KAIZEN PARADOX III –
A CASE STUDY: THE COVID-19 PANDEMIC & ITS EFFECTS ON THE GROCERY SUPPLY CHAIN.

HOW THE CYCLE OF IMPROVEMENT, TRANSFORMATION & INNOVATION BUILDS PRODUCTIVITY & RESILIENCE.

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LIGHTS-OUT LOGISTICS & THE FUTURE OF SUPPLY CHAINS

Imagine a warehouse full of produce, but no staff driving back and forth on forklift trucks, no load handlers examining products and picking items onto pallets, no electric light even – there's no need for light here – just sky high racking, shuttles, lifts, robots, conveyors and autonomous vehicles choosing their own paths through the darkness, self-navigating with laser guidance systems, detecting obstacles and moving silently past them. This is not some futuristic scene from a science fiction movie; this is Lights-Out Logistics, and it is here now. Through the darkness, a solitary light is being worn by a maintenance worker – looking more like a cave explorer than an electro-mechanical engineer. How did we get here and why?

This white paper will examine how Lights-Out Logistics has come into use, and how it can help our supply chains become more resilient in times of great uncertainty and disruption, such as pandemics and financial crises.

By way of example, we explore the effects of the COVID-19 pandemic on grocery supply chains, some of the measures that have been taken, and what can be done moving forward.

> This is not some futuristic scene from a science fiction movie, this is Lights-Out-Logistics, and it is here now.

THE KAIZEN PARADOX: A CYCLE OF TRANSFORMATION, IMPROVEMENT & INNOVATION

In the previous two white papers in this series, we examined the relationship between continuous improvement, radical transformation and innovation – giving some recent examples from the warehouse automation industry.

The first whitepaper explained how opportunities for transformation and innovation can often be impeded by a focus on continuous improvement, exposing otherwise successful companies to threats from rapidly developing competitors who seek to leapfrog them – a phenomenon we referred to as the Kaizen Paradox.

The second whitepaper explained how genuine innovation (Kakushin) can occur when Kaizen principles are applied to already transformative Kaikaku technology – a fact the head of Toyota confirmed, saying in a recent interview that they imitated and improved upon the state-of-the-art technology of their competitors and this led to innovation, and there's nothing wrong with that.

Long term, these effects can be illustrated within an organisation or an industry as a staircase of productivity gains, sometimes rapid and sometimes slow – where the rate of productivity increase is influenced by the type of improvement, be it Kaizen, Kaikaku or Kakushin.
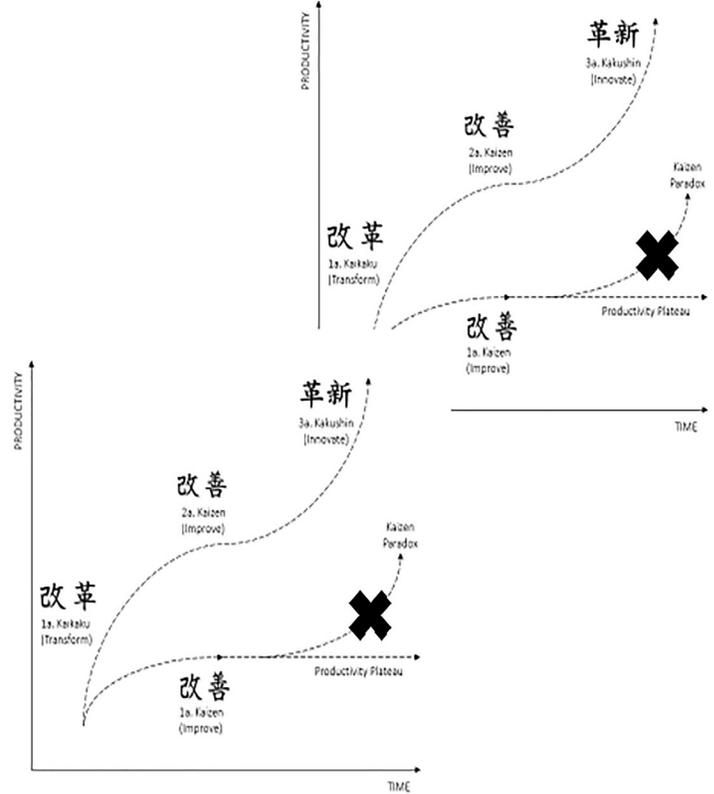
LEAPFROGGING FOR SURVIVAL: THE DRIVERS OF CHANGE

But what is it that is driving us towards greater and greater levels of automation inside warehouses and distribution centres, to the point where almost all the lights can be turned off in some facilities?

