THE RETAIL LANDSCAPE IN 2020 AND BEYOND

24 TECHNOLOGIES THAT WILL MAXIMIZE SAFETY AND SALES

PRESCOUTER

Contents

Intelligence Brief Question

Intelligence Brief Question

How will the consumer experience change as retailers strive to maximize transparency, safety and sales? What does the future of retail look like?

The retail sector has been greatly affected by the COVID-19 pandemic. In order to get the economy safely back on track, it will become imperative for both large and small retailers to re-evaluate the consumer journey. How can consumer confidence and personal connection be re-established to increase interaction? How can safe practices become optimized for both customers and retail staff? How can infected individuals be detected in real time to minimize disruptions and shutdowns? How can one maximize their sales during periods of restricted occupancy?

Existing technologies from other sectors and emerging technologies can be translated to the retail space in light of the “new normal” conditions that will be prevalent from here onwards.

In this report, we highlight examples and use-case scenarios to provide a view into the future of the retail shopping experience.

Executive Summary

Executive Summary | Key Takeaways

- The pandemic has catalyzed the development and implementation of technologies that were poised to affect the consumer experience in retail, such as AR/VR and interaction-less shopping.
- Higher-tech disinfection and sanitization technologies from other industries, such as healthcare, food safety and airlines, will need to be commodified and scaled for use in retail spaces.
- Rapid and real-time thermal and occupancy data will become key to isolate infected customers and ensure rapid foot traffic turnaround for maximized sales.
- Technologies for providing a visual indication of disinfection/sanitization or to ensure compliance to best practices will become commonplace to restore consumer trust.
- To replicate in-store experiences, AR and VR experiences will become crucial for product categories that involve sampling: cosmetics, apparel, etc.
- Opportunities exist for retailers to brand and package their services/experiences for consumers to replicate in their own homes.

Executive Summary | Maximizing Sales With Minimal Occupancy

As the population emerges from “shelter-in-place” restrictions, consumers are very likely to be apprehensive about resuming their retail shopping experience at the same level as prior to the COVID-19 pandemic. This in addition to the reduction of occupancy limits, translates into reduced foot traffic in stores.

In order to cope with this, retail businesses need to come up with new strategies such as, encouraging bulk buying from the limited customers in-store, increasing rapid turnover of customers within stores to bring up foot traffic to pre-COVID-19 levels, and embracing technologies which promote a contactless shopping experience.

According to PwC Canada’s 2020 Consumer Insights Report that surveyed 1000 Canadian consumers:

17%

Don't feel comfortable shopping in a grocery store

26%

Don't feel comfortable shopping in a physical store

38%

Don't feel comfortable going to a mall

Executive Summary | Transitioning to a Touchless Sampling Experience

Product sampling is one of the key sales techniques for retail industries. But due to the hygiene conditions brought about as a consequence of COVID-19, most of these practices have been put on hold.

In retail clothing stores, customers are reluctant to try on clothes which may have been potentially tried on by other patrons. This has led to suspension of trial and return policies.

Similarly, food sampling has been also halted due to potential transmission issues.

Beauty and cosmetics industries which heavily rely on store patrons trying on products that are available as communal testers, or through makeovers and facials, are also impacted. This has prompted the complete removal of testers from stores, as make-up goes onto the face, as it is a highly effective route for the transmission of pathogens directly to the nasal, mouth, and eye membranes.

Given that such conditions will prevail until a vaccine is developed, followed by the development of herd immunity, these industries need to pivot to a touchless experience, with augmented reality (AR) expected to make a huge impact.

Executive Summary | Rapid Thermal Monitoring

A potentially infected individual being feverish is one of the very few outwardly symptoms that currently enables large scale screening of people. Currently, large scale thermal screening is only being implemented in airports to screen for sick tourists and returning international travellers, and in manufacturing and processing industries to screen workers.

With businesses reopening and restrictions lifting, and the incipient influx of large groups of people in shopping malls and retail areas in general, it is becoming increasingly evident that large scale rapid thermal monitoring has to be implemented to prevent resurgence of infections, giving rise to a second wave.

Currently, temperature screening is optional, and the stores that choose to do it are employing temporary workers who screen customers one by one, using thermometer guns. This not only is highly inefficient and throttles foot traffic, it also potentially exposes store employees to infected individuals.

Hence, a long term solution that does not put store staff at risk, is also cost efficient, and enables rapid thermal monitoring must be sought.

Executive Summary | Location & Occupancy Data Acquisition

Retail businesses are used to focus on driving customers to their stores and keeping them there for as long as possible to encourage more purchases. But with the store occupancy limits reduced to half in most states, they now have to focus on having a rapid turnover of visitors to their store to recoup the loss from reduced store occupancies.

Many of the technologies that were previously employed by some stores to understand foot traffic patterns and customer crowding behaviour around product displays, will now have to be repurposed to maintain social distancing.

It is not only important to count how many people enter the store, it is just as important to know that if the same number of people have also left the store. If not, then this is an indication that a customer is staying in the store for much longer than usual. This may be an indication of the individual not following social distancing guidelines or an emergency of some sorts.

This kind of data is crucial for the store, as the layout also would need to be redesigned to enable a frictionless shopping experience for the task oriented shopper, and hence promoting a rapid turnover of customers.

In theory, it is possible that virus-containing microdroplets expelled by an infected person can be circulated throughout buildings by the HVAC system. There have been reports that suspect that such microdroplets were circulated by the air conditioning system in a restaurant in China. In early July of 2020, the WHO acknowledged that airborne transmission of the coronavirus may be a threat indoors.

Large droplets discharged by an infected individual's sneeze or cough will land within a distance of 6 ft or 2 metres, which is the prime way of the transmission of the disease. But smaller droplets may remain suspended in air for hours, hence for all intents and purposes it is airborne.

Moreover, it is advised that air-conditioning systems not be shut off, at least during the summertime, as this may result in thermal stress, which may again induce life threatening conditions within the customers. Current recommendations are to keep windows open or to use an AC unit that brings in air from outside, as opposed to recirculating the air existing within the building.

Hence, opportunities exist to incorporating virus filtration technologies in both large and small retail spaces to further restore customer confidence and improve safety.

Executive Summary | Mass Automated Disinfection

With the prevailing COVID-19 situation, stores have to focus more than ever on sanitation and disinfection. This not only increases the need for hiring of a large number of temporary new personnel, but it also competes with important tasks like restocking of products, especially now when stores would also be focusing on having a rapid turnover of customers. This shortage is further compounded by the need for increased frequency of cleaning and disinfection of surfaces.

So, instead of deploying more manpower in this direction, it would be prudent to automate these processes by means of using **robots**, in conjunction with advanced new technologies which keep surfaces disinfected for much longer periods of time.

