected, the frequency and impact of disruptive events are poised to increase.

As we look forward, we aim to build contingency plans for many varied and extraordinary scenarios, while continuously analyzing our vulnerabilities to potential threats. At the same time, because we cannot foresee every crisis, we are continuously building our organizational resilience in every way – operationally, technologically, financially, and culturally.

### Results of our COVID-19 response\*



#### Safety

- New surgical masks for every factory employee, every day
- Zero shortages at any site of masks, gloves, thermometers and sanitizing gel
- 167 site inspections by regulators, with only 3 recommendations issued



#### Continuity

- All sites in China returning to 100% operational in March 2020
- 70%+ reduction in component shortages since February 2020 peak
- 95%+ of open purchase orders re-confirmed with suppliers

\*As of April 30, 2020

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# Essential goods production

The COVID-19 pandemic triggered many urgent needs. Chief among them was maintaining the world’s healthcare infrastructure to both respond to the pandemic and ensure that other essential healthcare needs would continue to be addressed. We made the decision to focus our resources on the production of essential goods serving needs of medical care and critical communications.

Under these circumstances, and in consultation with our customers, we decided to prioritize our resources to produce essential goods in two key areas: critical medical devices and communications infrastructure components.



## All in to save lives

As COVID-19 infections rose, the world experienced an acute shortage of critical medical goods. With demand spikes overwhelming existing capacities, additional programs needed to come online immediately to expand production.

As we sought to support our current medical equipment and device customers, we also fielded requests from dozens of medical device suppliers and manufacturers, ranging from Fortune 100 companies to small operations. We quickly vetted these potential partners in a way that would optimize output. The result?

We produced a variety of critical medical goods in record time to support the global medical response to COVID-19.

We partnered with our customers to provide medical products. [Learn more >>](#)



## Answering the call of digital economy accelerated by COVID-19

If COVID-19 happened 20 years earlier, we would be ill-prepared to carry out routine activities like online grocery shopping and Zoom meetings. In 2002, only 50,000 U.S. homes had access to fiber connectivity. Today, 46.5 million homes in the United States have access to fiber broadband.<sup>1</sup>

In 2020, the virtual world became the norm overnight. From telemedicine to distance learning, digital technology provided the remedy to maintaining our way of living. These solutions were made possible thanks to the expansion of a robust cloud infrastructure and the continued evolution of wireless communications technologies – two areas where we have long led the way.

With significant economic activity occurring virtually, our manufacturing and supply chain solutions enable today’s communications, enterprise, cloud and ecosystems - allowing our customers to keep pace with the surging global demand for bandwidth and communications.

Learn how we delivered in record time the most volume of printed circuit board assemblies for our customer of 20 years. [Read more on flex.com >>](#)

We delivered motherboards at massive scale to support a major cloud service provider. [Read more on flex.com >>](#)

Source:

<sup>1</sup> [Broadband to make key transitions In 2020](#)

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“Everything we’ve been doing to support the global healthcare response to COVID-19 has been about speed and volume with no compromise to quality. Our partners counted on us to help them deliver critical medical products to patients in need at an unprecedented pace and urgency.

We were overcoming local labor challenges, parts shortages, and supply chain issues while racing against time as the pandemic was advancing. At the end of day, Flex provided critical horsepower to get from standard volume to high volume in record time. We moved a lot of mountains to get it done and I’m proud of how our team, customers and partners came together to make it a reality.”

John Carlson  
President, Health Solutions



“COVID-19 has forced us to change the way we live and work. In this new world, critical cloud and communications infrastructure is key for us to stay connected and share information. Stable network services are needed to connect the world’s medical communities, enable e-commerce and help students learn. Flex is proud to be partnering with customers to manufacture the equipment they need to provide that infrastructure.”

Raejeanne Skillern  
President, Communications, Enterprise and Cloud

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## Meeting critical healthcare needs

As COVID-19 spread throughout the world, we joined our healthcare partners in supporting the global medical response to the pandemic. We produced record volumes of medical goods in record time on our partners' behalf. Below are some examples of our efforts achieved under extraordinary circumstances.

### Making critical tools required by frontline workers

In the early days of COVID-19, our Kallang site in Singapore ramped up production of critical care application tools:

- Hand-held blood analyzer providing healthcare practitioners with real-time, lab-quality diagnostic results within minutes, not hours.
- Nebulizer systems combining lung expansion, secretion clearance and aerosol delivery into a single therapy to help COVID-19 patients with significant mucus build-up in their lungs.

[Learn how we overcame challenges to deliver on these critical tools. Read the story on flex.com >>](#)

### Meeting the call for 5X more infusion pumps

To ease the symptoms of severely ill COVID-19 patients, healthcare providers gave them medication that is usually delivered through an infusion pump. As COVID-19 patients began to fill hospital ICUs, supplies of infusion pumps quickly depleted. Flex was challenged to make five times our standard volume. We could raise capacity by as much as 30 percent, but a 400 percent increase was more than any manufacturing line for this product could generate. Meanwhile, the supply chain disruptions presented its own set of challenges.

[Learn how our close partnership with our customer helped us conquer these challenges.](#)

[Go to flex.com for more >>](#)



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## Delivering 400 percent more beds to hospitals

Hospital beds including critical care beds were in short supply in the United States as the number of COVID-19 cases jumped in March 2020. Our customer asked to increase production of critical care beds by 5X.

[Find out how we met our customer's targets in a matter of weeks. Read more on flex.com >>](#)

## Closing CT scanner shortages

In the earliest days of the pandemic, China's healthcare workers diagnosed COVID-19 using CT scanners which were in short supply. We worked with a customer to quickly supply the printed circuit board assembly (PCBA), a key component of CT scanners. By tapping our global supply chain expertise, we accelerated the PCBA production from weeks to days.

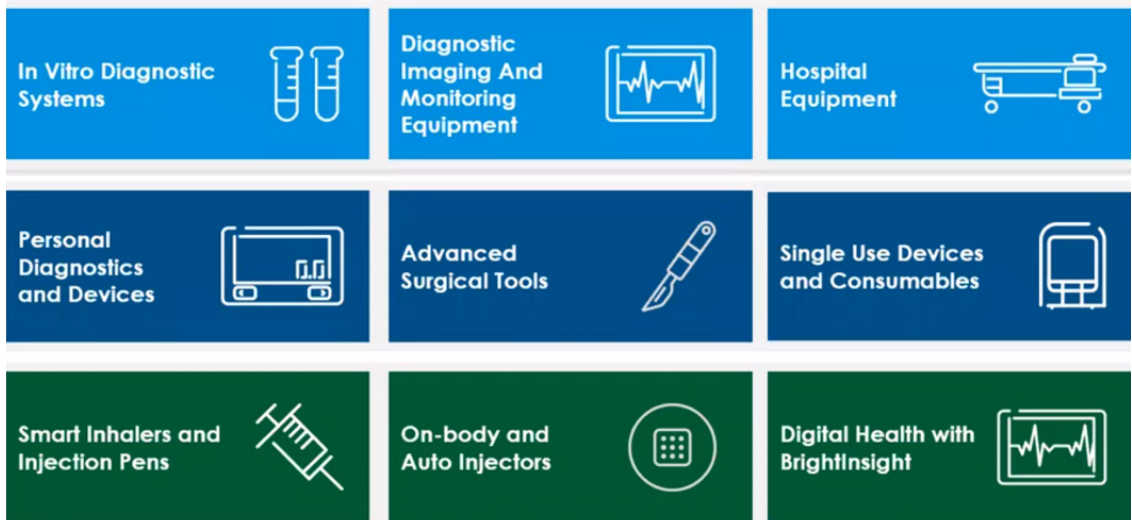
[How did we get this done? Learn more. Find out on flex.com >>](#)

## Increasing supplies of COVID-19 diagnostic tests

Real-time RT-PCR testing is an accurate method to detect COVID-19. Collected samples are then run through large, sophisticated machines, producing results in less than four hours. Within these systems are high-performance molded plastic parts. Having produced these precision plastics at our facility in Hegglingen, Switzerland for years, we were called on to produce more of these to enable growing demand for RT-PCR testing.

We engaged our sites in Connecticut, Illinois and Arizona sites to help.

[Learn more. Read the story on flex.com >>](#)



From diagnostic equipment to drug delivery devices, Flex provides a wide range of healthcare solutions made possible by a team of 20,000 people.



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# From zero ventilator to top independent ventilator producer\*

In a normal year, fewer than 80,000 ventilators are sufficient to meet the world's demand.<sup>1</sup> In 2020, this demand quadrupled due to the COVID-19 pandemic, which is primarily a respiratory infection.<sup>2</sup>

Simply speaking, a ventilator pumps oxygen to patients who have trouble breathing, one of the hallmarks of COVID-19. A ventilator is made up for hundreds of individual parts, including pumps that move the air around and various valves that control and adjust air pressure.

While doctors today are still trying to figure out when to start invasive ventilation, almost 75 percent of patients admitted to critical care were treated with oxygen using a ventilator during the first wave of the COVID-19 pandemic.<sup>3</sup> Ventilators have saved thousands of lives of patients infected with the novel coronavirus.

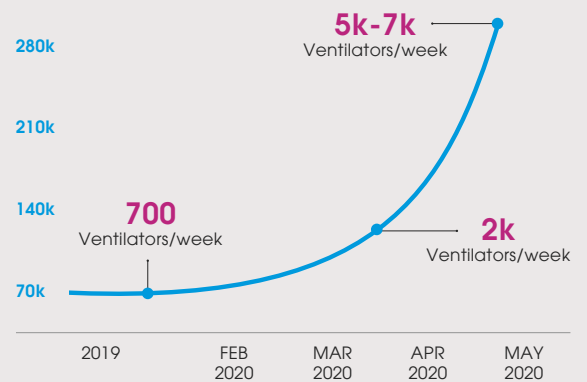
## A moral imperative

In the first quarter of 2020, the world needed medical device manufacturers to quickly supply hundreds of thousands of ventilators to save lives.

Flex had never built a single ventilator in its 51-year history but when we were asked by our customers and partners if we could help, we did not hesitate. Flex has extensive expertise in high-scale manufacturing of FDA class III medical devices and other complex medical products. We also have unparalleled purchasing power and resources to support an undertaking of the size and scope that was required.