Typically, it's the increases in productivity, space efficiency, accuracy and the return on investment (ROI) these technologies bring; the so called "hard" factors which are the primary (and sometimes only) tool used for measuring the value of each automated solution.

But there are also mega-trends at work in industry, such as **globalisation**, **an aging population**, **health and safety**, **mobility**, **urbanisation**, **individualisation** and **digitisation**, and these also place indirect pressure on organisations to automate.

And then there is the accelerating effect of a crisis – necessity being the mother of invention – which acts as a catalyst for transformation and innovation in critical services by elevating problems and providing the opportunity, motivation and resources to overcome them.

Industry mega-trends: globalisation, an aging population, health & safety, mobility, urbanisation, individualisation & digitisation.
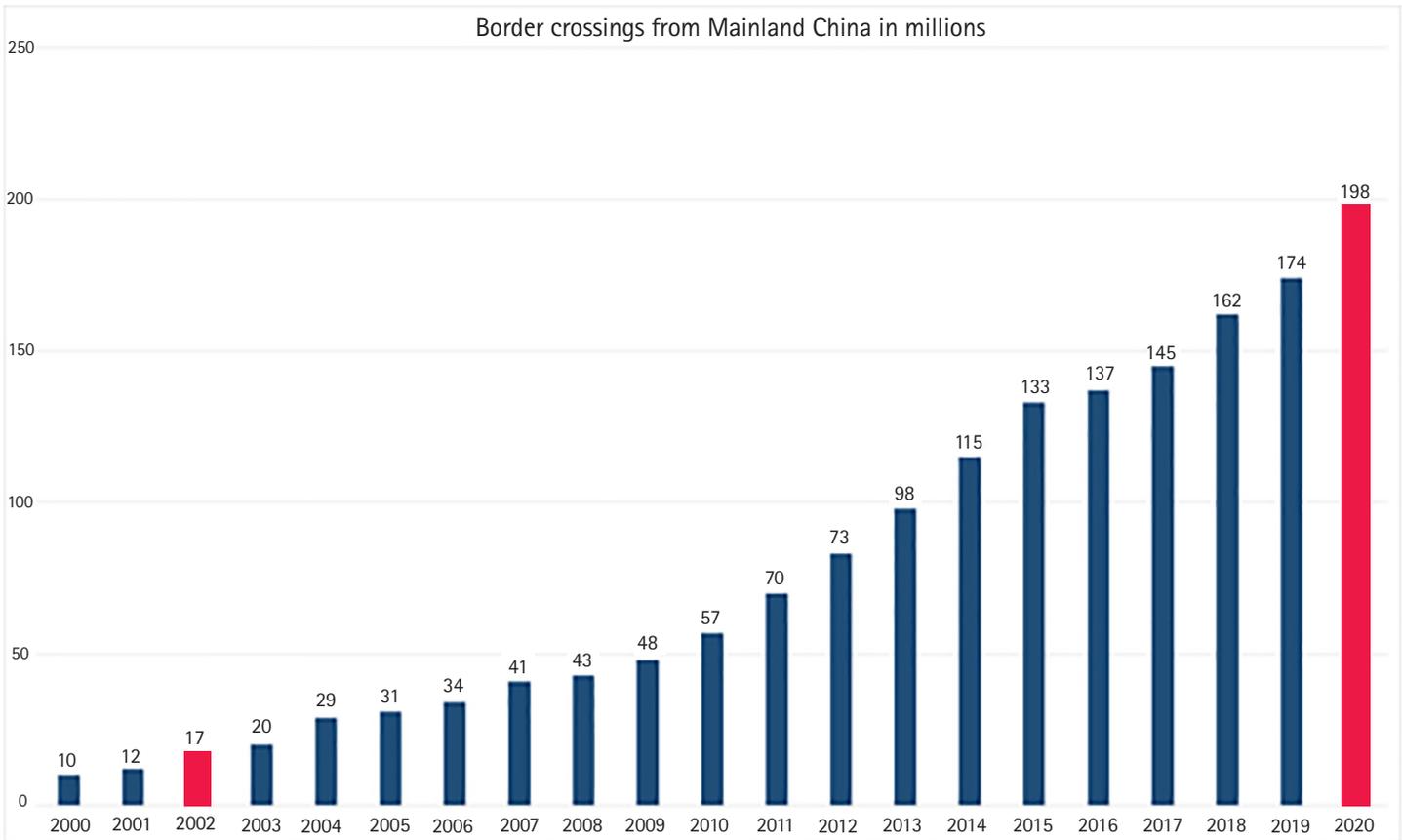
A CASE STUDY: COVID-19 AND THE GROCERY SUPPLY CHAIN