Post COVID-19, retail businesses have a golden opportunity to address these longstanding issues with the customer retail experience and revamp the store, as going forward only the stores offering the best retail experiences would entice customers to risk a visit to a brick and mortar store.

The Retail Landscape in 2020 and Beyond

Future Solutions

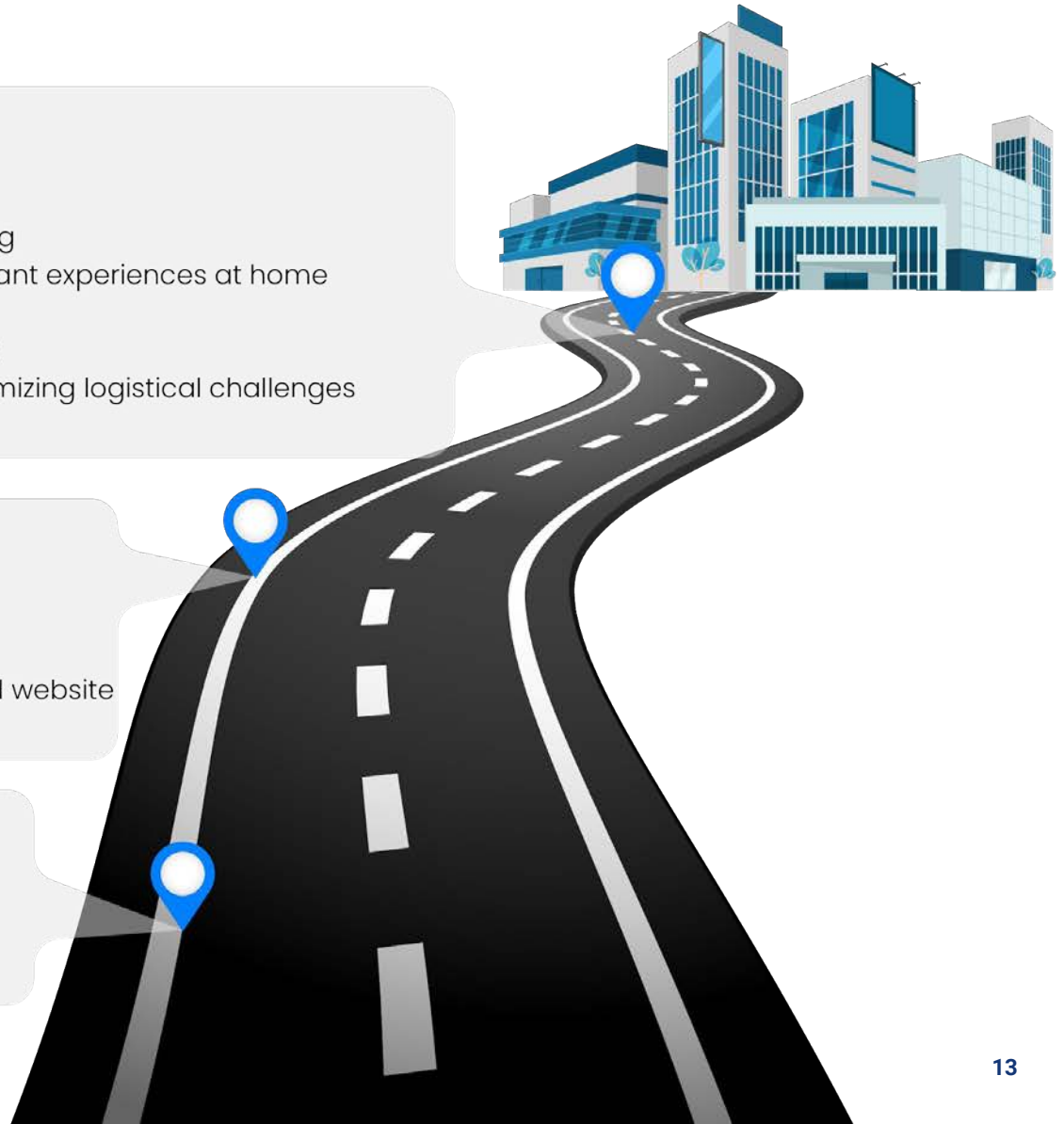
- Touchless shopping
- AR/VR-enabled shopping
- Heat mapping / real-time temperature monitoring
- Branded DIY kits to recreate retail/service/restaurant experiences at home
- Virus-deactivating air filtration
- Mass and automated disinfection in retail spaces
- Geo-fencing to maximize pickup sales while minimizing logistical challenges
- Robotics for disinfection and customer service

Currently Implemented Solutions

- Masks, social distancing
- Sanitizer sprays and wipes
- Emphasizing online sales and curbside pickup
- Enhancing the customer experience via apps and website
- Touchless payments

Current Challenges

- Occupancy restrictions and consumer unease
- Large-scale disinfection
- Tedious point-by-point temperature mapping
- Unable to sample food or try on clothing



24 Technologies Revolutionizing the Retail Sector

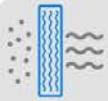
RAPID THERMAL MONITORING

14. Disposable Clinical-Grade Adhesive Thermometer Strips
13. Walk-Through Temperature Detectors
12. Infrared Thermal Cameras - Smartphone-Based
11. Infrared Thermal Cameras - Commercial and Industrial Grade

RAPID LOCATION AND OCCUPANCY DATA ACQUISITION

15. Non-Camera Based Occupancy Data Acquisition
16. Camera-Based Occupancy Data Acquisition
17. Social Distancing Through Proximity Bracelets

AIR PURIFICATION



18. Solutions for Large-Scale Premises
19. Solutions for Small Spaces
20. Personal Air Sanitization & Hygiene

MASS AUTOMATED DISINFECTION

21. Microcapsule and Nanoparticle-Based Antimicrobial Sprays
22. Sanitization Booths / Walk-Through Tunnels
23. Autonomous Mobile Robots for Wet Disinfection
24. Autonomous Mobile Robots for UV Sterilization

MAXIMIZING SALES WITH MINIMAL OCCUPANCY

5. At-Home Kits for Retail Service Providers
4. Robots for Last-Mile Delivery & Micro-Fulfilment
3. Curbside Pickup With Geofencing
2. In-Store Navigation & Product Location
1. Checkout-Free / Just Walk Out Shopping

TRANSITIONING FROM IN-STORE SAMPLING TO A TOUCHLESS EXPERIENCE

10. Take-Home Food Sampling
9. VR, Mixed Reality, & AR in Product Sampling
8. AR in Cosmetics Sampling
7. Motion Sensing and AR in Apparel
6. Interactive Shop windows

PRESCOUTER

MAXIMIZING SALES WITH MINIMAL OCCUPANCY

Challenges:

- Store occupancy limited to 50%
- Reduced foot traffic = reduced sales
- Need for rapid turnover of customers
- Need for boosting bulk buying
- Need for contactless shopping experience
- Messy and cluttered store
- Reduction of friction in an efficient shopping experience

Potential Solutions:

- ✔ In-store ambience: lighting, scent, and music
- ✔ Visual design of the store: the store layout, store organization, display, shelving, and storage

Checkout-Free / Just Walk Out Shopping Technology

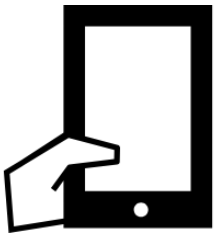
The transition to checkout-free shopping can **minimize contact and maximize customer turnover**. Customers can simply walk into a store, pick up the items they want and then walk out of the store with their selected items. There are no cashiers or checkout counters in the store.