In March 2020, we made a decision to work with a handful of customers and partners to help expand their ventilator supplies, quickly launching seven ventilator production lines in the Americas, Europe and Asia. Our timeline: 90 days from contract signing to products being used by patients. This schedule is a dramatic departure from the typical 12 to 24 months required to transfer a production line from one producer to another.

### U.S. ventilator production growth<sup>1</sup>



While we have a long history of manufacturing complex medical devices, we had yet to produce a single ventilator until the pandemic. To boot, parts shortages were plaguing producers everywhere.

Nonetheless, we quickly launched seven ventilator production lines for four global medical suppliers, going from contract signing to delivering functioning units within record times of 90 days or less.

#### Sources:

- \* [The US Strategic National Stockpile Ventilators in Coronavirus Disease 2019, Chest Journal](#)
- 1. [COVID-19: A better answer to the ventilator shortage](#)
- 2. [Ventilator market set to return to pre-pandemic levels in 2021](#)
- 3. [Covid-19: When to start invasive ventilation is "the million dollar question"](#)

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## Collaboration and creativity unhinged

To meet our commitments, we needed to not only collaborate relentlessly within Flex, but also leverage our customers' strengths to the Nth degree.

Within Flex, we looked for extra hands outside of our healthcare organization. Since automotive demand was in a lull, we deployed 75 sourcing specialists from our automotive team to secure parts required to make ventilators at a time when there were shortages for thousands of medical components.

With supply chains stretched, we needed to get creative to source key parts. The sophisticated valve and pump systems are the ventilators' critical components and often the source of supply chain bottlenecks. For some customers, we deconstructed the valve and pump systems into sub-components that we could source and then assemble.

Other customers chose to focus their resources to deliver these critical components and tasked us with rounding up more standard components. In all cases, our collaborative solutions to unblock supply chain constraints always combined the capabilities of Flex, our customers and our sub-tier suppliers. As John Carlson President, Flex Healthcare Solutions points out: "Innovation does not have to be a massive disruption. It can be small victories that put us on the path to the big win."

## Product transfers in the new normal

In normal times, we would travel to our partner's production site to get the production transfer underway. With travel restrictions in place, we had to rely on digital solutions to get this done. One customer walked their assembly line using an augmented reality system to capture each required step in the manufacturing process. We then used images from the augmented reality system to replicate our customer's manufacturing process at our facility. Working 24/7, we converted our automotive parts warehouses into a medical products factory in a matter of weeks. This accelerated development of the production line was replicated across six additional production sites, with a global team collaborating and standardizing processes to ensure that all sites were producing life-saving ventilators as soon as possible.

## Setting records in ventilator production

We partnered with a ventilator manufacturer to augment their ventilator production.

We participated in a task force formed by Brazil's government, joining other global companies to help expand the country's ventilator production. The first patient-ready ventilator shipped from our Sorocaba facility just six weeks after we signed a contract with the Brazilian government.

[Learn more >>](#)

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Since April 2020, Flex has produced more than 50,000 ventilators, making us the largest independent producer of ventilators in the world<sup>1</sup> – all from a company that had never produced a ventilator before the pandemic started. While ventilator production has slowed down in recent months due to decreased demand, Flex has created an infrastructure that can scale to meet unexpected product demand surges.

## Success factors

### At kickoff:

- We measured each project's complexity to identify potential failure points. Since our resources were limited, we allocate dedicated teams to these potential problem areas.
- We developed a team mindset to align on
- Tone of the project: patients are waiting
- Compliance as the minimum requirement, ensuring we never lose sight of quality
- Intense collaboration
- Leverage our knowledge from products we have built with similar technologies
- Every issue will be fixed in real time
- Prioritizing resources: the right team with the right people is key but equally critical is to identify their backup

### Approach:

- Shift from serial to parallel activities. It won't work for every single activity but there are many that can work. For instance, we validated multiple types of equipment in a single Installation Qualification (IQ) protocol.
- Take unconstrained view and weigh every risk. We constantly assessed benefit to risk. For instance, if one equipment failed validation, you would have to restart the entire validation process. The right team is going to take both conservative steps and calculated risks.
- With lots of people working simultaneously, we met hourly or daily to follow up in small teams. Meeting with dozens of people is ineffective.
- Productivity all the time. While waiting for the materials to arrive, teams were getting to know the product they were building and taking them apart to help them know the unit intimately.



The Manufacturing Leadership Council recognized Flex for our ventilator production effort.

## Lessons learned

The ventilator project gave Flex an opportunity to test its limits. When the challenge came up, our leaders understood that we had the people with the right expertise and processes in place to deliver products far more quickly than it ever had. The team, from C-level executives to our employees on factory floors, now have an updated playbook to mobilize immediately to meet pressing challenges. At the same time, Flex was able to improve already-strong customer relationships by demonstrating the ability to work nimbly, quickly and efficiently with unprecedented speed to deliver life-saving equipment.

### Flex ventilator production in numbers

**50k+** ventilators since  
April 2020

We are the world's top independent ventilator manufacturer

**25k** produced in  
two months

In line with the production volumes in an average year.

**1k** produced in  
30 days

Sorocaba, Brazil site

#### Source:

**1 The US Strategic National Stockpile Ventilators in Coronavirus Disease 2019, Chest Journal**

# Eye of the storm: managing early hotspots

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**5 Jan**

World Health Organization (WHO) shares details about pneumonia cases of unknown cause.

**11 Jan**

China reports first known death linked to the novel coronavirus after Wuhan government confirms dozens of pneumonia cases of unknown cause at the end of 2019.

**13 Jan**

Flex Global Resiliency Program office and regional crisis management teams (CMTs) mobilized. CEO-led meetings kick off with leadership and resiliency teams.

China CMT with support from shared services and other teams achieves key milestones within hours and days including developing safety measures that would lay the foundation of Flex's COVID-19 response. Team oversees quarantine of 4,500+ staff returning from CNY.

With the foundations in place, what did we achieve in China in the subsequent days and weeks?

[Learn more >>](#)

**22 Jan**

WHO forms committee to assess potential scope of pandemic outbreak with no clear consensus <sup>1</sup>

**23 Jan**

Wuhan enters lockdown, joined by more than a dozen Chinese cities days later.

**24 Jan**

On eve of Chinese New Year (CNY), massive human migration begins as people travel to their hometowns to be with family.

### Source:

<sup>1</sup> [WHO forms committee to assess potential scope of pandemic outbreak with no clear consensus](#)

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**27 Jan**

Daily Flex CEO briefings initiate as task forces and crisis rooms formed for health and safety, customer focus, supply chain and logistics.

**30 Jan**

WHO declares global public health emergency.

**19 Feb**

WHO calls disease caused by novel coronavirus “COVID-19”.

**21 Feb**

COVID-19 cases surge in Italy; lockdown ordered for parts of Lombardy region including Somaglia, one of Flex’s sites in Italy.

Flex CMT team mobilizes in Italy and subsequently in all countries where Flex operates, contributing further to Flex’s COVID-19 response. Italy becomes model for Flex European sites, much like China did for Asia.

How did the team rise to meet our customer commitments at a moment of a national crisis in Italy?

[Learn more >>](#)

**11 Mar**

Flex takes decision to produce face masks to ensure adequate supply for worker safety and to minimize disruption to mask supply for frontline workers.

Global team mobilizes to plot mask-making journey, despite zero mask production experience.

[What was the outcome? >>](#)

**18 Mar**

WHO declares COVID-19 a pandemic.

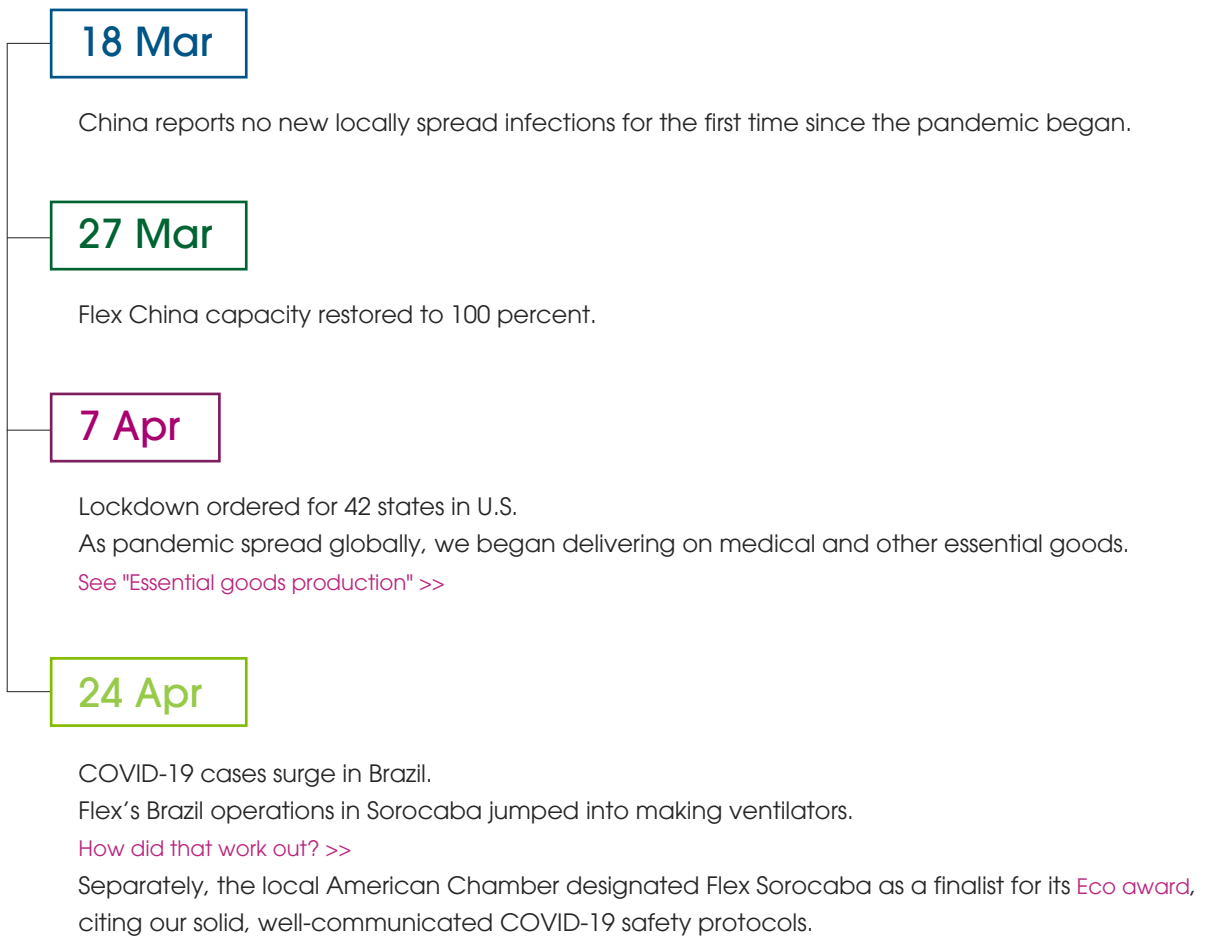
Malaysia, Flex’s second-largest country site by headcount in Asia, begins movement control order.

