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A ROCKWELL AUTOMATION COMPANY

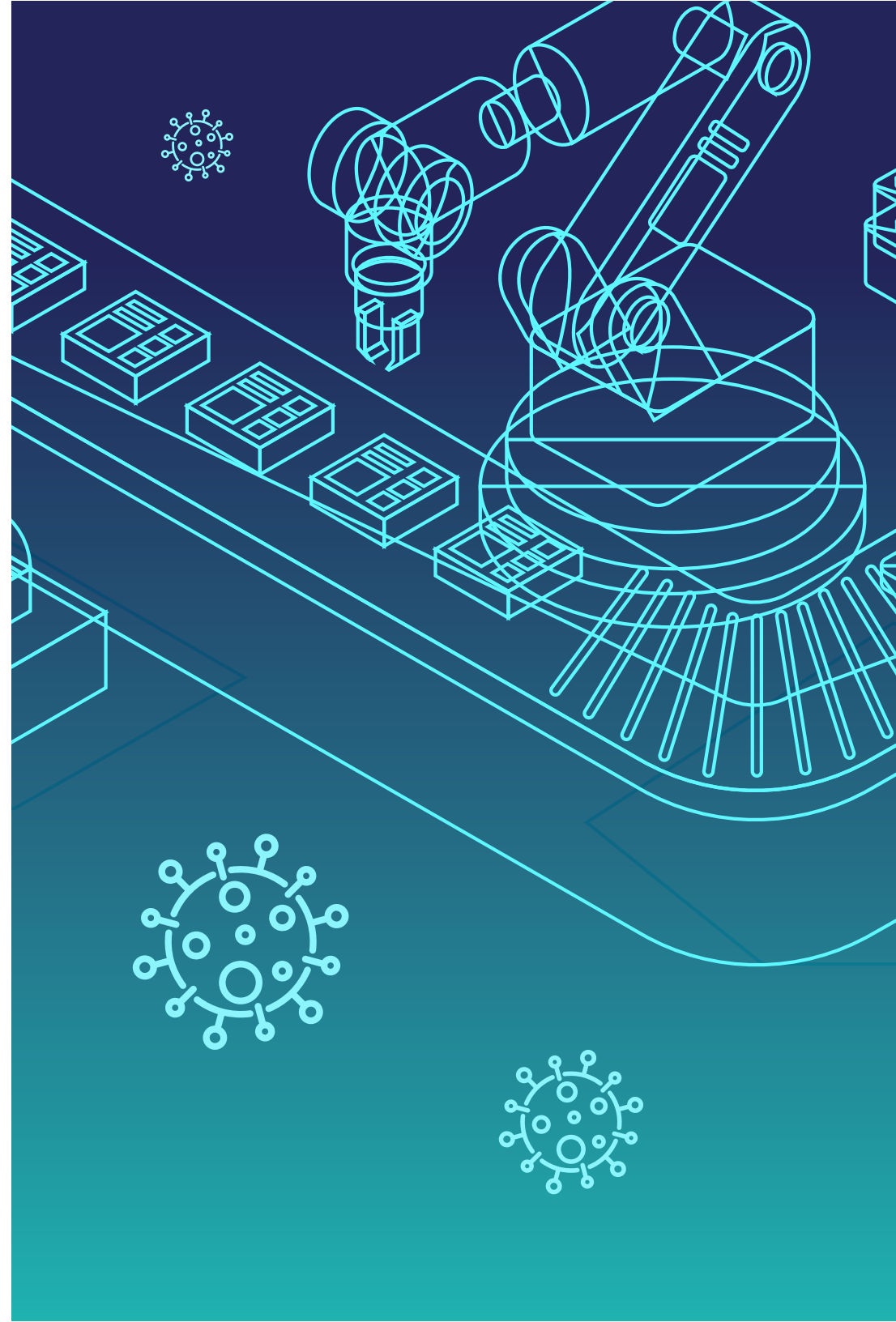
Manufacturing Playbook: How to Reframe, Stabilize and Optimize for 2020 and Beyond



Like most aspects of business today, manufacturing is challenged by extraordinary COVID-related disruptions. The challenges faced in 2020 alone—including volatile demand, supply chain disruptions, changing consumer behavior, surplus energy supplies and facility closures—may permanently redirect the course and role of manufacturers.