Companies offering this technology

amazon go · [Sc] STANDARD COGNITION · ZIPPIN

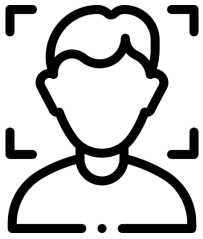
This methodology may not be suited for retailers whose products require a guided retail experience, and increased tech utilization could mean technical difficulties.

1



Customers register with their online account at the entrance of the store by means of a smartphone app

2



Once inside, the store keeps track of chosen items by means of computer vision, RFID sensors, and machine learning technology.

3

The final items are charged to the customer's online account when they leave

In-Store Navigation and Product Location

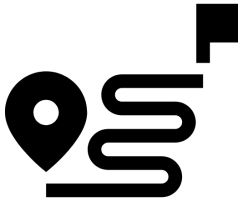
The adoption of in-store navigation technologies will allow for a **more efficient and brisk shopping experience**.

This system works by digitizing the indoor spaces, store inventory, and floor plans into searchable venue maps. The user is then positioned indoors and navigated in the store using a variety of technologies such as, computer vision, depth sensing, wi-fi, magnetic, and visible light communication. This is used to provide users with an augmented reality environment to enhance their shopping experience.

1

The store's layout and product location is mapped out

2



Users are provided with turn-by-turn directions via a smartphone app to find the product they need using the most efficient route.

Companies offering this technology

Lowe's Innovation Labs

aisle411

Curbside Pickup With Geofencing

Curbside pick up coupled with a geofencing technology allows for a **hassle-free curbside pickup experience**. Both Walmart and Panera Bread have adopted a geofencing technology.

This is an extension of the Buy Online and Pickup In Store (BOPIS) concept, wherein the pickup happens on the curbside. The original curbside pickup concept included repeated notifications to the customer to pick up their order within a time-frame and venue, which also have to be selected during the placement of the order. The updated concept includes a geofencing attribute. This enables customers to just arrive at a location of their choice, and store to be alerted immediately. Pickups and orders can both be done from the curbside.

1

This system works by extending the store's wifi to the curbside, which enables alerts to be sent to the store as soon as a customer's smartphone is detected.

2

This eliminates the need for the customer to call the store and notify them of their arrival.

3

The geofencing technology alerts the store of the exact location of the customer.

Robots for Last Mile Delivery and Micro-Fulfilment

Robots used in last-mile delivery and micro-fulfilment can **improve the efficiency and speed of processing online orders**.

Doorstep delivery of goods will be undertaken by autonomous mobile robots (AMRs). Most goods and groceries can be shipped on the same day to the customer using these delivery robots, which can even climb stairs and navigate complex terrains to deliver direct to the doorstep.

Companies using last mile delivery robots include: Starship Technologies (right) and FedEx (left).

Other companies specialize in micro-fulfillment, where autonomous robots help efficiently source and put together the items from an online order placed by a customer via an app. This system, which is essentially an urban warehouse, can be built into individual stores, where these AMRs manage collecting items from the inventory, and making the order ready for last mile delivery.

Companies specialized in micro-fulfillment technologies include: Takeoff Fabric

Together these two types of robots serve urban businesses all the way from receiving an order on an app, micro-fulfilment, and last mile delivery to the customer.

At-Home Kits for Retail Service Providers

Retail businesses which are not consumer goods based, but provide services as their products also need to adopt technological solutions to stay afloat. Grooming services such as barber shops have started posting tutorial videos on social media on how to do beard trims, shaves, and self haircuts. Some hair salons, are putting together quarantine color kits which have each client's custom color formulas. Both services offer personalized consultations via FaceTime, Zoom, and other means. Food retailers like bakeries, restaurants, and cafes can provide an online grocery store to buy proprietary ingredients and meal preparation kits, deliver to the customer's door, and also provide exclusive recipes and instructional videos on cooking them, enabling the customers to recreate the restaurant experience at home.

THE ART OF SHAVING® NEW YORK

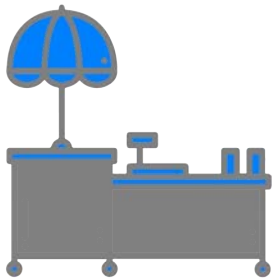
The Art of Shaving offers video masterclasses / tutorials for at-home grooming. The process is explained step by step, making it easy for viewers to follow along.

THE BIRD HOUSE BROOKLYN

The Bird House created a Quarantine Color Kit. The kits come with color and developer, an applicator bottle, gloves, a processing cap, hair clips to section the hair as you apply dye, step-by-step instructions, and a tutorial

GIRL & THE GOAT-CERIES by Stephanie Izard

Girl & The Goat-ceries offers meal prep kits with instructional videos on how to prepare the meal.



TRANSITIONING FROM IN-STORE SAMPLING TO A TOUCHLESS EXPERIENCE

Challenges:

- Need for pivoting from in-store product sampling to technologies providing a touchless experience
- Shifting the focus from mass marketing to customer-specific personalized consultations
- Pivoting from monologue style advertising to interactive experiences targeting potential customers

Potential Solutions:

- ✔ Virtual Reality (VR) technologies
- ✔ Augmented Reality (AR) technologies
- ✔ Facial Expression Recognition
- ✔ Gesture Control
- ✔ Body motion analysis
- ✔ Interactive shop windows and smart displays

Interactive Shop Windows

With the number of shoppers in-store being restricted, shop windows have a bigger role now in driving customer engagement. Interactive shop windows turn advertising from a monologue to a dialogue by gamifying marketing messages. In order to avoid touching surfaces, technologies which utilize recognition of motion, gestures, and facial expressions through computer vision, provide a touchless, safe, and intuitive interface for customers to interact with content in smart windows.

Interactive display at Dylan's Candy Bar. Source: WWD.

Retail brands such as Dylan's Candy Bar are using interactive windows developed by Outernets. In addition to eliminating physical browsing of products, smart windows can perform data analytics in real-time to provide targeted marketing to customers, enabling faster shopping and quicker turnarounds.