Flex Penang wins accolades from government for our COVID-19 response.

The team meets demand surges for vacuum cleaners. [Learn more >>](#)

Working with Flex Zhuhai, team Penang produces record volumes of PCBAs. [Learn more >>](#)

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As country after country was impacted by the pandemic, we reviewed and redirected our plans constantly. As we continued to anticipate the next site that could be impacted, we built contingency plans for many varied scenarios and deployed them as needed. As a result, we minimized the impact of the pandemic to our operations with these outcomes:

- Any sites we closed were due to sweeping government orders in the affected areas. None of our sites suspended operations because of contagion, a sign that we effective safety protocols.
- Many of our facilities worldwide have undergone government audits and none have resulted in fines, citations or permanent shutdowns.
- In the course of the audits, we were asked by some local governments to share our safety protocols. Additionally, we provided guidance to some of our customers on managing government audits.
- We have more than 145,000 people onsite daily to ensure our manufacturing lines are functional and productive. Our crisis management team has worked hard to keep all of our people safe for more than a year as they performed their work successfully.
- We are proud that there has not been an instance where a COVID-19 infection has impacted our ability to deliver products.

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## Asia: highlights and learnings

The actions of our China team provide a case study in rapid response, not least because the country was the epicenter of the pandemic and one of our largest operations.

### Get out in front – and early

With no visibility on how widespread the novel coronavirus could become, we felt the threat was significant enough in January 2020 to initiate executive meetings with regional and resiliency advisory team leaders. Soon after, we formed multiple task forces to address the critical domains of our operations.

Getting in position to prepare for potential challenges helped us to manage our sites as the pandemic spread rapidly around the world.



### Speed and heroics

Our China resiliency team achieved key milestones within hours and days:

- Procured three million face masks by tapping teams in Mexico and Europe as supplies were constrained amid China's lockdown.
- Developed and enforced safety measures that would lay the foundation for Flex's [COVID-19 Global Resiliency Overview](#).

### Achievements

- Zero COVID-19 cases in China facilities.
- Flex among the first few businesses to resume operation in China.
- Flex safety practices recognized as model examples by Chinese and Malaysian governments.
- Delivery of medical goods and supplies in record time, including CT scanners and critical care application tools.

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## Pioneering protocols in uncharted territory

We are committed to deploying the latest safety mandates and evolving them as we learn more about COVID-19. While Flex complies with the orders of government and health authorities, we also implement additional procedures to ensure maximum safety.

## Replicate and scale

The practices developed in China and other early hotspots were shared and adopted at each of our sites. We moved fast but we also made sure to document proven processes to help us scale. We developed our [COVID-19 Resiliency Overview](#) to share a high-level summary of our operational practices. While the guidance took a global view, they are adjusted based on local government and health policies. This means practices and protocols may vary by region and site.

## Delivering for customers

As our facilities reopened, we set about producing essential goods for our customers.

We produced printed circuit boards on behalf of a major technology provider.

[Read the full story on flex.com >>](#)

We produced vacuum cleaners at a time when the world needed to maintain high standards of cleanliness.

[Read the full story on flex.com >>](#)

Flex Asia helped to establish our template for managing COVID-19 across our global operations.



### Establishing CMT by country

- Security, operations, HR, government affairs, IP, finance, legal, communications
- Daily Council



### Daily reporting mechanism

- Daily reporting to senior leaders
- Customer, supplier and employee communications



### Precautionary measures

- Temperature screening
- Daily site sterilization
- Self-quarantine



### Readiness to resume operations

- PPE and mask procurement
- Staff availability
- Government waiver applications to resume operations

## Flex Penang site: standard bearer

Three days after Malaysia was ordered by its government to lockdown on March 18, 2020, our Penang site received government approval to reopen at reduced capacities in Penang.

Our site was held up by the Penang state government as representing exemplary operations that strictly adhered to standard operating procedure (SOP) guidelines. [Learn more.](#)



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# Europe: highlights and learnings

## Eyeing business continuity at start of shutdown

In dramatic fashion, northern Italy experienced a sudden and exponential surge in COVID-19 cases in late February 2020. The Italian government ordered lockdowns in parts of the Lombardy region leading us to suspend our operations in Somaglia.

Following a two-week shutdown, we learned on a Sunday evening that we were allowed to reopen the next morning.

With eight hours to implement all the measures, we needed to complete critical tasks, including:

- Re-configure the layout of the entire warehouse to create ample space for exceeding distancing guidelines. We opted to support distancing at 2 meters instead of the mandated 1 meter.
- Create a brand new outside “village” with common spaces and additional restrooms to minimize people density indoors.
- Train team on how to work in the reconfigured areas.

## Meeting unprecedented e-commerce demand

It was critical for us to reopen our Somaglia facilities seamlessly. Here, we run forward logistics and distribution for a strategic customer who depends on Flex to distribute inventory to its stores, resellers and e-commerce customers. We oversee last-mile delivery to markets in Italy, Spain, Portugal and Switzerland.

Starting in February, our customer’s online sales rose sharply so our fulfilment had to be flawless.



Our Somaglia site provides logistics and distribution services to serve four European markets on behalf of a strategic customer.

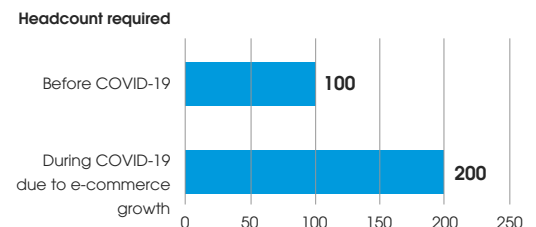
## Agility in motion

Our staff of about 100 was equipped to handle our customer’s e-commerce volume typical of the season.

But with soaring demand for our customer’s products as people shopped online from home, we needed to beef up our staff immediately.

As retail stores were closed, we immediately redeployed our staff of 200 who were supporting the logistics for products destined for the customers’ stores and resellers. For two weeks, we trained 200 people rigorously, putting them right behind our most experienced technical and systems staff to accelerate their learning.

Additional 100 headcount required to train in less than 2 weeks



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## Achieving 100 percent KPIs – and then some

We worked to dispatch a portion of our customer's goods amounting to some 700,000 units to an alternative distribution center to mitigate risks as the world reeled from COVID-19.

This new route to market (RTM) required us to immediately redeploy resources to bring new skills to execute 20,000 orders per day compared to 5,000 orders per day during the same time in the previous year.

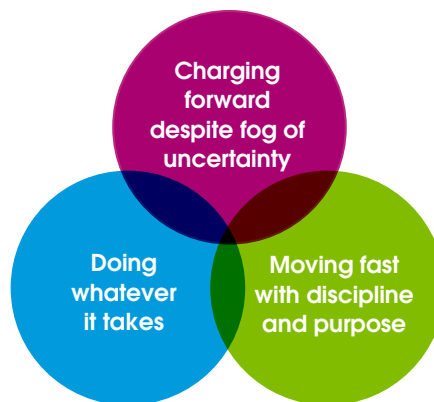
This translates to successfully managing 300 percent increase of daily volume in e-commerce sales, achieving all KPIs at 100 percent.

### Success factors

No sooner had Somaglia gone into lockdown than we planned to resume operations despite having no idea when we could return to the site.

We left nothing to guesswork and worked with the local government to fully understand the health protection measures so we could implement them immediately when we returned to work.

The team's knowledge and fast footwork became the model for other Flex sites in Europe. The collaboration with other teams in Europe was instrumental in bringing our sites back online after lockdown orders were lifted throughout the region. This further exemplifies the criticality of scaling repeatable processes.



### Recognitions

- As Flex's first site in Europe to adopt COVID-19 safety measures, our execution was recognized by our strategic customer and local authorities as best in class.
- Our deployment also became a national standard in Italy.
- In summary, we provided a safe environment for all employees; acted with agility and disciplined execution; and intense collaboration with customer, local governments and work council.

Flex was the first business in Italy to achieve ISO 28000 certification for a supply chain security management system. This was an effort we initiated before the shutdown, and very quickly completed after our facilities reopened.



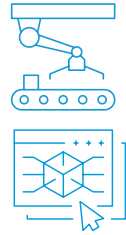
# Resilience lever: Technologies and processes

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Perspectives and case studies

# Marrying proven processes with digital and automation technologies

We've prepared our operations for uncertainty by standardizing proven technologies, tools and processes.



Our toolbox includes automation technologies and digital tools like analytics and simulation. These tools build our resilience by enabling us to:

- Gain visibility on internal and external events so we can respond appropriately.
- Collaborate through orchestrated workflows across our entire operation.
- Improve decision-making through data-driven approaches.

Below are some examples of our approach, systems and processes.

## Disciplined execution

We launched Flex Business System in 2020 to embed disciplined execution into key processes in our operation. One of the tools in the Flex Business System is SHIELD, a project management tool purpose built for flawless new product introductions (NPIs) and transfers. SHIELD is designed to maximize collaboration, transparency and other success factors in our NPI executions. As each NPI and product transfer is managed through SHIELD, we will be well-positioned to drive repeatable and consistent performance for our customers.

Using SHIELD, we launched our medical device production programs, contributing to their on-schedule delivery.