This playbook is a guide to crisis response and revitalization. It's geared toward plant managers and operations managers who are thinking about how to **reframe, stabilize, and optimize** operations for a future that is markedly volatile, uncertain, complex and ambiguous, all while ensuring worker safety.

The goal of this playbook is to provide guidance on how to recover more productively from unexpected disruptions by embracing both foundational and digital solutions, as well as considering social aspects of change.



But first, what is the “new normal” we keep hearing about?

Clearly, no one knows for sure. There is much debate and speculation, and many smart people performing thoughtful analysis. One excellent study with great insights was developed by some of our colleagues who are examining four possible future pandemic recovery scenarios for the consumer industries using foresights analysis (see K Kornet, et al, 2025 *Post Pandemic Futures*, Kalypso, 2020). This expert team currently sees indicators of all four recovery scenarios playing out across geographies. Time will tell which scenario will be the most prominent and if, or when, we will return to pre-COVID production levels.

But while we all hope the economy quickly returns to its pre-COVID tempo, it is also possible that we are already in the new normal. For example, many may be surprised to learn that SARS-CoV-2, the virus that causes COVID-19, is the third major coronavirus outbreak since 2000 (note that the coronavirus is but one of hundreds of virus types that can infect humans). And that COVID-19 is the 2nd global pandemic in the past 20 years (preceded by the H1N1 pandemic in 2009).

Health crises aside, manufacturers regularly and frequently experience major disruptions from social, environmental, and political events. While most of these have localized impact, a list compiled over the last 12 months alone would include social unrest and rioting, earthquakes, tsunamis, hurricanes, and shortages of materials and products due to operational interference from trade wars.

How to read the following infographic

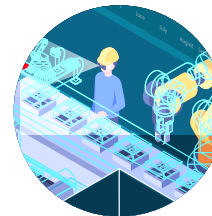
The following graphic summarizes key considerations for manufacturers as they navigate through the effects of the current pandemic, chart a course through recovery, and build a plan for resilience.

We organize these considerations and recommendations across four levels within the manufacturing organization starting with the **individual worker**, then expanding to the **production line**, further to the whole **plant or factory**, and finally to the entire **supply chain** of the company.

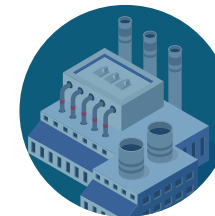
For each level, we also map the considerations to the stage of recovery—or timeframe—in which manufacturers will be able to practically address them. For example, complying with heightened PPE and social distancing requirements is a precursor to being able to reopen the plant, so it needs to be addressed in the initial, immediate recovery stage. A consideration like redesigning production lines or improving supply chain resilience will require more time to accomplish, and therefore likely will not be addressed until later stages.