On Dec. 31, 2019, China alerted the world to a novel coronavirus spreading within Wuhan. By Feb. 11, 2020, the WHO declared COVID-19 (also known as the novel coronavirus, SARS2 or CoV-2) a global pandemic, and on April 1, 2020, the UN chief described it as "the greatest challenge the world had faced since WW2," with ripple effects spreading quickly through every part of industry.

It is telling that some of the same mega-trends that have contributed to a recent double-digit annual growth across the intralogistics automation industry have revealed themselves to be the most significant epidemiological factors driving the spread and impact of the COVID-19 viral pandemic, and so its effect on the supply chain can therefore be examined under the same microscope:

Mobility: The world first learned about COVID-19 via reports from its epicentre in Wuhan in late December 2019. Within weeks, it was detected in multiple cities around the world, as businesspeople and tourists carried it with them on their travels and fell sick abroad. Adding to the speed with which COVID-19 spread outwards from China was the increasing mobility of its burgeoning middle class (see below graph). Within a few months, it had spread worldwide, borders were closed, airlines grounded, and the world economy was in deep crisis.

"The greatest challenge the world had faced since WW2."

Border crossings from Mainland China in millions

Year	Millions
2000	10
2001	12
2002	17
2003	20
2004	29
2005	31
2006	34
2007	41
2008	43
2009	48
2010	57
2011	70
2012	73
2013	98
2014	115
2015	133
2016	137
2017	145
2018	162
2019	174
2020	198

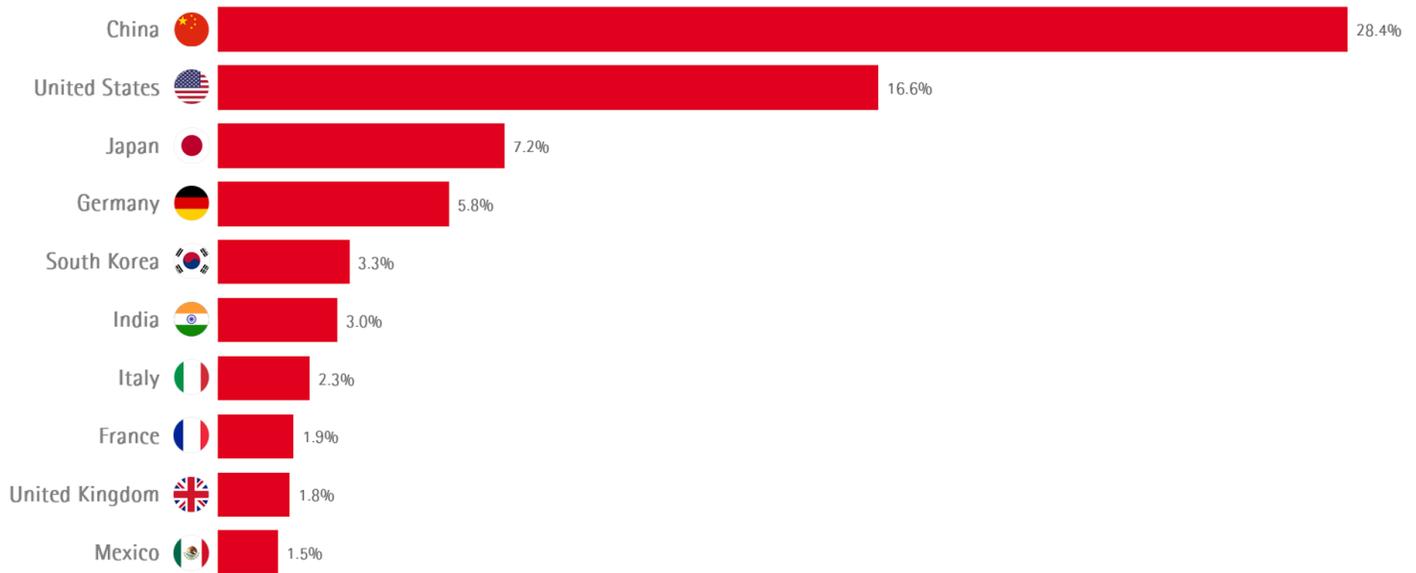Border Crossings from China in Millions – Source: COTRI Analytics