Glamos, world's smallest LiDAR device. Source: de zeen.

Small businesses can also provide touchless interactive shop windows by the use of technologies such as the Glamos, the world's smallest LiDAR device. This device can be connected to a smartphone or laptop, and its content can be projected onto a screen on the window which customers can interact with.

Motion Sensing and Augmented Reality in Apparel

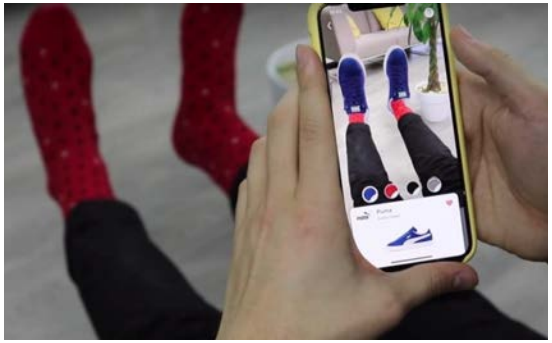
Motion-sensing technologies and augmented reality (AR) can minimize customer contact with products and offer a touchless retail experience, especially in the apparel sector. They can be used to setup invisible pop-up stores, or enable any customer with a webcam or smartphone to turn their home environment into a virtual fitting room.

TopShop's AR mirror. Source: Mascola.

Apparel brands such as Timberland and TopShop have utilized motion sensing technologies like Microsoft Kinect, to sense a customer in front of an AR mirror, and create a virtual fitting room experience. This smart mirror allows customers to visualize the in-store clothes on themselves.

Lacoste's AR app. Source: Engine Creative.

Lacoste in conjunction with **Engine Creative**, launched an AR mobile app where customers could virtually try on shoes, and have AR experiences with in-store signage, window displays, and promotional postcards.



The Adidas try-on app. Source: Next Reality

Adidas launched an AR sneakers try-on app with Vyking, who specializes in making AR environments for footwear brands.

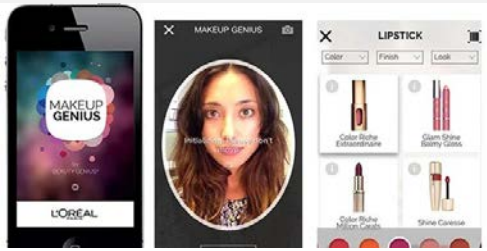
Augmented Reality in Cosmetics Sampling

The touchless cosmetics retail experience is finally here. A number of beauty brands are turning to AR to offer a touchless trial of makeup.

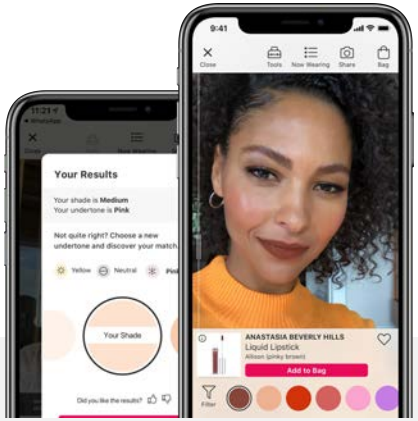
Charlotte Tilbury's Magic Mirror using the Holition technology. Source: Holition.

Charlotte Tilbury developed a **"Magic Mirror"** on the wall with Holition, a creative studio. Here a patron would look into the mirror in a store where the face would be scanned, following which images of how the face would look with various curated looks would be displayed on the mirror.

Sephora, on the other hand built an app where the individual has to upload a selfie, to which they can apply makeup. Similarly, **L'Oréal Paris's app Makeup Genius**, allows for patrons to try on curated looks and see if it suits their faces.



L'Oréal Paris Makeup Genius. Source: L'Oréal.



The Ulta Beauty Glam Lab app. Source: Ulta Beauty.

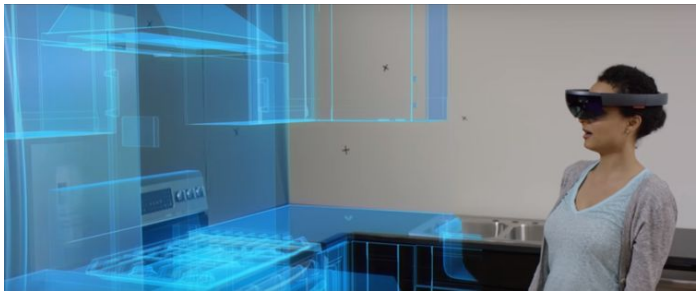
Ulta Beauty, went a step further and launched the **Glam Lab app**, where patrons can try virtual makeup and try the multitudes of products to build their look, and finally order their customized list of products if desired.

Virtual Reality, Mixed Reality, and AR in Product Sampling

Virtual reality is a headset-based technology where customers can be completely immersed in a virtualenvironment and experience using products in a store, as demonstrated using the '**Holoroom Test Drive**' platform by Lowe's Innovation Labs. This should enable the reduction of product trials and returns, eliminating the need to take them home to try. This technology can also be used to provide virtual training at scale to customers and store staff alike, on the use of various products.

Holoroom Test Drive.
Source: Lowe's Innovation Labs.

Mixed Reality uses a hologram based headset (Microsoft Hololens) to layer holograms onto the real world, creating a mixed reality to help customers visualise an enhanced reality, enabling them to do things such as customize and choose the best products for their kitchen by visualizing the furnishings of their kitchen.

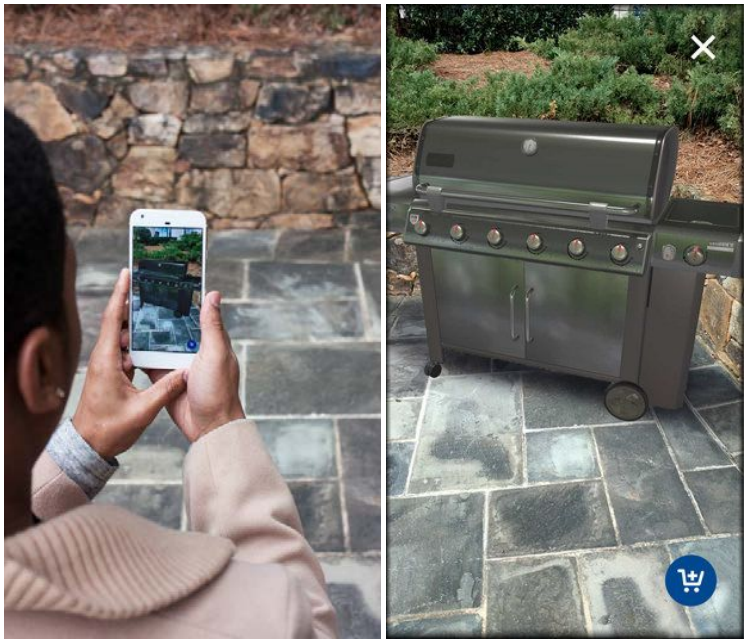


Holoroom Hologram.
Source: Lowe's Innovation Labs.