Individual Worker



Production Line



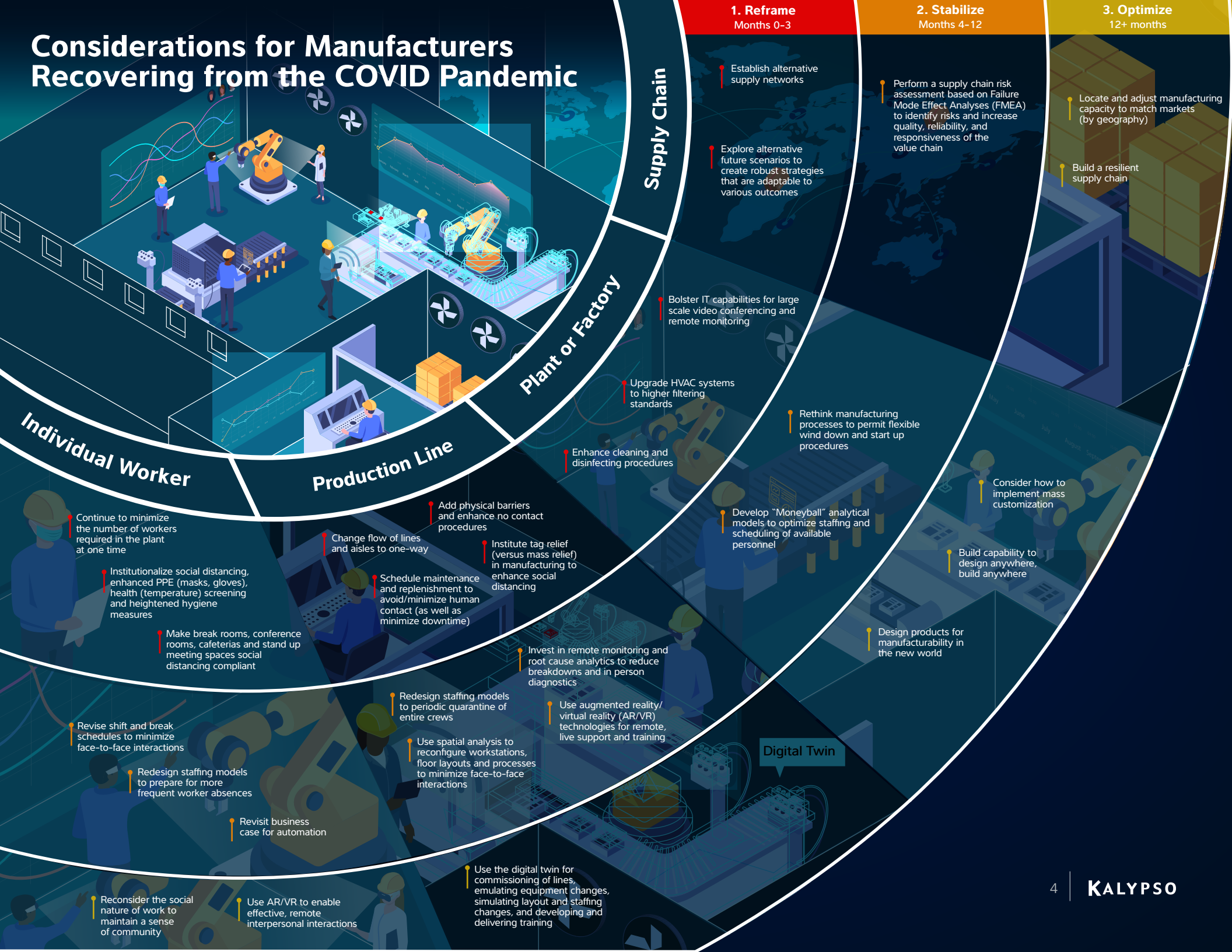
Plant or Factory



Supply Chain

See full infographic next

Considerations for Manufacturers Recovering from the COVID Pandemic



Individual Worker

- Continue to minimize the number of workers required in the plant at one time
- Institutionalize social distancing, enhanced PPE (masks, gloves), health (temperature) screening and heightened hygiene measures
- Make break rooms, conference rooms, cafeterias and stand up meeting spaces social distancing compliant
- Revise shift and break schedules to minimize face-to-face interactions
- Redesign staffing models to prepare for more frequent worker absences
- Revisit business case for automation
- Reconsider the social nature of work to maintain a sense of community
- Use AR/VR to enable effective, remote interpersonal interactions

Production Line

- Change flow of lines and aisles to one-way
- Schedule maintenance and replenishment to avoid/minimize human contact (as well as minimize downtime)
- Invest in remote monitoring and root cause analytics to reduce breakdowns and in person diagnostics
- Use spatial analysis to reconfigure workstations, floor layouts and processes to minimize face-to-face interactions
- Use the digital twin for commissioning of lines, emulating equipment changes, simulating layout and staffing changes, and developing and delivering training