This was not the first novel coronavirus to originate in China. In November 2002, SARS (severe acute respiratory syndrome) appeared there; however, COVID-19 (SARS2) had a higher R0 (rate of person-to-person transmission), and while initially it appeared that mortality rates were much lower than SARS1 – in some countries or states such as Italy, Spain, the UK and then major cities like New York, as the virus affected more people and ICUs became overwhelmed, the mortality rate increased toward 10% (equivalent to SARS).

Within the food supply-chain, the loss of a backpackers and other foreign labour raised immediate concerns.   Many of our farms and orchards relied more on this mobile workforce to harvest crops, and they may now have to start turning their produce back into the soil. Online retail was also affected, with an increase in demand for home delivery services, which became a vital source of income for retailers, restaurants and transportation workers, but new practices were needed to prevent person-to-person transmission.
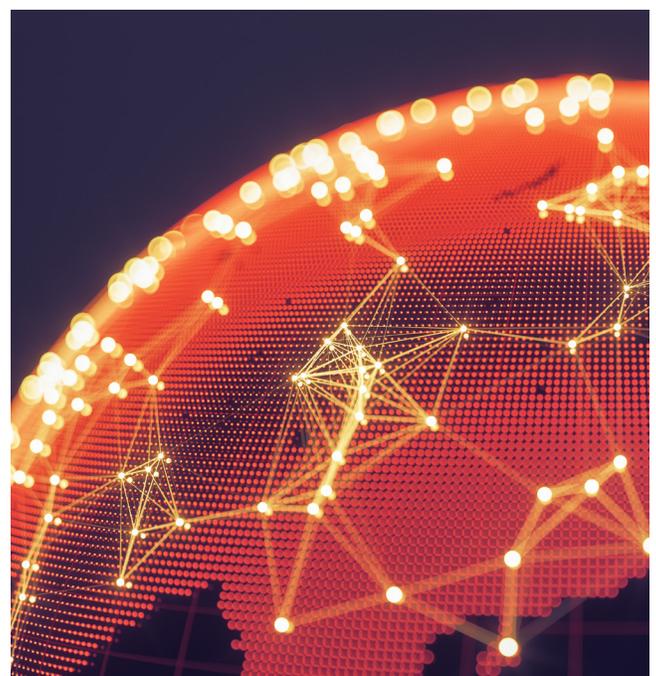
China is the World's Manufacturing Superpower

Top 10 countries by share of global manufacturing output in 2018

Country	Share
China	28.4%
United States	16.6%
Japan	7.2%
Germany	5.8%
South Korea	3.3%
India	3.0%
Italy	2.3%
France	1.9%
United Kingdom	1.8%
Mexico	1.5%

Top 10 countries by share of global manufacturing output (Statista)

Globalisation: As governments searched for ways to build a virtual wall around their nations and states, the world economy entered a period of unexpected deglobalisation, the air cleared above the world's factory – China, and questions inevitably were asked. How reliant are we on imports? If they've shut down their production can we still get what we need? In 2018, China accounted for around 28% of global manufacturing output – 12% higher than the USA (see graph).