Virtual Reality, Mixed Reality, and AR in Product Sampling

Augmented Reality, on the other hand relies on headset free technologies, which are available in the smart devices of the average customer. **IKEA** has an app called IKEA Place, developed on the ARKit platform; Apple's AR developer environment, which lets customers view 3D items and furniture from IKEA into a AR space in their home environment. **Lowe's 3D** is a similar app as well with a "View in your space" function. Google's Tango technology, now matured into ARCore to power this app.

Ikea Place. Source: Ikea.



Lowe's 3D. Source: Lowe's Innovation Labs.

Take-Home Food Sampling

Food retailers have relied on in-store sampling as a reliable sale conversion strategy. With the current COVID conditions, they have two directions to pivot.

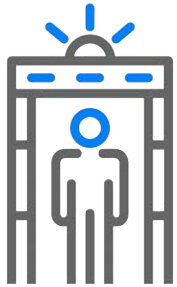
To enable in-person sample delivery and relationship building, stores can provide **dry demos** to customers. *How it works:* Customers are given sachets or sealed samples of products to take home and try. EDS Strategy is an example of a company specializing in in-store product demos, acting as an extension to existing sales teams.

Source: Grocery Dive

Drive-thru sampling offers a quicker grab and go alternative. A cereal startup brand called Three Wishes resorted to drive-thru sampling to replace their in-store demos.

Source: Lohud

In the e-commerce direction, free samples can be **added to online grocery orders**.



RAPID THERMAL MONITORING

Challenges:

- Need for large scale, rapid thermal screening
- Eliminating loss of foot traffic due to slow manual temperature screening
- Shifting the modality of thermal screening from manual to automatic systems
- Ensuring staff and customer safety by putting distance between the staff and customers

Potential Solutions:

- ✔ Forehead Infrared Thermometer
- ✔ Tympanic Infrared Thermometer
- ✔ Thermography camera systems predominantly used in airports

Infrared Thermal Cameras - Commercial & Industrial Grade

Thermographic camera systems are installed at entrances of premises, and they scan the faces of multiple people simultaneously, focusing on the inner corner of the eyes, as they are the closest at representing core temperature through a non-invasive method.

If a temperature higher than 1.3°C from the average is detected, individuals will be approached for a forehead or tympanic thermometer reading to get a more accurate measure. This method is overall very low contact, as the actual readings and images from the thermal camera can be viewed remotely by the store staff, thus limiting contact greatly. It is also efficient in screening a much greater number of people, faster.

Source: Flir

- Remote monitoring of temperature
- Allows scanning in bulk
- Price range is $5k - $25k which can be more cost effective than employing a labour force to do the screening

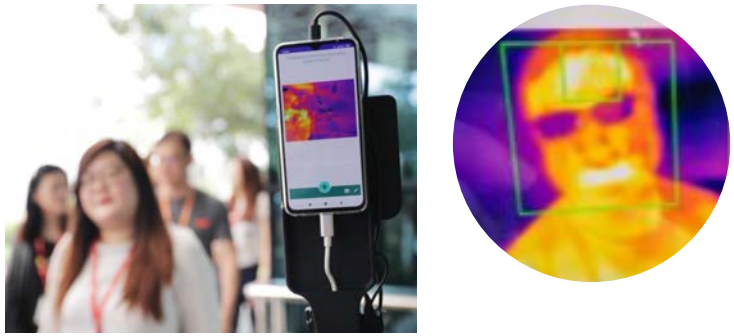
Some companies offering this technology include

FLIR, dahua TECHNOLOGY, MATRIX VIDEO COMMUNICATIONS CORP, ICI INFRARED CAMERAS INC, HIKVISION

Infrared Thermal Cameras - Smartphone Based

Thermographic camera systems may prove too expensive for small retail businesses. In this case, smartphone-based technologies can serve as a more feasible alternative. One available technology is **iThermo**, an AI-powered thermal and 3D laser camera attachment for smartphones. This platform was developed by KroniKare and Integrated Health Information Systems (IHiS), Singapore, and is available at a monthly subscription of $720.

1. The smartphone camera captures facial features
2. Images are mapped onto the thermal images captured by the thermal camera
3. This is then correlated with the distance measured by the 3D laser camera, as the individual needs to be within a 3m range for an accurate measurement.



Source: (Right) KroniKare; (Left) IHiS.

This technology can measure the temperature from the forehead of people passing by, regardless of whether they are wearing eyewear, masks or headgear.

Walk-Through Temperature Detectors

These are essentially thermal sensors/cameras mounted onto existing metal detector frames, or wall mounted thermal sensors, which provide a simple method of assessing if employees entering the store premises have a fever.

A walk-through temperature scanner. Source: ZKTeco.

In addition, coupling facial recognition capabilities along with thermal sensing can provide extra information to aid in contact tracing in the event of an infection breakout. **Yates Enterprises**, **HIK Vision**, **ZK Teco** are examples of companies providing temperature scanners with facial recognition capabilities or measurement of other biometrics.

(Left) A wall mounted temperature scanner; (Right) Temperature scanner with facial recognition. Source: Yates Enterprises.

Disposable Clinical-Grade Adhesive Thermometer Strips

Another option that completely does away with cameras is the use of digital liquid crystal technology as unbreakable, latex free, self-applied, easily readable from a distance, and disposable clinical grade adhesive thermometer strips.

Feverscan Forehead Thermometer, developed by **LCR HallCrest**, is a non-invasive strip that simply needs to be applied to the centre of the forehead like a Band-Aid, and let sit for 10 – 15 seconds for the temperature reading to stabilise. The temperature reading is accurate for at least 2 hours.

Feverscan Forehead Thermometer. Source: HallCrest.

A smart variation of a thermometer adhesive strip is **TempTraq**. This is single use, bluetooth enabled thermometer strip that send continuous temperature data to a smartphone via an app for 48 hours. This wearable device would be ideal for monitoring the temperature of potentially infected store staff.

Source: TempTraq.