Plant or Factory

- Enhance cleaning and disinfecting procedures
- Upgrade HVAC systems to higher filtering standards
- Use augmented reality/virtual reality (AR/VR) technologies for remote, live support and training

Supply Chain

- Establish alternative supply networks
- Explore alternative future scenarios to create robust strategies that are adaptable to various outcomes
- Bolster IT capabilities for large scale video conferencing and remote monitoring
- Perform a supply chain risk assessment based on Failure Mode Effect Analyses (FMEA) to identify risks and increase quality, reliability, and responsiveness of the value chain
- Upgrade HVAC systems to higher filtering standards
- Rethink manufacturing processes to permit flexible wind down and start up procedures
- Develop "Moneyball" analytical models to optimize staffing and scheduling of available personnel
- Consider how to implement mass customization
- Build capability to design anywhere, build anywhere
- Design products for manufacturability in the new world
- Locate and adjust manufacturing capacity to match markets (by geography)
- Build a resilient supply chain

1. Reframe Months 0-3

2. Stabilize Months 4-12

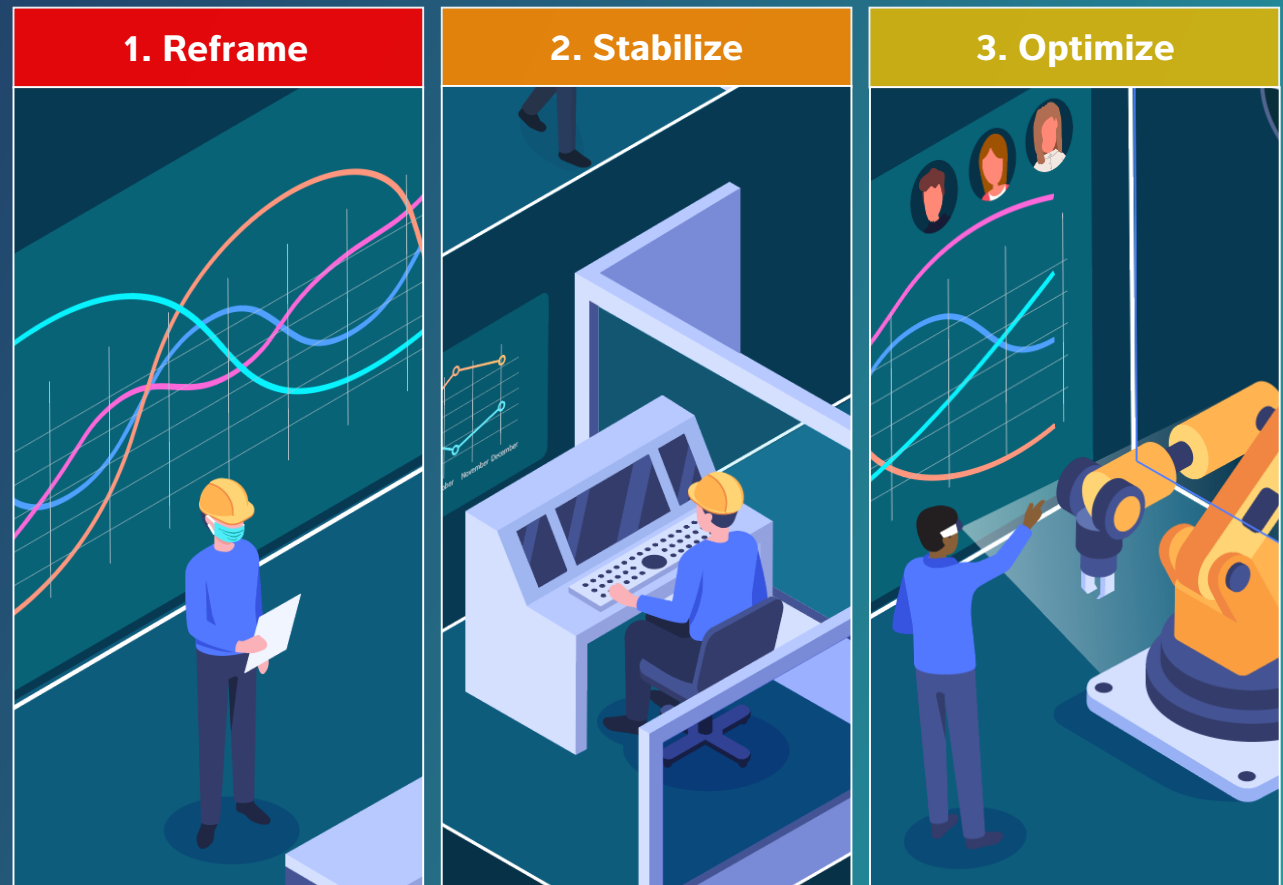
3. Optimize 12+ months

Digital Twin

Planning for Three Stages of Recovery

In the first stage, companies are **Reframing** their operations to function in a safe manner. This stage is likely underway and even complete for most manufacturers. Most of the changes required to comply with enhanced safety protocols have been straightforward – at least within the constraints of current technology and what is known about how COVID spreads.