[How does SHIELD consistently enable successful product launches? >>](#)

## Automation for speed and accuracy

Automation can generate efficiency and reduce human bottlenecks and error, carving a direct path to resilience. Many of our operational and transactional processes are automated. For instance, we share RFQs, purchase orders, invoices and other transactional documents with our suppliers using EDI capabilities that automate information exchanges. Ultimately, the automation projects in our factories represent our biggest investments. Our automation portfolio includes everything from high-speed lines that generate high throughput to cobots performing repetitive tasks alongside our staff on the floors of our warehouses and factories.

[How do we apply automation to boost PCBA testing productivity? >>](#)

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## Digitizing our operations

COVID-19 has put pressure on businesses to accelerate their digital transformation. Flex began our digitization journey many years ago, achieving a major milestone in 2015 when we launched Flex Pulse®, our digital supply chain management tool.

Flex Pulse® is our go-to for supply chain visibility, collaboration and transparency across the entire value chain. The system’s dashboards feed us critical signals to help us proactively identify risks and anticipate disruptions. We have visibility all the way from product origin to product lifecycle. Pulse breaks silos across teams and geographies by automatically triggering supply chain workstreams, enabling seamless coordination and cooperation.

[Learn how Flex Pulse® builds supply chain resilience >>](#)

## Simulation and digital twins in a post-COVID world

As COVID-19 has forced us to adapt virtually, one silver lining is we have made strong inroads into simulation, completing more than 200 simulation projects over the past 24 months and saving our customers time and money.

We are applying simulation and digital twins on many fronts to optimize everything from the design of our production systems to the manufacturing process.

[We used simulation and created a digital twin to optimize the manufacturing of a medical device.](#)

[Learn more >>](#)



“We are incredibly good at adapting quickly, finding creative solutions with our customers to manufacture products that improve the world. But in the post-COVID world, we need to get even better. We will be accelerating on simulation, automation and digitization, driving value and speed through mastering technology.”

Paul Baldassari, EVP

Flex EVP Paul Baldassari offers his views on simulation and other Industry 4.0 technologies in an interview with Industry Week. [Read the Interview on industryweek.com >>](#)

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# Resilience through Industry 4.0

We are several years into the fourth industrial revolution, Industry 4.0, where our manufacturing ecosystems are smarter and more efficient thanks to the application of digital and automation technologies.

At many points along the value chain, we are applying these technologies at scale to help us ensure safety, gain efficiencies, improve quality, reduce costs, apply sustainable practices and lower risks.

## Adapting to the new normal

COVID-19 ushered in a new reality that had businesses reaching in their 4.0 toolkits to adapt quickly. Many of our sites, for instance, needed to move fast to meet demand spikes or clear backlogs built up from suspended operations ordered by local governments. To raise our capacities, we leaned on our automation solutions to rapidly replicate existing lines, allowing us to deliver the operations. We relied on them to help us communicate and connect with our customers in cases of new product introductions (NPIs) and product transfers.

As our teams prepared to produce ventilators for the first time in Flex’s history, for instance, we used videos and virtual reality environments to facilitate the training and production transfer processes. We set up virtual tours to review the current production lines on the customers’ factory floors. The onsite production teams wore cameras on their headsets that recorded the processes while providing the narration. One customer delivered immersive experiences of the existing assembly line using an augmented reality system to capture each required step.

Virtual tools opened new possibilities for teams from engineering to quality control to collaborate providing an environment that felt as though they were in the same place. We will be creating new programs and ways of working to help us get more out of these tools in the future.



“We all want to fast-forward the adoption of Industrial 4.0 revolution technologies to achieve higher performance. As we become more innovative and provide a great experience to our workforce, this can lead to more meaningful and safe jobs.”

Flex CEO Revathi Advaiti discusses our Industry 4.0 vision during an event sponsored by Global Lighthouse Network, a collaboration of the World Economic Forum and McKinsey & Company.

Watch >>



Please jump to 31:20 to view Revathi’s talk.

# Key pillars of Flex advanced manufacturing

We deploy innovative solutions to enable advanced manufacturing to help lower costs and risks while improving quality and speed-to-market. To deliver a unified digitization solution, we're eyeing to implement digital twins in each of our factories to optimize customer experiences, along with advanced robotics and automation across our programs.

## Here are the five pillars of our advanced manufacturing:

1

### Advanced simulation

- Digital twin of automated line to improve decision-making
- Use of automation component library to select best automation solution
- Predicting physics of failure and optimize product design

2

### Automation and robotics & IIoT

- Collaborative robots – cobots – to automate wide-ranging manual processes
- Autonomous mobile robots (AMRs) to improve material handling, transport and transfer
- IIoT modules/devices can improve throughput and data intelligence via autonomous closed-loop machine to machine communication

3

### Digitization

- Digitizing design for automation (DDFAut) for clash detection and feedback
- Use of automated ML and AI tools for predictive analytics on test data
- Machine-to-machine communication and optimization

4

### Real-time supply chain

- Alternate options to improve supply chain velocity and less touch points
- Cost reduction options for customer to improve market penetration
- No touch material management – automated warehouse, automated mobile robot and feeding surface-mount technology

5

### Additive manufacturing – 3D-printing

- Tools and fixtures reduce setup and lean transformation of lines
- Rapid prototyping during concept and design phases
- Spare parts support to improve maintenance, repair (MRO) and operations and overall equipment effectiveness (OEE) costs

## Actioning with data in a closed loop manufacturing system

With cloud and edge computing, IIoT-connected devices in the warehouse and on the factory floor, we are constantly collecting data to train machine learning models to monitor operations in real time and flag risks.



- 1** A combination of efficient handling systems\* receive incoming inventory and dispatch materials automatically when required for production\*
- 2** Transactions are triggered through connected eco-system of scanned and scan-less processes for tracking and tracing
- 3** Collaborative robots (rather than industrial robots) perform value-add tasks, working alongside operators to provide a safe work environment
- 4** Inspection methods are applied with built-in AI algorithms
- 5** Teams monitor process insights and real-time status by reviewing dashboards in control tower
- 6** Combination of various inputs, e.g., tags and product ID, the system communicates location and status of the products
- 7** Driverless forklift moves product as raw materials, work-in-process inventory or finished goods to their next destination
- 8** AMR is also used as a point-to-point fetch and deliver products on-demand

\*Efficient handling systems combine autonomous mobile robots (AMRs), driverless forklift, smart conveyance and scanning technologies (e.g., BLE Beacons, RFID, human or machine-readable barcode, etc.)



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# Disciplined execution through repeatable processes

Our scalable, repeatable processes have been battle-tested to withstand stressors like sudden changes to production volume – an event we experienced many times in 2020 as COVID-19-induced demand spikes required us to raise our production levels manifold across the world.

Below, we pull back the curtain on how our standardized processes help us manage each new product launch and product transfer that comes with its unique challenges.

## Ready to adapt

We standardize our executions to drive consistency across our global footprint. This approach is at the heart of our operational playbook, which in turn creates alignment and accountability that enable us to scale successfully.

Every team member involved in an NPI or product transfer adopts a set of standard methodologies and processes for their functions and roles.

## SHIELD: Simplified Handshake to Inform, Execute, Launch and Deliver

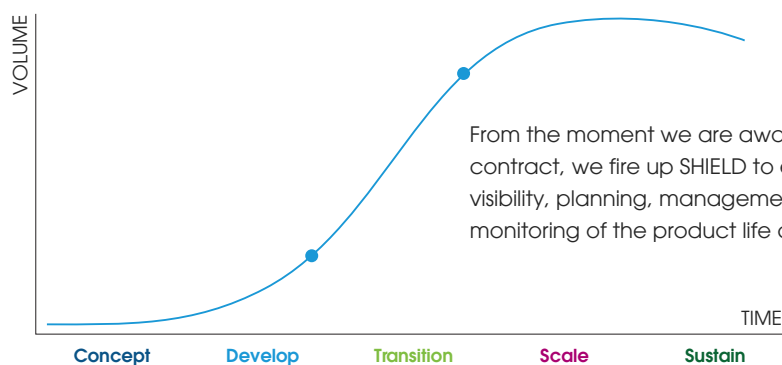
We invest in pre-production planning and preparation efforts to maximize a program's success. At the heart of this is SHIELD, a standardized project management tool we developed in-house to manage the lifecycle of every product we build.

## A proven method

As we rolled out SHIELD in 2019, it gradually became our standard program management platform. The KPIs of SHIELD-managed programs were consistently higher than the KPIs of the programs managed off-platform. Today, we use SHIELD to manage nearly every NPI and product transfer. We see higher SOPs among SHIELD-compliant product launches versus those that predate SHIELD. The latter forms the baseline for enabling KPI comparisons.

## Diverse experts standing by

We may experience issues during launch or transfer that need to be solved by experts with deep domain expertise. In these cases, we draw on our deep bench of talented engineers, testing, operations and other technical experts ready to troubleshoot these escalations to resolution. While this central support team of hundreds typically diagnose and resolve issues in person, they have been highly productive troubleshooting over Zoom due to COVID-19 travel restrictions.



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## Designed for disciplined execution

SHIELD integrates rigor and best practices for flawless delivery, including techniques to anticipate risks.

### Engage and align

Our program managers have their fingers on the pulse of the program status and engage constantly with cross-functional teams from finance to engineering to ensure alignment.

### Staying ahead

SHIELD provides real-time data that helps us surface early signs of issues before they become problems:

- What is the status of the week's milestones?
- What is the source of problems for delayed milestones?
- Visibility. If an original SOP cannot be met, SHIELD can be used to display reason for this delay.

Being data-driven helps teams align and collaborate to correct course as needed to improve outcome.

### Rigors of hand-offs and hand-backs

In SHIELD, we mandate a standard timeline for information exchanges between the account and site production teams. These exchanges are part of a relay that involves hand-offs and hand-backs.

In the handoff, the account team sets expectations with the site program team. The hand-back confirms the site program team's understanding of the program requirements via a draft project plan complete with milestones and flagged risks. This is followed by a handshake meeting to level-set between the two teams using a standard SHIELD agenda.