RAPID LOCATION AND OCCUPANCY DATA ACQUISITION

Challenges:

- Rapid turnover of customers to compensate for reduced foot traffic
- Eliminating customer crowding in stores
- Maintaining social distancing
- Reducing friction and making the customer path streamlined and efficient

Potential Solutions:

- ✔ Pressure Sensitive Mats
- ✔ Infrared beam sensors at entrance
- ✔ Manual people counting using a tally counter

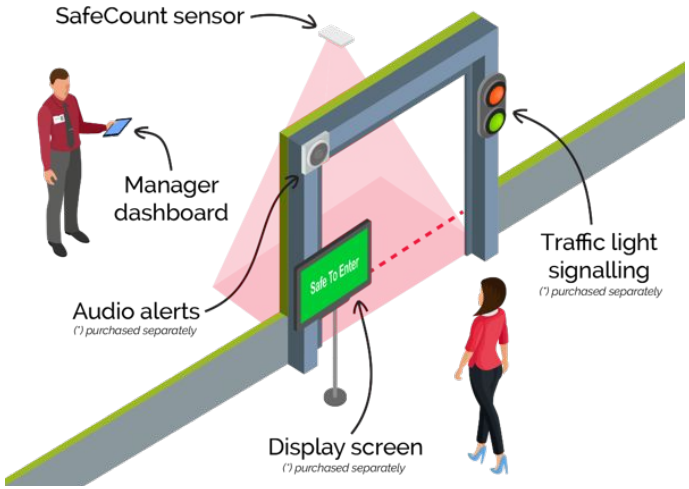
Non-Camera Based Occupancy Data Acquisition

Infrared Time of Flight (ToF) sensors and Thermal Sensors:

Here the focus is on preserving the privacy of the customers being monitored. Using non-camera based anonymous sensing technologies, such as the **Vector 4D** and **Gazelle 2**, developed by Irisys, based on infrared ToF and thermal sensors, these systems are even able to distinguish between adults and children through height measurement, giving an accurate count of customers, rather than simply counting bodies.

These systems have the ability to count people over wide entrances by linking multiple cameras together. They can also be used for queue management, by predicting the need for the deployment of additional labour at checkouts due to a growing queue.

By keeping the queues short and fast moving, rapid turnover of customers is maintained.



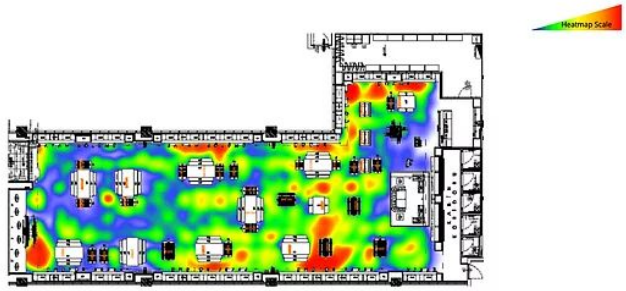
The Irisys SafeCount system. Source: Irisys.

Camera-Based Occupancy Data Acquisition

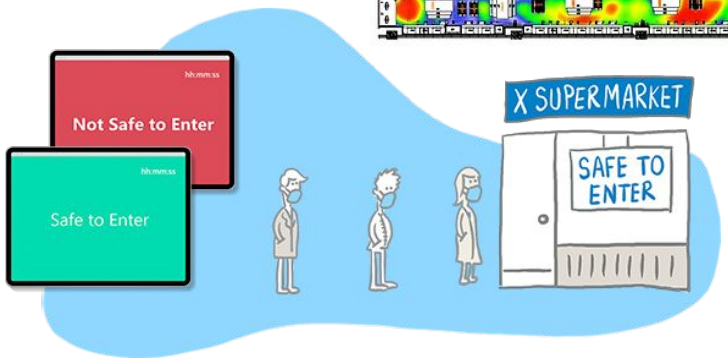
Cameras are essential if retailers want to perform analytics of customer behavior in their stores. AI algorithms can count people in CCTV footage.

Stereo vision cameras can perceive depth, which is useful in accurately counting customers by eliminating children. **Thermal cameras** are mainly used for heat mapping. They can help retailers identify which products are popular, as these areas would show up as hot spots on the heat map. Conversely, thermal cameras can also help stores identify where the shoppers tend to cluster. In addition, a multi-camera system can help trace the complete path taken by a customer, which will prove extremely useful for contact tracing.

V-Count is one of the leading companies in visitor analytics, and has donated many systems to help with the COVID-19 social distancing efforts. They also aid in providing video signage outside the store to let customers know if it is safe to enter the store, and let the staff know about any breaches of occupancy limits in real time, through email and push notifications.



The V-count - Heat Map. Source: V-Count.



An example of the signage showing when it's safe to enter. Source: V-Count.

Social Distancing Through Proximity Bracelets

Proximity bracelets can serve as an additional layer of safety in stores. These bracelets enable social distancing by alerting the user if they breach their safety circle. They also keep track of other bracelets they came in contact with previously. If someone they came in contact with tested positive, the users will be alerted of it to help them in immediate self-isolation and contact tracing.

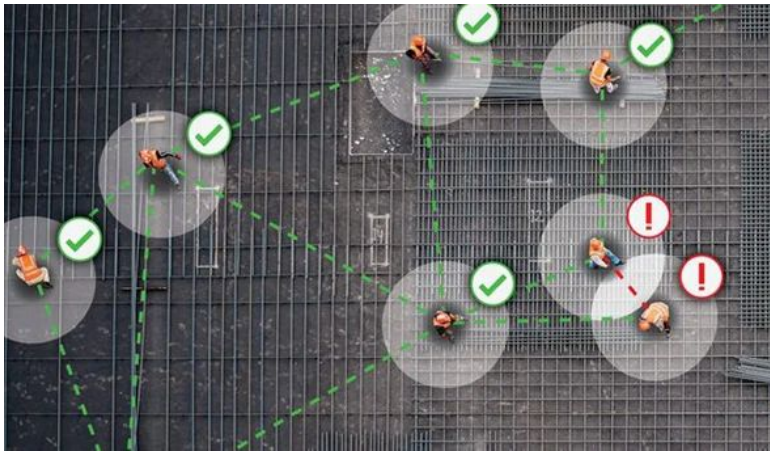
Labby Light by Meta Wellness

Labby Light, doesn't use an app so a smartphone is not needed, it doesn't need a GPS, Bluetooth, or WiFi system, and it doesn't track the user's movements. All data is stored on the device itself. This device retails for $27.

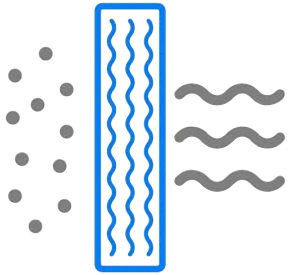
Source: Meta Wellness.

Halo by Proxxi

Halo offers similar services to Labby Light, along with a dashboard for employers to look at their employee social distancing statistics. Halo retails for $100.



Source: Proxxi.