For example, manufacturing processes that are inherently manual and performed in close quarters (e.g., meat packing, wire harness assembly, etc.), require fundamentally new approaches and technologies that will require time to adopt. Similarly, the sudden increase in the number of remote workers has strained some companies' IT infrastructures, requiring new investments to meet productivity needs and cybersecurity standards.



In the second stage, companies should focus on **Stabilizing** their operations and returning to pre-pandemic levels of performance. Companies should be prepared for occasional, disruptive spikes in illness. These spikes could range from handfuls of individual workers to entire lines or teams of workers, causing them to be absent for 10-14 days (e.g., to quarantine or to provide care for children if schools close). This requires a new approach to staffing of workers and covering for absentee.

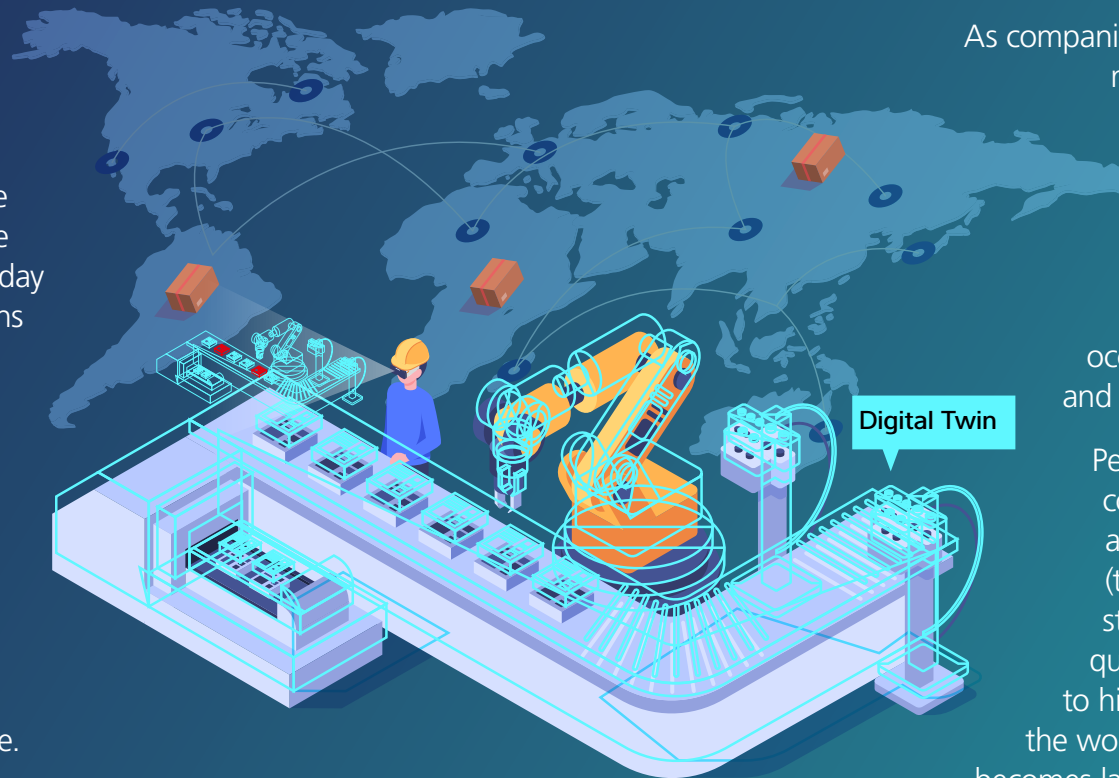
Companies should also revisit their original use cases and business cases for automation. Automation investments that may not have been cost justifiable, or even envisioned in the past, may now be attractive. For example, some companies are experimenting with robotic dogs for inventory cycle counting via RFID, while others are using robotic cleaners for disinfecting workstations with UV light. The strategy here is to apply advanced technologies to provide both productivity gains and enhanced safety.