Almost daily during the outbreak, the news services interviewed a grocery chain operations chief or CEO inside either a busy manual warehouse or a busy grocery store, who each made a similar appeal to the public – 80% of what we sell is locally grown or manufactured, and our manufacturers are working around the clock. We just can't get it to our stores quickly enough to meet the current demand – please just buy what you normally would.

The general public largely ignored this request, and within a few weeks multiple temporary distribution centres were being established in an unprecedented effort to meet demand. A brief respite to reports of widespread unemployment became the availability of thousands of jobs created within grocery supply chains and online shopping (Amazon hiring 100,000 alone, and Woolworths hiring an additional 20,000).

Percentage of Population Over 65 years of Age
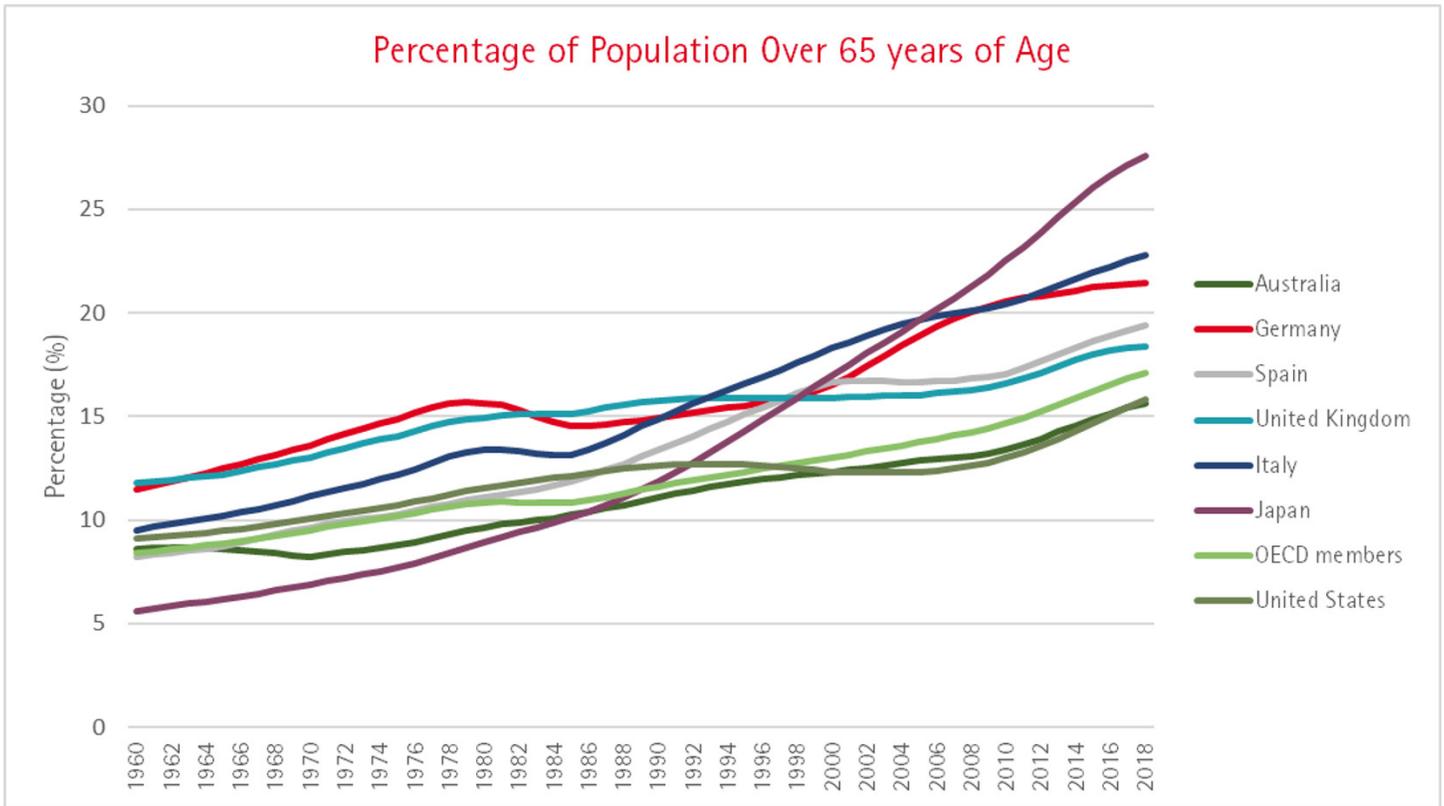
Percentage of Population over 65 years of age (World Bank Statistics)