### Tracking and alignment

SHIELD provides tracking and reporting tools that enable program managers to:

- Track deadlines and milestones
- Identify risks and mitigation plans
- Track financial targets. For example, team members can track current expenditures against budget
- Conduct program review and assess site performance across multiple KPIs to inform continuous improvement

### Accountability and real-time status

Access to high-level SHIELD dashboards by the executive leaders helps to drive accountability and the accuracy of each program's current status.

While SHIELD is an indispensable tool in our program launch arsenal, it is our people with their commitment and discipline that ultimately deliver for our customers.

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## SHIELD: A record of disciplined execution

Two examples of programs managed through SHIELD

### Product transfer

**Products:** 2 oxygen concentrator and 1 nebulizer - Medical device class II

**20+:** Years produced at customer facility

#### KPIs

- 100 percent utilization of SHIELD
- Launched within seven months from kick-off to mass production, a record for medical device transfers
- All 20 milestones achieved on time or ahead of schedule
- Within first 90 days of production, attained 2x units per hour above customer's sustained facility volumes
- Delivered 300 percent more units in the first 90 days than planned, mitigating higher-than-expected rate of attrition at customer location
- Customer issued perfect satisfaction score acknowledging robust launch execution

### New product introduction

**Product:** Automotive infotainment module

#### KPIs

- 100 percent utilization of SHIELD
- Relay completed on-time with all deliverables confirmed, including financials
- Successfully achieved all milestones on time
- All 5 program gate reviews were completed on-time with a task completion of 98 percent or better
- Subsequent next-gen launches executed successfully in three other sites

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# Resilience through digitized supply chains

Transparency, visibility, agility and collaboration drive resilience and this applies equally to supply chains.

## COVID-19 supply chain escalation using Flex Pulse®

As the Chinese New Year holiday came to an end in February 2020, the Chinese government ordered the country to shelter in place to help curb the spread of COVID-19. With China's leading role in the world's supply chain, this shutdown led to global supply shocks.

How did we use Flex Pulse® to manage supply chain escalations during this time? Here are a few examples:

- Flex Pulse® helped us pinpoint parts having China as country of origin allowing us to confirm those parts orders with their respective suppliers. We needed to understand the status of these POs to help assess the downstream impact including our production schedules. This exercise triggered workstreams to solve for those parts that could not be fulfilled in a timely way.
- If a site was experiencing materials shortage, we could identify sites with excess supplies so production could continue.
- We can gain insights on where the opportunities are for reducing minimum order quantity based on inventory impact and supplier delivery pattern.

## Fingers on the pulse of our supply network

At Flex, we use both home-grown and third-party digital tools to help us manage and mitigate risks throughout our supply network. Our primary data tool, Flex Pulse®, is a cloud-based system that provides us with real-time insights into our supply chain, allowing us to reduce risk, lower costs and improve efficiencies for greater speed.

As the eyes and ears across our supply ecosystem, Pulse aggregates live-streaming data from hundreds of sources to deliver exceptional levels of connected intelligence. Our data sources combine Flex systems such as our ERP and MRP with third-party tools that provide visibility across wide-ranging spheres, from weather to politics. Applications and algorithms process this data to produce more than 100 real-time dashboards that ladder up to an integrated view of our entire value chain.

*Flex Pulse® is the eyes and ears of our supply network. From data visualization to event-triggered workflows, its wide-ranging tools help us detect risk, plan, and coordinate for optimal outcomes.*

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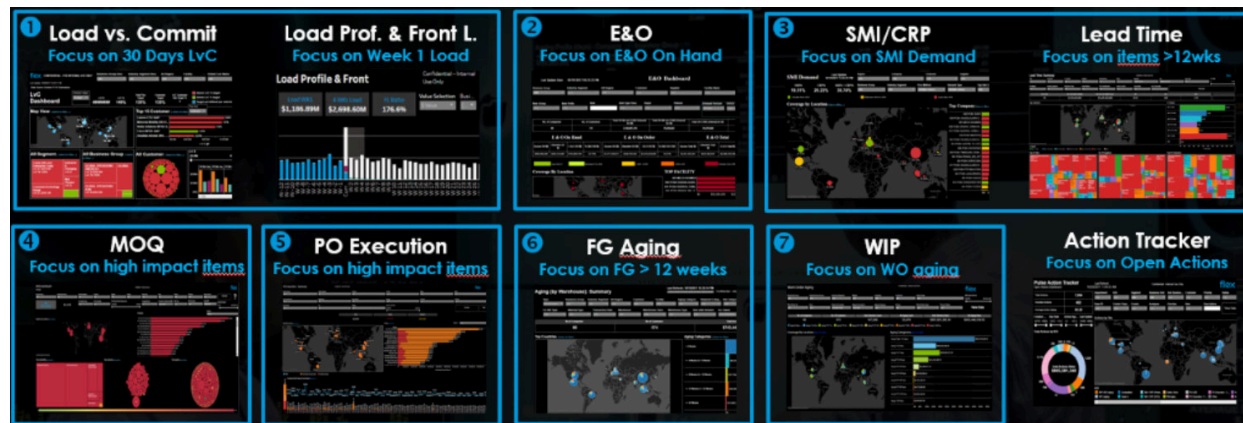
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## 24/7 supply chain management, anywhere

While Flex Pulse® listens and monitors our supply chain 24/7, we can also use the system to help form the right response by locating critical data quickly. We can get aggregated data from many perspectives – global, regional or site-level views such as excess inventory, PO execution, lead time trends, finished goods, and much more. We can also drill into a specific part to see what actions are required to address a particular shortage.

With its wide-ranging applications, depth of data and ease of use, Flex Pulse® is the most widely used tool in our supply chain organization. Our teams can access the tool anywhere and anytime through their Internet-connected computers, tablets or smartphones.



Flex Pulse® dashboard examples

# Simulation and digital twin for medical manufacturing

Although COVID-19 has been the dominant health concern, medical professionals continue to address other critical healthcare needs.

## Applying simulation + digital twin to produce a diabetes device

In the first quarter of 2020 when the pandemic began to spread globally, we began a project using DES to optimize the manufacturing of a Class II diabetes product. At a basic level, DES models the operation of a real-world system as a sequence of discrete events.

To start the process of simulating the production of our customer's state-of-art diabetes device, representations of the production assets including equipment, layouts, and staff, were imported into the DES software and arranged to mimic the actual real-world process.

Once the process flow was created, we loaded the relevant data into the software and assigned them to the various assets. We had essentially created a "digital twin" of the factory that simulates real-world processes without having to move any equipment and material.

## Game-changing results

With DES, we can design efficient flow of people and material, predict yields more accurately, reduce inventory and increase throughput, all of which add up to significant cost savings and margin improvements. Applying DES to the manufacturing of our customers' diabetes device generated significant ROI, including:

- Greater efficiency by using more carts to transport material and WIP products around the factory for various value-added processes.
- Optimized cart availability, raising the utilization of one process by 15 percent and another by 21 percent.
- Raising the number of units produced per quarter by 47 percent.
- Significant increase in station output – as much as 70 percent – by optimizing work order sizes.

## Rigors of medical manufacturing

The manufacturing of medical devices is highly regulated to ensure that every product produced meets stringent performance, reliability and safety specifications.

As the production process must be well-defined, validated and documented, developing and establishing this process can take years. Any modifications – even very minor ones – have to be re-validated, documented and often re-submitted to the regulatory authorities, which is time-consuming, costly and can lead to significant delays.

This means the production process and system have to be properly planned and forecasted, with the well-being of patients in mind as their lives may depend on it. For all these reasons, medical device manufacturing is an ideal candidate for the application of simulation technologies that use software-based environments to optimize processes. One of the simulation techniques we use is called discrete event simulation.

2021 MANUFACTURING  
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WINNER

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The Manufacturing Leadership Council recognized Flex for our application of simulation and digital twin technology.

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## Double-digit efficiency gains

Our solution combining DES and digital twin to optimize production processes for our customer's diabetes device generated these efficiency gains:

70%

Increase in  
station output

47%

More units  
produced

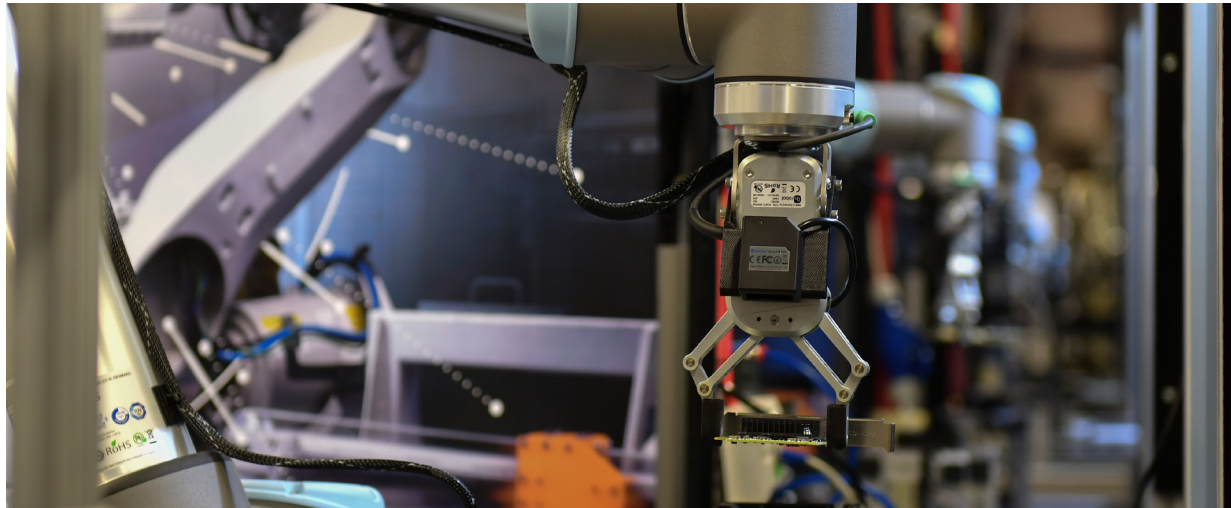
15 - 21%

higher value-added  
process utilization

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## Boosting PCBA testing productivity with automation

In 2020, we worked fast to meet the demand spike for printed circuit boards (PCBs). These thin plates are designed to mechanically support and electrically connect the electronic components contained in each unit. As PCBs are in every electronic device from smartphones to medical imaging equipment, demand for this component accelerated last year in lockstep with the growing needs for medical services and online shopping.