AIR PURIFICATION

Challenges:

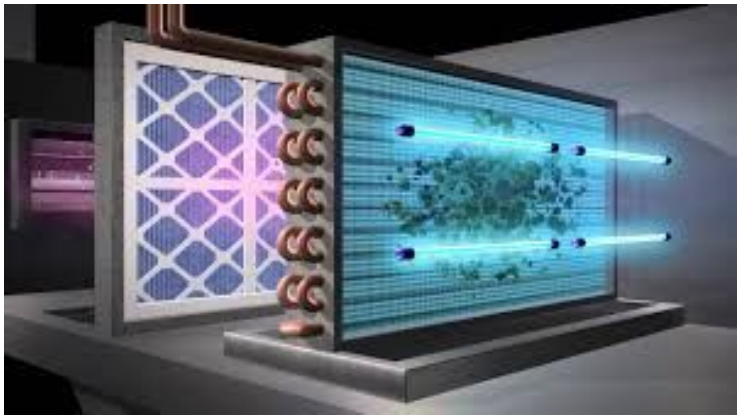
- Disinfecting air in closed buildings using Heating Ventilating and Air Conditioning (HVAC) systems.
- Preventing circulation of microdroplets potentially carrying the virus throughout the building.

Potential Solutions:

✔ High Efficiency Particulate Arresters (HEPA) filtration systems, usually installed in intensive care areas in hospitals and clean room facilities.

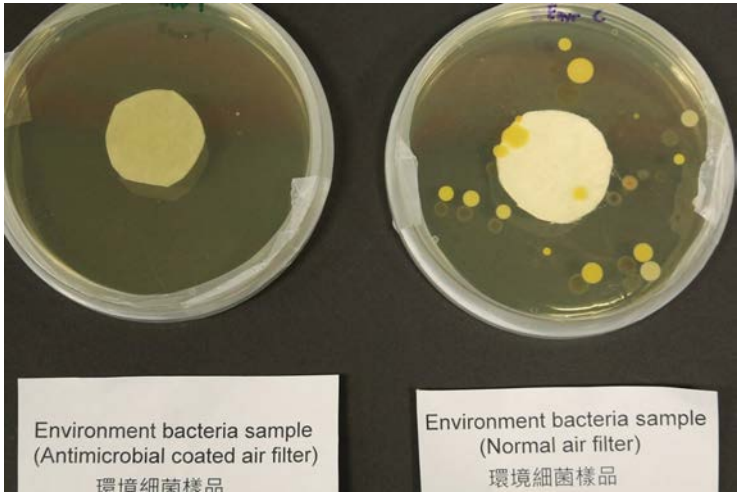
Solutions for Large-Scale Premises

Large-scale premises which **employ HVAC systems**, can use an ultraviolet germicidal irradiation (UVGI) system, which is what **Steril-Aire** manufactures primarily for healthcare environments. It is installed within duct systems, and it disinfects air by producing germicidal UVC radiation which disrupts the DNA of microorganisms, including viruses. The effectiveness of this method depends on the intensity and duration of the radiation to the potentially contaminated air.



Source: Sterile-Aire.

Germagic manufactures an antimicrobial chlorine dioxide based formulation which when sprayed onto **HEPA filters** gives it contact killing, release killing, and anti-adhesion properties. The coating is 99.99% effective in killing a host of bacteria, virus, and fungi. The coating also does a slow controlled release of reactive oxygen species which extend the antimicrobial effect to the proximal area of the coating. This coating may potentially be applied to existing air filters in HVAC systems with a few adjustments.



Source: Germagic.

Solutions for Small Spaces

Smaller spaces such as a dentist's practice area, can use **non-chemical based medical grade portable air disinfection units** such as those manufactured by **Novaerus**. This unit works by drawing air through its vents into a ultra low energy plasma field, which then destroys pathogens and airborne microbes on contact, including the COVID-19 virus by 99.99%, and returns this clean air to the environment.

Source: Novaerus.

Germagic manufactures filters which can be cut to size and stuck **onto existing air conditioning system filters or vents**. These filters also come installed in portable air disinfection units, which have to be replaced every 3-6 months.

Source: Germagic.

Personal Air Sanitization & Hand Hygiene Reminders

Personal Air Sanitizer

Sanibadge, a personal air sanitizer badge can be worn by the staff to disinfect the air in their immediate vicinity, by means of a controlled chlorine dioxide antimicrobial disinfectant dosage safe for humans. This badge developed by Boecker, can be effective till 30 days from opening of the package. This will not only sanitize air around each staff member, but it will also prevent transmission between potentially infected individuals and the rest of the staff, and customers

Source: Boecker.

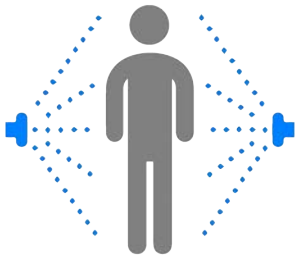
Hand Hygiene Reminder

Retail staff spend extended amounts of time interacting with large number of customers and touching their shopping items at checkout counters. Therefore, electronic hand hygiene reminder badges, such as those manufactured by **BioVigil**, to remind staff in retail environments to wash their hands regularly should be considered as a mandatory requirement. Hence, we can envision that future PPE for staff in retail environments will include Sanibadge and BioVigil type badges, in addition to gloves, masks, and face-shields.

Green is clean

Yellow is a reminder

Red is stop and wash hands



MASS AUTOMATED DISINFECTION

Challenges:

- Need for increased frequency of cleaning and disinfection of surfaces
- Need for increased frequency of cleaning and disinfection of surfaces competing with other tasks in store; e.g. restocking of products
- Shortage of store staff needed to complete all tasks

Potential Solutions:

✔ EPA recommended list of disinfectants; List N

Microcapsule and Nanoparticle-Based Antimicrobial Sprays

Microcapsule-Based Antimicrobial Spray

A polymer microcapsule-based antiviral spray manufactured by Germagic called MAP-1, can remain effective for 90 days even after it has dried. The nanocapsules are heat and moisture responsive, and they release further disinfectants every time they come in contact with human skin. The disinfectant itself is safe for human skin and the environment.

Nanoparticle-Based Sprays

NanoLife in India is manufacturing silver nanoparticle-based disinfectant solutions which can be sprayed onto surfaces. These products use a proprietary green nanotechnology licensed from the University of Missouri.

MAP-1 polymer microocapsule spray. Source: Germagic.

Source: NanoLife.

Sanitization Booths / Walk-Through Tunnels

Walk-through disinfection tunnels can be installed at the entrances of buildings or facilities as an extra precautionary measure. Below are examples of some companies providing or employing such a solution.

Hong Kong International Airport

Hong Kong airport uses a full body disinfection booth from CleanTech. The interior surface is coated with an antimicrobial coating making use of photocatalyst activity using nano needles which can kill viruses on human bodies and clothing.

Source: Airport Authority Hong Kong

Sanitunnel by Boecker

Boecker has developed the Sanitunnel, which is available in the Middle East and Africa. The tunnel comes in two sizes for small and large entrances and is equipped with motion sensors. The disinfectant used is called Microbecs, a patented molecule that doesn't contain chlorine or ethanol and is EPA registered and FDA approved.