An Aging Population: Early on, COVID-19 virus revealed itself to be a grave threat to those over 70 years of age. And for those with underlying respiratory health conditions, it was life threatening. The high rate with which it spread within cities and the overwhelming number of elderly sufferers it placed into ICUs was of particular concern due to our aging societies (see graph). To minimise the harm, we were asked to stop traveling, self-isolate and work from home if possible, only venturing out to shop for food, seek medical assistance or exercise – this would be the only way to stop the spread.

Millions of ordinary people, fearful of being exposed to the virus, of being quarantined for weeks or of stock running out, stocked up in unison, placing unprecedented demand on grocery chains and their online services. Within hours, certain shelves in supermarkets were picked clear by panicked shoppers, and delivery slots for online grocery services were booked out for weeks in advance, forcing major retail chains to re-think the way they supported their customers throughout the COVID-19 pandemic.

Several major grocery chains have made the tough decision to restrict their online shopping and home delivery services at a time when they were in greatest demand, so that they could focus on getting food to the elderly and replenishing empty shelves. Another implemented "community hour" in the early morning to assist older shoppers and more vulnerable members of the community, which certainly helped, but couldn't completely resolve the problem as long queues formed and many of the shelves were still empty.

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Health and Safety: Grocery stores, once places to do our weekly shopping, were now understood to be critical infrastructure that would be kept open in any scenario, presenting a serious dilemma; how to protect the health and safety of frontline workers who could become exposed to the virus through interaction with seemingly well customers and vice versa.

The long gestation period of the COVID-19 virus (up to and sometimes exceeding 14 days with no symptoms while potentially contagious) meant that a simple temperature check of staff and customers at the door would not suffice. Social distancing rules were put in place at checkouts, guards appeared at doors, and limits were placed on how many customers could enter at one time.

And what happens to a grocery chain Distribution Centre (DC) if a positive case is detected inside one of them? At one airport, several baggage handlers tested positive, and the concern was that as they had all handled thousands of bags for passengers, and as the virus could survive on surfaces for a day or more, they had just became an unwitting vector for other travelers, airport workers and taxi drivers. An aircraft was turned back, and others were grounded, such was the level of concern. Could the same thing happen in grocery DCs?

Increasing demand on manual operations within DCs also meant an increase in forklift movements and increased risk of collisions and injuries. Not to mention – new workers in their thousands were being put into unfamiliar roles in these busy environments, so the risks weren't limited to the spread of the virus but to general matters of health and safety.
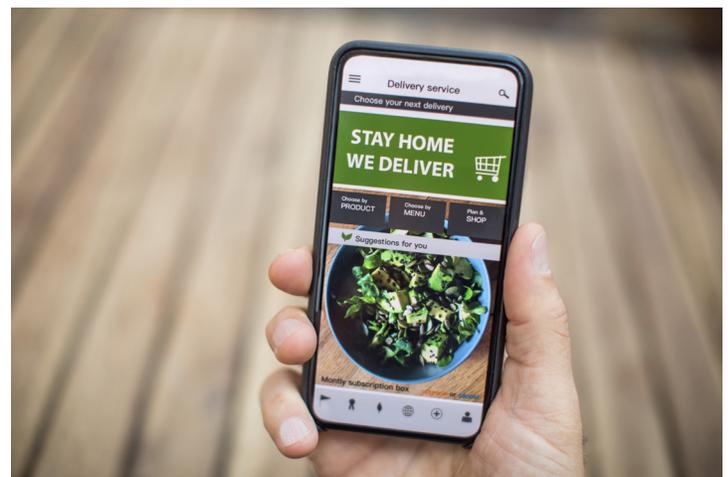

Urbanisation: An unfortunate byproduct of urbanisation is that shoppers have a very limited appreciation for the current resilience of the grocery supply chain. They are unable to see the months of inventory held in warehouses and DCs or see the increased output from factories in industrial estates – they can only react to what is missing from the shelf. Of course, much of the prolonged spike in demand for certain goods was unnecessary, if each household increased their weekly shopping by a little bit to gradually make up their quarantine stockpile, the supply chain would cope.