### Challenge

As Flex produces millions of PCBs each year, we constantly looking for ways to improve every aspect of our production, including our PCB assembly (PCBA) testing processes. Though we have been using automation in this process, we knew there was room for improvement.

### Solution

One of our automation engineering teams in Israel designed and implemented an autonomous testing collaborative robotic solution and loading system. This robot picks up a small/medium sized PBCA from the loading system's vacuum forming tray, places it into the functional tester, and after the test is complete, picks it up and places it back onto the tray. This eliminates potential errors, handling defects and the need for full-time manual operators.

The complex system includes software which manages the interaction between the robot, the loader and the tester. The robot comes equipped with a force-sensitive gripper, as well as barcodes with software to provide a results report. The system is also extremely versatile. The loader and the arm can be moved and used across many different testing stations. Another site has since adopted two robots to replicate this success.

### Result

Prior to using this new system, each testing station was able to complete 16 tests per hour, with a full-time operator. Now, it completes 24 tests per hour, and only requires occasional review and tray replacement by an operator.





# Resilience lever: Collaborative partnerships

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Perspectives and case studies

# Partnering with our stakeholders

During a crisis, extreme collaboration is a must. Flex team members worked hand-in-hand with one another but our collaborations with customers, suppliers, governments and other partners were equally critical.



## Customer collaborations key success factor

Through our shared priorities, our customers were true partners. They helped us overcome challenges and setbacks we faced as we ramped to record production levels under circumstances made difficult by strained supply chains, compressed timelines and logistical issues.

Our customers' partnerships came through in their relentless dedication in helping us chase supplies, share data, and validate our operations as essential services with government bodies.

Here are a few examples of our intertwined partnerships that led to successful outcomes:

- [Partnering with GN Audio to meet work-from-home demand surge for headsets >>](#)
- [Collaboration with u-blox drives supply chain resilience >>](#)
- [Taking security readers product launch to the finish line >>](#)
- [Cleaning up the quarter with record production of vacuum cleaners >>](#)

## Supplier relationships key

Successful sourcing depends on strong, long-term supplier relationships. At Flex, these relationships have been years and even decades in the making, and we don't take them for granted.

When supply chains were strained in the early stretches of 2020, we were able to access scarce parts in certain instances due to our longstanding supplier relationships.

We worked with our customers to validate their forecasts so we could give our suppliers demand signals that were as accurate as possible. We had a responsibility to prioritize appropriately as our suppliers were also challenged by the pandemic.

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In particular, we needed to support our tier-1 suppliers as many were holding tremendous financial liabilities. We also wanted to respect our tier-2 suppliers during a time when multiple levels of the supply chain were experiencing challenges.

Fundamentally, strong supplier relationships built on history, trust and mutual success is vitally important. Partnerships develop slowly when times are good and are tested when times are difficult. Trusted supply chains take time to establish, but when built correctly, can withstand the pressure of global disruptions. Our supply chain resilience has been a competitive advantage for Flex and our customers.

### Partnering with governments globally

As COVID-19 became a health crisis, we immediately prioritized the health and safety of our team members. We were also committed to producing critical medical equipment on behalf of our customers who supply life-saving devices. We could not have carried out these goals without deep collaboration with our partners in government. As we applied for exemptions to shutdowns as a provider of essential manufacturing services, we worked closely with government agencies, and appreciated their rapid response in granting us approvals.

Thanks to our direct line to local government authorities who gave us guidance on safety protocols over the early days of the COVID-19 outbreak, we were able to install rigorous protective measures quickly. In turn, these measures were extended globally, putting us far ahead of many businesses as COVID-19 infection rates continued to rise.

In April 2020, the Brazilian government turned to domestic industry to produce ventilators as the pandemic took its toll throughout Latin America. Brazil’s government authorities asked Flex to work with Magnamed, a ventilator producer in São Paulo, to help the company accelerate its ventilator production. The request? 6,000 ventilators a month, which was in line with the country’s total volume in a single year.

[Learn how we partnered with the Brazilian government to fast-track production licenses that would normally take months to secure >>](#)

# Flex joins RESPIRA Brazil to expand ventilator production

In March 2020, the Brazilian government announced RESPIRA Brazil or BREATHE Brazil, an initiative that seeks to dramatically increase the country's ventilator manufacturing capacity from 200 ventilator units per month to 4,000 units monthly.

## FRIDAY – March 20th, 2020

The Brazilian government called our government affairs lead in Brazil and invited Flex to join a task force comprised of other large companies that would contribute to RESPIRA Brazil.

## MONDAY – March 23rd, 2020

We said yes.

The task force companies were introduced to Brazil's ventilator manufacturers. One of them was Magnamed which chose Flex as its manufacturing partner.



We not only achieved our monthly target of 1,000 units, but within a record 30 days, our Sorocaba team went from never having produced a medical device to completing the production of its first clinical ventilator unit.

RESPIRA Brazil  
From 200 to 4,000  
ventilators a month

## New to medical device manufacturing

Sorocaba is one of our sites in Brazil specializing in consumer electronics and communications infrastructure and industrial goods.

Within a record 30 days, we achieved these key milestones, putting us on the path to meeting our goals:

- Obtained site ANVISA and INMETRO (UL equivalent) registrations and approvals,
- Built new infrastructure to install oxygen
- Set up production lines
- Trained staff on product assembly via video conference
- Learned new quality system
- Performed validation, including testing and regulatory documentation.



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## Success factors

Intense collaboration with the Brazilian government and our task force partners contributed to our success.

We needed to secure regulatory certification from the Brazilian health regulatory agency ANVISA to initiate medical device production. ANVISA's regulations are virtually identical to those of the FDA, and clearance normally takes 12 months. We coordinated in rapid-fire fashion with Magnamed and ANVISA to expedite the regulatory and approval processes. As our processes, system integration, assembly and final testing were validated in real time, we achieved certification within days, rather than the normal cycle of months.

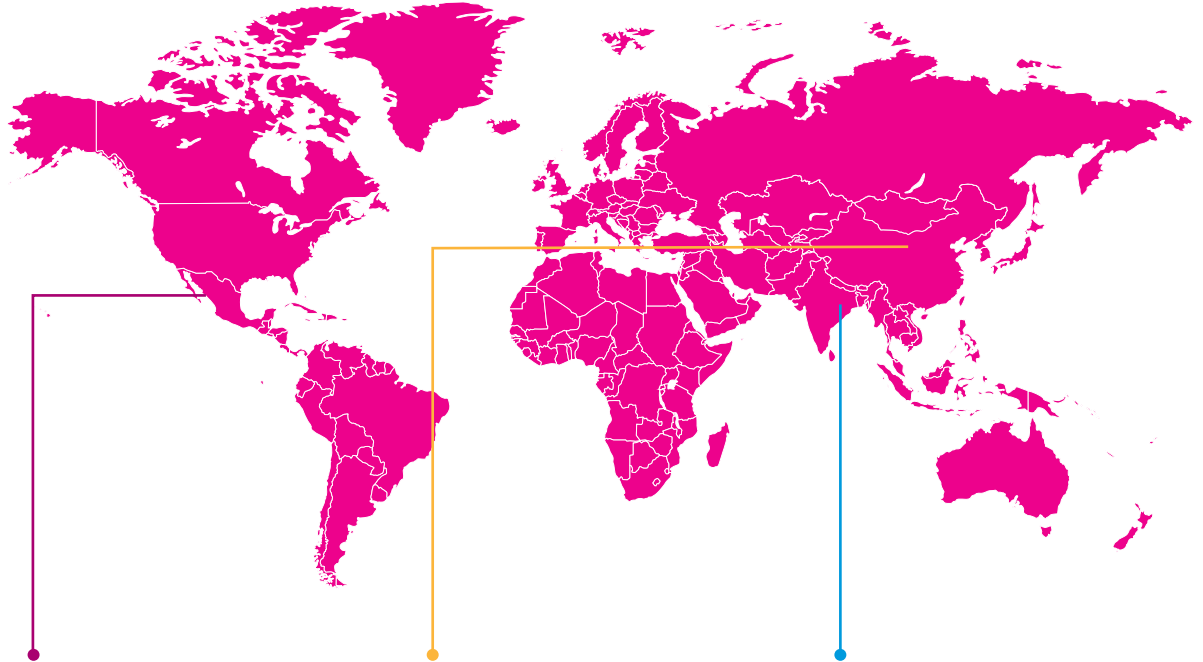
We were guided by our Flex medical device specialists in North America. Our teammates worked directly with Magnamed's regulatory team and attended every regulatory audit.



Flex Sorocaba was featured in a news broadcast on Brazilian government's channel for our support of RESPIRA Brazil.

# Recognition from all levels of government

We worked with governments and health authorities at all levels – national, regional and local – to achieve our shared goals. Here are a few examples of our coordination and success stories with governments and NGO stakeholders.



## San Luis Río Colorado City Council Health Committee visit

Our site in San Luis Río Colorado, Mexico welcomed officials from the Health Committee of the City Council. Their visit was to validate first-hand our preventive COVID-19 protocols with an eye to using our safety measures as a standard for other businesses in the area to follow.

[Learn more >>](#)

## Travel restriction compliance

The Chinese government announced travel restrictions during Chinese New Year in February 2020 to help contain COVID-19. This is a time when millions of people in China's urban areas return to their villages to celebrate. Flex was held up by the Chinese government as a model employer by celebrating the festivities with our employees in meaningful ways, bringing cheers to their holiday.

[Learn more >>](#)

## COVID Warrior Award

In recognition of our significant contributions towards implementing best practices in the prevention and management of COVID-19 in the workplace during the pandemic, our manufacturing site in India – the Chennai Industrial Park – was given the COVID Warrior Award by a consortium of nonprofits from Chennai that includes healthcare and human resources groups.

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## Penang state government gives Flex thumbs up

The Chief Minister of Penang visited our site to observe our standard operating procedures (SOPs), an event that received broad media coverage which included:


- [State government press >>](#)
- [Penang Chief Minister Facebook page >>](#)
- Others as archived on the [Flex Malaysia Facebook page >>](#)

Select the image below to watch a video produced by the Penang state government featuring our Penang site as an example of exemplary operations that strictly complied with the state's standard operating procedure (SOP) guidelines.