Other examples include providing service and support remotely and training workers virtually using AR/VR-related technologies, thus reducing the number of people and person-to-person interactions on the shop floor. We have also helped clients apply advanced analytics to day-to-day operations to improve plant throughput.

Specific examples include improving equipment reliability and optimizing how workers are assigned to lines and machines. This is similar to the Oakland A's in the movie "Moneyball," where the specific set of workers who are available on any given shift or day can be assigned to workstations in a manner that predictably maximizes daily throughput.

In the third and final stage, manufacturers should focus on **Optimizing** for the future by securing the ability to meet a wider range of challenges as they arise, gaining flexibility and building resilience. Because of the longer horizon available to manufacturers who have successfully reframed and stabilized their operations, they can rethink fundamental manufacturing and supply chain strategies and capabilities.

For example, truly realizing the capability to design anywhere/build anywhere or mass customize products allows manufacturers to minimize disruptions in production in the case of future



COVID-like outbreaks. Similarly, using a digital twin of the production line reduces the time and amount of interpersonal interaction required to commission new lines as well as to analyze and repurpose existing ones. This enables the resilient supply chain. Adoption of such strategies and game-changing capabilities require time and commitment and are therefore recommended as part of a longer-term rethink of the manufacturing approach.

As companies COVID-proof manufacturing plants – with tactics like full time social distancing, elimination of the traditional lunch break, and increased automation – interesting discussions occur around the human and social aspects of work.

People thrive with social connections in both work and personal relationships (there have been several studies that link high-quality work relationships to high performance) What if the workday, even in the factory, becomes largely devoid of in-person interactions? If not addressed adequately, what are the lasting impacts on workers and job satisfaction?

What are the impacts on apprenticeship-based jobs and on companies that rely on person-to-person transference of tribal knowledge to capture and perpetuate expertise to new workers? And does increasing the level of automation and digitization in your operations mean you can upscale the workforce as quickly as you would like?

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We may already be living the new normal.

If we are, manufacturers must rethink and reframe their factory operations, revisit the value case for automation, and take advantage of advanced digital and analytical capabilities. This will give them the agility to recover from current crises and to weather future disruptions. Unfortunately, major health outbreaks, natural disasters, and social or political unrest occur more frequently than most people would think. But with significant recent advancements in technology, there are new opportunities for manufacturers to achieve resilience across plant and supply chain operations by applying a digital perspective to how they discover, create, make and sell products.

However, as the social fabric of the workplace also gets disrupted, attaining this level of adroitness may come with human consequences beyond health and safety concerns. Thoughtful plant, operations, and manufacturing managers will weigh these concerns as they recover and pursue resilience in their manufacturing and supply chains.

About Kalypso: A Rockwell Automation Company

Kalypso is a professional services firm helping clients discover, create, make and sell better products with digital. We help manufacturers use interconnected machines and devices, intelligent analytics and connected workers across the value chain to increase uptime, improve operational efficiency, reduce safety incidents and increase employee satisfaction. We have deep experience delivering solutions for smart connected operations, connecting the factory, the field and the enterprise.