But what drives millions of urban consumers to panic buy in times of crisis is initially a lack of preparation (many shop day-to-day) followed by the fear of missing out – and like a run on the banks, this drives normally calm people to react in ways they normally wouldn't. And people have long memories, so the unfortunate reality is, the same thing will likely happen again next time there is a crisis, and more shelves will be emptied for longer.

Individualisation: The virus affected everyone differently. Men appeared to be at greater risk of dying than women. Children and young people, while they may not have been dying in as high numbers as the elderly, were still at risk for serious and potentially debilitating diseases and were seen as high-risk carriers due to their comparatively lax attitude to hygiene practices and social distancing rules. The CDC reported that 12 percent of known COVID-19 cases in the U.S. have resulted in hospitalisations, and 20 percent of those hospitalisations were among those ages 20 to 44. The list of potential risk factors for individuals grew longer by the day, as did the demand for ventilators.

And in a modern world full of choice for the consumer, where even a can of tuna comes in three sizes and 10 types, and mass customisation is becoming the norm, one of the more startling symbols of the crisis was the decision by a grocery chain to make up ration boxes full of the same selection of essential items for the elderly and more at risk and sell them online. A great initiative, and one that was sadly needed, but stood in stark contrast to the mega-trends.

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Digitisation: One of the few weapons the modern world had against the disruption caused by a pandemic was undoubtedly the internet. And businesses, medical services and grocery chains alike made good use of it during the outbreak. Aside from the working from home practices many were newly getting accustomed to, doctors' appointments were moved online, as were personal trainer sessions, social events, movie releases and – for a rapidly increasing number of customers – grocery shopping, at least until some online services became overbooked and needed to be targeted to just the most in need.

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HOW WE CAN IMPROVE, TRANSFORM AND INNOVATE FOR BOTH PRODUCTIVITY AND RESILIENCE

As explained by the CEO of Americold in a BBC article in mid-April 2020, there has never really been a shortage of food during the outbreak because, at any one time, up to three months' worth of goods have existed inside the supply chain. The challenge has been getting it out of suppliers' warehouses, into and out of the grocery supply chain National Distribution Centres (NDCs), Regional Distribution Centres (RDCs) and local DCs and onto the stores shelves fast enough to keep up with demand.

High density, high throughput Automated Storage and Retrieval Systems (ASRS) technology for pallet handling, such as Swisslog's PowerStore, could be a real game changer in these prolonged spike scenarios moving forward – providing much needed horsepower to grocery chains willing to shift their focus from just-in-time to just-in-case.

It has already been deployed inside the beverage supply chain, where a low number of very fast moving SKUs distributed at pallet level is the norm, but it could work just as well inside the grocery supply chain to look after the top 200 or so most in demand products (whatever they might be).

Depending on the scale of investment, these systems can move from hundreds to thousands of pallets per hour into and out of individual DCs, far more quickly, efficiently and safely than is possible with forklift trucks. When the demand spike is over, PowerStore could then be fully utilised as the engine of a dynamic case pick or layer pick system.

Urban Micro-Fulfilment Centres (MFCs) utilising low footprint, high density, Goods-to-Person (GTP) online order processing technology such as AutoStore have been available for many years now, while Goods-to-Robot (GTR) technology such as ItemPiQ has recently been added.

One of the reasons it has not been widely implemented is that traditionally not a large enough percentage of customers in each urban area shopped for groceries online – so the ROI for MFC has been quite long. This has been changing in recent years, and one of the ripple effects of this pandemic, as was witnessed in the GFC a decade earlier, will be that it will change enough customers' behaviour toward more use of online shopping.

Once online shopping is supported by highly automated MFC systems in urban areas, then many of the mega-trend

challenges faced by the grocery supply chain, which we have shown become amplified in a crisis, can be systematically addressed.