**Flex - Malaysia**  
Apr 8, 2020 · 🌐

Flex menyokong penuh semua usaha kerajaan dalam membendung penularan wabak... See More



**Penang Lawan Covid-19** · Follow  
Apr 6, 2020 · 🌐

Demi menjamin keselamatan semu... See More



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### Resuming operations with speed

Flex Penang was among the first operations producing technology to secure the Malaysian government's approval to reopen, albeit at reduced capacity.

This fast resumption of operations was due to our preparations and guidance by our China crisis management team (CMT) on deploying COVID-19 safety measures.

This enabled us to return to our business of producing essential goods.



# Towards a resilient future

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# Lessons learned

In the early days of COVID-19, every business operated in the fog of the unknown. What got us through these times and what lessons can be drawn from this experience?

## The pandemic has underscored the importance of purpose and values.

We see what we are made of in difficult times, and in these moments, our work culture becomes a critical input to informing our actions. Our mission to make products that improve people’s lives never shone brighter as when we ramped quickly to produce essential goods to serve the needs for healthcare and communication services.

Forming a response to the pandemic took all of us to produce purposeful output. This was possible because we take pride in being a Flex team member, consistently demonstrating our values to do the right thing and move fast with discipline and purpose.

## Agility and speed matters.

Our ability to adapt quickly helped us navigate through uncertainty and ambiguity.

All the resilience levers formed the foundation of our agile response. We met demand surges rapidly without compromising quality. We produced goods we’ve never made in compressed time frames because we had the infrastructure and experience to ramp at scale on short notice. Being in uncharted territory, we operated in unconventional ways, hustled and got scrappy.

## Robust systems and tools provide the necessary visibility to respond to risks.

Our investments in developing systems, data-driven processes, and digitization over the years were indispensable in helping us address the COVID-19 impacts. We pivoted quickly to a highly productive virtual work environment while our digital tools helped us navigate a supply chain under stress.

## Transparency and communications go a long way to build trust in times of uncertainty.

In any crisis, stakeholder communications is everything. We communicated frequently with our global team, customers, suppliers, government partners, sharing whatever information we had and responding to their questions. We didn’t always have answers, but we let them know we were working on it.

## In good times and bad, nurture and invest in your ecosystem.

The pandemic showed us that getting through a crisis requires extreme collaboration. What we thought was impossible became reality thanks to the support of our team members, customers, suppliers, and partners in government. We did not build these strong relationships overnight, and how we supported each other during our most difficult days will set the tone for how we collaborate in the future.

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We are also mindful of building resilience in the communities we operate in, and to that end, we have provided support through our nonprofit charitable arm, the Flex Foundation.

Above all, we are committed to our employees. Their safety trumps everything. We also seek to nurture their resilience – by fortifying both their expertise and emotional well-being. Our shared services team, for example, are trained on an ongoing basis to advance their cross-domain expertise. Their heavy lifts and expertise were vital in getting us through the crisis. Developing soft skills such as communications and how to juggle work-life balance is also important to building emotional resilience. Lastly, kindness and understanding have been the code of conduct; our humanity will get us further than anything else.

### **It pays to get out in front with a decision.**

As we operated in an environment of fear and chaos, we chose to over-prepare. Without the full picture in January of 2020, we activated our crisis management teams and various task forces when COVID-19 was described as a “mysterious pneumonia.”

The alternative would have been to delay decision-making when we had better visibility. If we had waited, however, we could not have resumed operations and met our customers’ needs as quickly. Our fast response made us ready for government audits that occurred at many of our sites. We continuously asked: “what can we do next? How can we get ahead of the next roadblock?”

We identified the next decision points to help mitigate risks and potentially influence the outcome before it was decided for us.

Maneuvering a crisis involves constant, collaborative decision-making. In the absence of precedents, we relied on each other’s experience and judgment to reach critical decisions.

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# Flex Forward

Though the global pandemic weighed on our hearts and minds, we decided to announce our Flex Forward strategy in March 2020. The crisis was still in its early days and continued to evolve. As China was reopening, other countries began locking down. We felt the time was right to communicate why we expected our strategy to position us well to execute even in an operating environment as challenging as the one we faced.

Flex Forward sets up our business units to operate with autonomy, speed, and importantly, accountability. Under this plan, we continue growing our core business while doubling down on serving markets where Flex offers clear differentiation. These twin engines – Agility to strengthen the momentum of our foundational core business, paired with our Reliability business to fuel growth – will propel us forward.

**Flex Agility**  
 Products with relatively short life cycles and quick turnarounds. Optimized for speed to market at any volume

Flex Agility operates on a very flexible supply and manufacturing system to deliver on high volumes at speed. Agility serves wide-ranging industries from consumer electronics to data center providers.

**Flex Reliability**  
 Products with longer lifecycles requiring complex ramps. Optimized for any volume with specialized production models.

Serving regulated industries such as healthcare and automotive, Flex meets and exceeds quality standards and consistency across critical products such as precision plastics and wearable medical gadgets.

## Refreshing Flex values

Fundamental to our transformation and building on our strong foundation, was a rethink of our purpose and mission through which we would anchor our strategies and decisions. How and where we engage in the market should align with our core purpose of making great products for our customers that create value and improve people’s lives.

## Early validation

We have a unique operational model that helped us execute under the difficult circumstances we experienced in 2020. Last year, we began pruning our portfolio and shedding volatile, low-margin businesses in alignment with our mission and disciplined growth strategy. These actions, along with our disciplined execution, have yielded positive results.

In the last three quarters, we reported strong earnings – an early validation that our strategy is sound. We look forward to carrying out our strategy to its full potential with disciplined execution.

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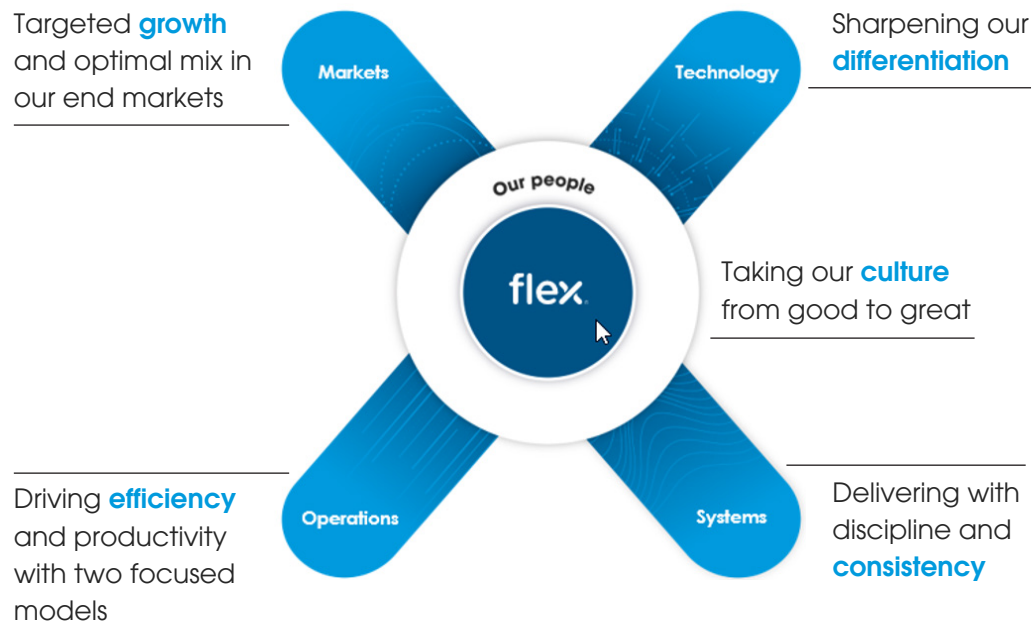
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## Entering year two of Flex Forward



- Continuing to shift portfolio to be more diversified and differentiated to maximize value and reduce risk
- Deepening our relationships in healthcare and infrastructure, expanding in industrial and automotive segments
- Focusing on new operational model to support regionalization, production and supply chain adaptability
- Emphasizing business excellence to drive consistent results
- Reducing spending and maintaining disciplined capital allocation plans
- Adapting to uncertainty with strong liquidity and cash position



# Awards and media coverage

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# Honors and distinctions

We are proud of the recognition we have drawn over the last 14 months for a wide range of efforts. We share a few examples below.

## Flex named to FORTUNE's World's Most Admired Companies



We are honored to be join FORTUNE magazine’s 2021 roster of great businesses recognized as World’s Most Admired Companies. This distinction is based on company surveys and peer ratings from top executives, directors and members of the financial community. Companies are rated in nine criteria. [Learn more >>](#)

## 2020 Intel Supplier Achievement Award for COVID-19 response support

Flex received this award for demonstrating “innovation and resolve” in our efforts to manage COVID-19-related supply chain challenges. We were recognized for uninterrupted supply and supporting Intel in meeting its product demand while keeping our teams and communities safe.

## Cisco 2020 Excellence in Sustainability Award

Among the supplier awards we received in 2020 was the Cisco 2020 Excellence in Sustainability Award. This award recognizes Flex for our vision and collaboration in the social and environmental sustainability space, marking the second year in a row that we ha received this award.

## Flex Global Services & Solutions draws national and regional recognition in India

Our Global Services & Solutions (GSS) provides global distribution and after-sales services to help our customers thrive in their markets.

Our GSS team in India won multiple honors in 2020 for their excellence in providing aftermarket services. In all cases, these were validations of our teams’ best practices, problem solving techniques and innovative technology solutions.

Triple Award Win for Flex India (GSS) .....