Source: Boecker

Autonomous Mobile Robots for Wet Disinfection

Nanyang Technological University

Researchers at Nanyang Technological University, Singapore, have developed a semi-autonomous robot called the **Extreme Disinfection Robot (XDBOT)**, that can be controlled via laptop or tablet to efficiently and safely spray large areas with a disinfectant. This has the dual advantages of keeping the frontline workers from coming in direct contact with the disinfectant itself, and from picking up the virus from contaminated surfaces.

Source: NTU Singapore

Brain Corp

Brain Corp added **AI-based autonomy features to the floor scrubbing machines** of their partner original equipment manufacturers, making this a win-win solution for Brain Corp, their partners, and the retail businesses. The new machines are trained on their route along the store by existing store machine operators, after which the machine can scrub and clean floors, and efficiently navigate around people and various obstacles. These machines are capable of providing 8000+ cleaning hours everyday.

Source: Brain Corp.

Autonomous Mobile Robots for UV Sterilization

UV-C radiation kills viruses and other microbes through disrupting their DNA. As this radiation is harmful to humans, it is wise to automate this method of disinfection with robotics.

UVD Robotics

UVD Robotics, a subsidiary of Blue Ocean Robotics, manufactures UV disinfection robots. The UV light tower stands on top of a mobile robot, which can be controlled easily by means of an smartphone app. It is designed to be operated with safety and ease by the cleaning staff as part of their everyday routine.

Source: UVD Robotics

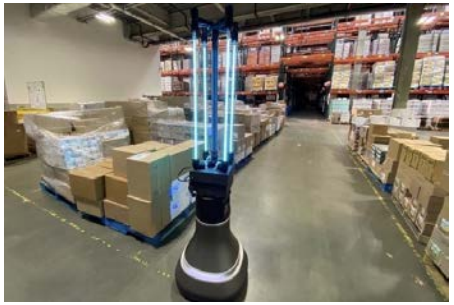
Xenex Disinfection Services

Xenex Disinfection Services, also manufactures a UV disinfection robot called LightStrike, which similarly reduces microbial load of the room it is in. Depending on the technology and the size of the room, the disinfection time ranges from 5 - 10 minutes. Hence, retailers looking to adopt these technologies in their stores may choose one appropriate for them.

Source: Xenex

MIT

A team from MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL), in collaboration with Ava Robotics and the Greater Boston Food Bank, designed a new robotic system that disinfects surfaces using UV-C light. In tests, the CSAIL team's robot could disinfect a 4,000-square-foot space in the food bank's warehouse in just half an hour.



Source: Alyssa Pierson/CSAIL

About the Authors

Daniel Morales, PhD

PreScouter

Daniel is an alumnus of the PreScouter's advanced degree researcher' network and has worked with PreScouter for more than three years, on over 50 projects, spanning across areas such as innovation strategy and roadmapping, product and process improvement and development, sustainability, and technology trends throughout the CPG industry. Daniel earned his Ph.D. in Chemical Engineering from the NC State University, where his research focused on developing stimuli-responsive polymer networks for microrobotics applications. After his graduate studies, he completed postdoctoral work at INSA Toulouse, France where his work focused on the intersection of nanoparticle assembly, nanofabrication and microfluidics to develop novel sensors. Before joining PreScouter, Daniel gained industrial experience in pharma manufacturing, polymer processing and science manuscript editing, and he is based in Raleigh, North Carolina.

About the Authors

Naveen Noah Jason, PhD

PreScouter

Naveen is a medical technology professional with a deep interest in new and emerging technologies and their impact on businesses. He is passionate about understanding his clients' needs and guiding them towards technology solutions which are a perfect fit. He is also a science communicator and has consulted for pharmaceutical research clients, medical technology companies, and for PreScouter. Being of an entrepreneurial mindset he worked as a co-founder of two medical device start-ups in the areas of sports injury rehabilitation and mental health. He is experienced in managing intellectual property, drafting investigators brochures and ethics applications for clinical trials, and navigating regulatory guidelines to maintain compliance levels of medical devices. During his PhD, he developed expertise in the synthesis and use of electrically conductive nanomaterial inks to manufacture wearable biosensors, which resulted in a patented invention, garnering interest from Johnson & Johnson Innovation and 3M. He holds a PhD in Chemical Engineering from Monash University, Australia.

Next Steps

SOME POSSIBILITIES THAT PRESCOUTER CAN OFFER FOR CONTINUATION OF OUR RELATIONSHIP

- ☑ COMPETITIVE INTELLIGENCE
- ☑ TECHNOLOGY ROADMAPPING
- ☑ TECHNOLOGY & PATENT LANDSCAPING
- ☑ MARKET RESEARCH & ANALYSIS
- ☑ TRENDS MAPPING
- ☑ REVIEW BEST PRACTICES
- ☑ PATENT COMMERCIALIZATION STRATEGY
- ☑ DATA ANALYSIS & RECOMMENDATIONS
- ☑ ACQUIRE NON-PUBLIC INFORMATION
- ☑ SUPPLIER OUTREACH & ANALYSIS
- ☑ CONSULT WITH INDUSTRY SUBJECT MATTER EXPERTS
- ☑ INTERVIEWING COMPANIES & EXPERTS

WE CAN ALSO DO THE FOLLOWING

- ✔ **CONFERENCE SUPPORT:** Attend conferences of interest on your behalf.
- ✔ **WRITING ARTICLES:** Write technical or more public facing articles on your behalf.
- ✔ **WORKING WITH A CONTRACT RESEARCH ORGANIZATION:** Engage with a CRO to build a prototype, test equipment or any other related research service.

For any requests, we welcome your additional questions and custom building a solution for you.

About PreScouter

PRESCOUTER PROVIDES CUSTOMIZED RESEARCH AND ANALYSIS

PreScouter helps clients gain competitive advantage by providing customized global research. We act as an extension to your in-house research and business data teams in order to provide you with a holistic view of trends, technologies, and markets.

Our model leverages a network of 3,000+ advanced degree researchers at tier 1 institutions across the globe to tap into information from small businesses, national labs, markets, universities, patents, startups, and entrepreneurs.

CLIENTS RELY ON US FOR:

Innovation Discovery: PreScouter provides clients with a constant flow of high-value opportunities and ideas by keeping you up to date on new and emerging technologies and businesses.

Privileged Information: PreScouter interviews innovators to uncover emerging trends and non-public information.

Customized Insights: PreScouter finds and makes sense of technology and market information in order to help you make informed decisions.

500+ CLIENTS WORLDWIDE

4,000+ RESEARCH REPORTS CREATED

150,000+ HOURS OF RESEARCH COMPLETED FOR CLIENTS