Firstly, as MFCs receive and process their orders digitally, they can operate 24/7 when required (unrestricted by trading hours and consumer behaviour), enabling prolonged spikes in demand to be managed with the minimal addition of labour. And, as much of the picking and replenishment occurs at ergonomic workstations in such systems, social distancing and worker health and safety in general, are simplified.

Secondly, MFC technology can be combined with convenient drive thru or curbside click-and-collect systems and number plate recognition systems can also be used to identify the customer as they arrive and quickly bring their order out to them. In the USA, some click-and-collect grocery services have already used this streamlined process to load groceries directly into the trunks of their customers' cars – which further streamlines the operation, assists the elderly and enhances social distancing.

Thirdly, as networked MFC systems know instantly what inventory is available in each AutoStore and can foresee shortages due to orders received in each urban area, a more preemptive and rapid replenishment process will help to ensure stock levels are maintained. It is also very difficult for security staff to recognise individuals who are hoarding if they come and go from stores and at different times of the day/night, whereas every online shopper is uniquely identifiable and can be purchase history tracked.
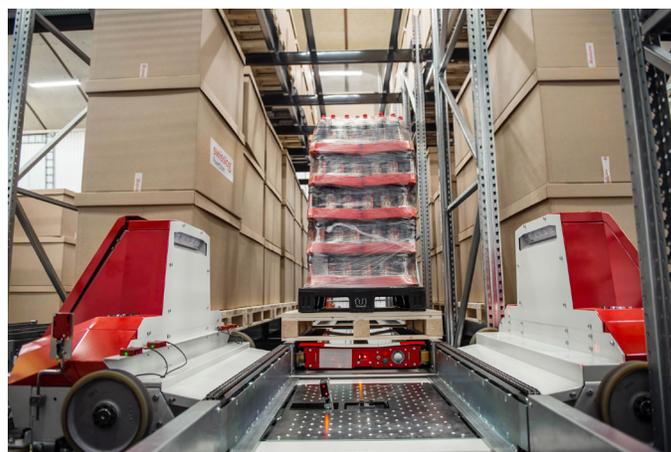
RECOMMENDATIONS FOR BOARDS AND MANAGERS

One of the learnings from the COVID-19 pandemic is that mega-trends (an aging population, globalisation, health & safety, mobility, urbanisation, individualisation and digitisation) need to be given more consideration and weight than in the past. They need to be put alongside traditional financial benefits when considering opportunities for transformation in critical services – something we all now recognise the grocery supply chain to be.

The old adage of "Don't build the Church for Easter Sunday" when it comes to investments in automation, where grocery chains have traditionally found manual workarounds for the peak days, which are highly predictable in their timing (national celebrations) and limited in duration, may also need to be reconsidered. A focus on just-in-time will have to be widened to just-in-case, as "Easter Sunday" can now appear unexpectedly and last for months – at least for non-perishable staples.

The wider industry is also recognising that embracing automation and robotics is a powerful tool for deglobalisation, reshoring the local supply chain and re-creating jobs in the home markets, as for many processes, much of the labour cost can be removed. Interestingly, China has recognised this fact earlier than most countries and is the largest consumer of industrial robots in the world today.

Industry as a whole has always been resilient, and many local companies are already planning for post-virus operations by putting in place measures to increase efficiency and better serve their customers. It will be interesting to see if companies - particularly those involved in logistics and e-grocery industries adopt automation strategies in response to COVID-19, and whether they see productivity and profitability gains that they otherwise wouldn't have experienced.

And just as there have been many pandemics before this one, it's almost inevitable that there will be another one in the future. The exact date of the next one is impossible to predict, but if implementing well thought-out automation strategies has ongoing benefits, and helps during a pandemic crisis, that's a double benefit that's hard for industry to ignore.

Paul Stringleman
Paul is a Senior Consultant at Swisslog. He began his career in intralogistics 20 years ago in Tokyo, Japan and has spent 15 of the last 20 years living abroad and designing large scale automated systems for airports and distribution centres. In the past five years, Paul has developed several data driven automated warehouse solutions for e-commerce/retail companies in Australia.

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