<div style="text-align: center;">  <p><b>4<sup>th</sup></b> Consecutive national win</p> </div> <p><b>Scale Award 2020</b> @ 7<sup>th</sup> Supply Chain and Logistics Excellence Eminent Position (Technology Solution Providers for Logistics category)</p> <p><b>Awarded by:</b> CII Institute of Logistics <b>Presented to:</b> Flex GSS’ Logistics Department</p>	<div style="text-align: center;">  <p><b>5<sup>th</sup></b> Successive regional and national win</p> </div> <p><b>Gold Award 2020</b> @ 29<sup>th</sup> Chapter Convention on Quality Concepts (CCQC)</p> <p><b>Par Excellence Award 2020</b> @ 34<sup>th</sup> National Convention on Quality Concepts (NCQC)</p> <p><b>Awarded by:</b> Quality Circle Forum of India <b>Presented to:</b> Int-LOG Wizards of Flex GSS’ Logistics &amp; Material Department</p>
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## Chennai recognized for COVID-19 best practices

In recognition of our significant contributions towards implementing best practices in the prevention and management of COVID-19 in the workplace during the pandemic, our manufacturing site in India – the Chennai Industrial Park – was given the COVID Warrior Award by a consortium of nonprofits from Chennai that includes healthcare and human resources groups.

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## Manufacturing Leadership Awards

For our manufacturing efforts in 2020, we were recognized by the Manufacturing Leadership Council which honored us with the Manufacturing Leadership Awards for our achievements in:

### Collaborative Innovation

We quickly and effectively set up 12 manufacturing lines in 10 locations across the world in order to produce face masks to keep its employees safe. By relying on a connected network of experts, suppliers, vendors and employees, Flex was able to quickly create the infrastructure and processes needed to produce 1.5 million masks per week. [Learn more >>](#)

### Operational Excellence

We were recognized for our commitment to producing ventilators in order to help close the global shortage brought on by the COVID-19 pandemic. Flex delivered its first patient-ready ventilator in a matter of weeks and manufactured more than 50,000 ventilators between April and December of 2020, making Flex the largest independent manufacturer of ventilators in the world – all from a company with extensive experience in medical products, but had never manufactured a ventilator before the pandemic started. [Learn more >>](#)

### Enterprise Integration and Technology

In this category, we were distinguished by our use of simulation technology to create a digital twin of an existing factory in order to optimize the manufacturing process of a Class II diabetes product. By implementing the simulation, this project reaped multiple benefits in the areas of operations, technology and project management. [Learn more >>](#)

# Global media coverage highlights

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- [Union members race to convert factories to produce supplies for Covid-19 patients](#), Industrial All Global Union, March 26, 2020
- [‘It’ll never be fast enough’: 5 questions for a ventilator manufacturer](#), Fortune, March 31, 2020
- [GM Begins Ventilator Production At Indiana Parts Plant](#), Forbes, April 14, 2020
- [Keeping employees engaged](#), Human Capital Magazine, May 2020
- [Broadcast segment showing resumption of manufacturing at Flex, Sriperumbudur factory detailing steps taken to ensure employee safety](#), Raj TV, India, June 4, 2020
- [How one company manages supply chains for every single ‘essential’ industry](#), Fortune, June 11, 2020
- [In-house lawyers focus on fairness in the workplace](#), Financial Times, June 20, 2020
- [Meet Flex: One Of The Most Crucial Companies You May Not Be Familiar With](#), Forbes, June 22, 2020
- [How Manufacturer Flex Navigated Covid Shutdowns to Keep Apple Products and Philips Ventilators on the Market](#), The Washington Post, June 30, 2020
- [A Manufacturing Lifeline for Medical Devices](#), BISinfotech, India, July 3, 2020
- [We are passionate about solving our customer’s toughest problems](#), Electronics Maker, July 9, 2020
- [How a GC Protected a Company During COVID-19: An Innovative Organizational Structure](#), ACC Docket, July 28, 2020
- [Manufacturing a force for good during the pandemic by John Carlson](#), Med-Tech News, October 6, 2020
- [Accelerating technology adoption in the manufacturing industry](#), Electronics Maker, India, October 7, 2020
- [Pandemic Tests Flex’s Supply Chain Resilience](#), EPS News, October 12, 2020
- [On guard for breakdowns and rule breakers](#), Financial Times, November 19, 2020
- [Special delivery: the logistics of curing Covid-19](#), Pharma Technology Focus, December 2020
- [An all-seeing, no-touch future](#), Supply Chain Quarterly, December 7, 2020
- [Flexibility for the Future - How Disruption Fosters Innovation](#), MIT Center for Transportation and Logistics, December 15, 2020
- [Industry 4.0 will be more relevant in 2021: VP – Operations, Flex India](#), Express Computer, January 4, 2021
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- [3 women of colour on how to boost diversity from the outside in](#), Hellenic Shipping News, January 19, 2021
- [Reimagining the future: The changing face of supply chain](#), Amity webinar, January 29, 2021
- [A Lesson For The Vaccine Industry From The Future Of Flexible Manufacturing](#), Forbes Podcast, February 8, 2021
- [ECIA Charts a Resilient Electronics Industry](#), Connector Supplier, February 9, 2021
- [Pat Ring - Securing the future for business](#), Irish Examiner, February 12, 2021
- [Global Manufacturer Looks at Industry 4.0 Through COVID-19 Lenses](#), Industry Week, February 15, 2021
- [How Business Leaders Can Prepare for the Next Health Crisis](#), Harvard Business Review, March 2021
- [Enduring Lessons from the COVID 19 Pandemic](#), Supply Chain Management Review, March 1, 2021
- [For CFOs, Turnaround Chapters Frequently Open Doors To Bigger Opportunities](#), Forbes, March 3, 2021
- [Growing strong against the pandemic](#), Prestiz, March 18, 2021

Also available on YouTube: <https://www.youtube.com/watch?v=VIOR88hGIMc>



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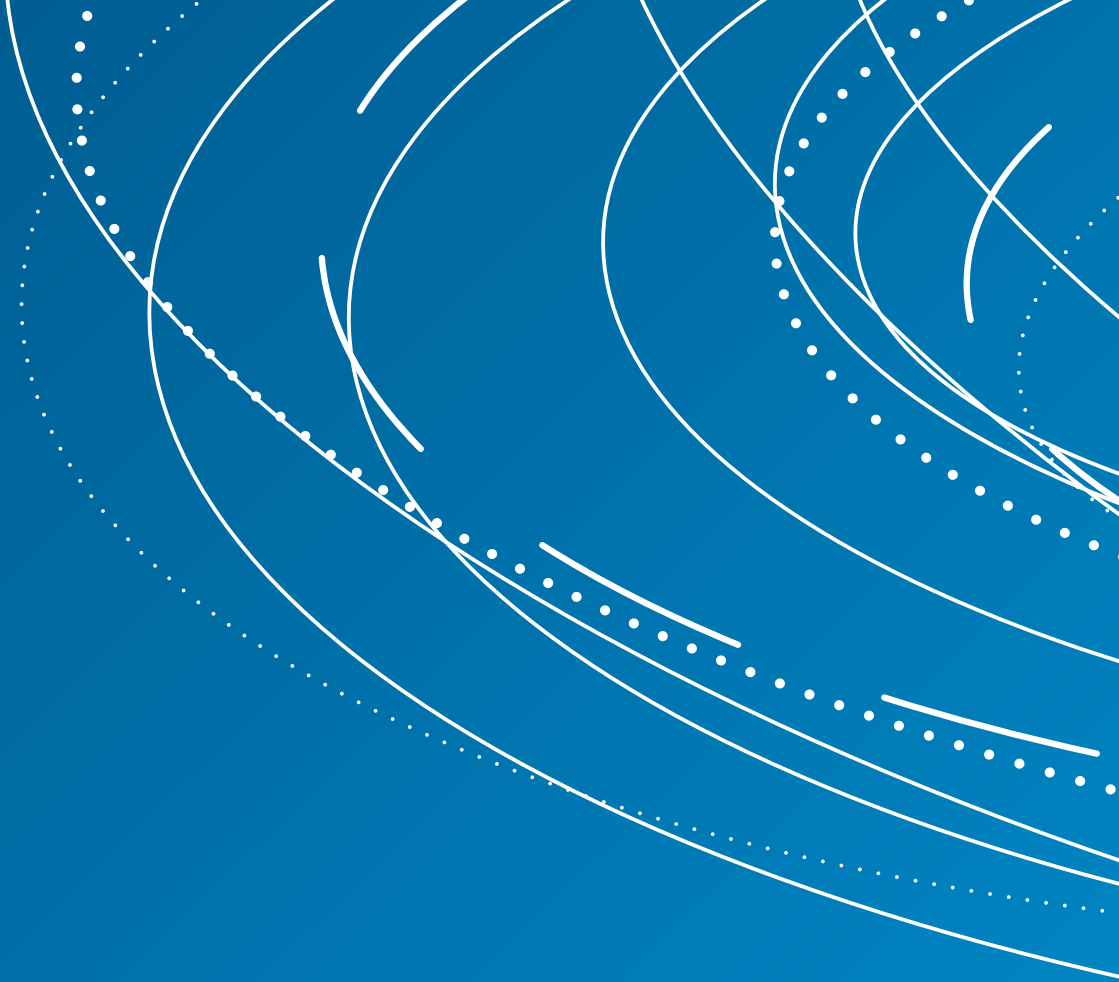
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During this year's Chinese New Year (CNY) holiday taking place in February, the government of China encouraged its citizens to stay put rather than return to their hometowns in a bid to curb the spread of COVID-19.

As Flex complied with this policy, we were positioned by the government as a model employer. At a time when people traditionally gather with family, we drew national and local media coverage for how we engaged and celebrated CNY with our employees, providing gift packages, bonuses, meals, and a virtual gala.

- [China Daily](#) focusing on CNY celebrations at Flex Dongguan and Zhuhai.
- [Dongguan TV](#) featuring an interview with HK Chong, GM of Flex Dongguan, on celebrating the festivities with employees
- [Bao'an TV](#) featuring an interview with Will Zhang, GM of Flex Fuyong.
- [Bao'an News](#) and [Bao'an Daily](#) interview a working mom to learn about her experiences celebrating CNY with her coworkers at our Fuyong site.
- [Dongguan TV](#) and [Dongguan TV-Dongguan](#) news profiled Flex Dongguan to describe how we ensured smooth production after CNY
- [Kunshan TV](#) interview with Todd Chu, GM of AGM, a Flex company



Flex (Reg. No. 199002645H) is the manufacturing partner of choice that helps a diverse customer base design and build products that improve the world. Through the collective strength of a global workforce across 30 countries and responsible, sustainable operations, Flex delivers technology innovation, supply chain, and manufacturing solutions to diverse industries and end markets. For more information, visit [flex.com](https://flex.com).

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