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A **COVID-19** Virtual Ideation Experience

Team Topic and Number: The Autonomous Workplace. Team #10

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A post-pandemic autonomous workplace. Accelerating the development and deployment of existing technologies: sensors, applications, and user interfaces.

The COVID-19 pandemic has disrupted the world, putting governments and organizations in an awkward position of planning for the unknown. Despite the current uncertainty, we will recover from this health pandemic. Already the demand for an effective workplace has new focus and energy. Ideas on how to maintain social distancing, physical and emotional safety, and sanitation within an effective workplace are all being vetted as organizations plan their future.

IoT, AI, and robotics are components within a modern workplace today, however not in widespread use. Solving the challenges of a post pandemic world may provide the opportunity to accelerate these technologies and integrate them holistically. IoT and AI will expand significantly to focus the power of technology to ensure health and safety in a touch-less workplace. This paper provides a high-level overview of an autonomous workplace in an Office Building (non-industrial, non-retail) after a vaccine has been effectively deployed, and testing and tracing procedures are commonplace. The overview

assumes some social distancing measures will still be required. Four areas of the workplace are described: Access & Egress, Individual Work Areas, Collaborative Areas, and Social Areas.

The post pandemic autonomous workplace will monitor and interrelate occupant location and environmental conditions much more granularly than is typical today. The precursive key to this capability is the deployment of a robust network of sensors. These sensors will provide real time data to create an accurate Indoor Positioning System (IPS) and provide input to various Building and Workplace Automation Systems (BAS and WAS). The use of Ultra-Wide Band (UWB) technology recommended based on its low power consumption and high accuracy rate. UWB is already installed in iPhone and Samsung smart phones, and occupants without UWB enabled smart phones could be issued UWB wearables. Workplaces will need to install sensors to process the UWB signals and transmit the data to applications. Applications will process and interrelate proximity, biometric (identification scans, temperature scans, etc.), and environmental (IAQ, lighting, etc.) data to control workplace conditions and issue social distancing guidance to occupants. Occupants will receive guidance via an Autonomous Building User Experience (ABUx) App, as well as make BAS and WAS requests through the App.

AUTONOMOUS BUILDING USER EXPERIENCE (ABUx) APP

The ABUx interfaces with the BAS and WAS to provide users with information and tools to safely manage their day. Employees must reserve workspaces (whether Hoteling or Assigned), and check in/out daily, through the ABUx. People tracking and room reservations features will allow employees to safely work and move about the workplace, with a digital wallet providing a touchless purchasing experience. Through the ABUx, occupants can make temperature and lighting adjustments and place maintenance orders. Catering requests can be ordered and paid for, as well as vending purchases.

ACCESS & EGRESS

Building Entry, Security & Access Control

An occupant's presence and biometric data are provided to Access Control, Room Reservation, BAS, IPS, and Visitor Management systems. Employees must reserve a workspace before being granted access. Access is either granted, or the occupant is redirected to in-processing station for further evaluation and/or provision of a UWB wearable device. The IPS notifies the elevator control system and the ABUx App directs in-house employees to the proper elevator. Visitors are directed to their elevator by the Visitor Management system. High intensity UV lighting automatically "scrubs" each elevator after every trip during rush hour, and periodically throughout the day.

Suite Entry

An employee's UWB proximity device activates automatic suite entry doors. A visitor's UWB wearable will notify an in-house employee of the visitor's arrival at the suite entry doors.

Wayfinding (Large company)

WAZE™ like wayfinding is provided for employees by the IPS and the ABUx App. Visitors are escorted by in-house associates with the ABUx App.

Wayfinding (small company)

Protocols are established for "One Way" corridors throughout the office. Smart Phone or UWB Wearables provide proximity alerts.

INDIVIDUAL WORK AREAS

Employees are required to reserve a work area daily, whether Hoteling or Assigned. Upon an employee's arrival, multiple systems are notified, and the employee is provided a safe travel path to their work area through a WAZE™ like interface on the ABUX. Employees who do not reserve a work area will be directed to do so before being granted access. If social distancing protocols are not maintained, individuals will receive haptic feedback on their smartphone or UWB wearable, and monitoring personnel could be dispatched.

Employees must "check-in" to their workspace through the ABUX. Convenience outlets and task lighting will only be enabled after check-in. Check-in data will be provided to the BAS to tailor IAQ and improve energy management. Motion sensors will monitor actual utilization and prolonged inactivity will dim task lights. Check-out will be automated per the reservation time schedule and will disable convenience outlets and task lighting. Occupants will be notified prior to check-out and allowed to extend the reservation. Checking-out will notify Operations to disinfect a Hoteling space. Once cleaned, a Hoteling space will be available for new reservations. Assigned spaces will be cleaned after-hours.

Cleaning individual work areas could utilize robotics for both general area cleaning and the cleaning of surfaces. After-hours cleaning could employ robots for vacuuming, high intensity UV, and dispersal of liquid cleaning mists. Healthcare facilities routinely use UV lights to kill microbes to decrease the spread of infection. Scheduling routine and stringent cleaning could be conducted based on occupancy tracking data gathered through the IPS. By interrelating HR and Business Continuity data with IPS and occupant tracking data, intensive cleaning can be rapidly deployed if an infectious person is identified. Similar interfaces could notify the HVAC system to change protocols around a potentially infected area.

Providing real-time occupant tracking data from the IPS to the BAS could tailor IAQ to the actual occupant load requirements and improve energy management. Voice activated interfaces could reduce the need to touch copiers, vending machines, and coffee makers. An autonomous workplace could include surfaces with self-cleaning technology, fabric with silver ions that retains fewer germs, or non-porous surfaces for easy cleaning. Push notifications from the ABUX could remind occupants to wipe down desks at the end of the day.

COLLABORATIVE AREAS

Although the quarantine period has proven the effectiveness of remote work and virtual meetings, in person meetings will still be the preferred method of interaction. Employees will book meeting rooms through the Room Reservation system. The app can be calibrated to block reservations if social distancing thresholds are exceeded. By interfacing with the people tracking function of the IPS, a safe path of travel to the destination can be provided through a WAZE™ like user interface.

Meeting rooms need to be equipped for easy and effective integration of both remote and in person participants. Real-time occupant information from the IPS to the BAS could tailor IAQ to the actual occupant load and improve comfort and energy management.

Audio-visual connectivity between a user's device and the room's display systems should be as touchless as possible. Voice activated interfaces should become common practice for Bluetooth or NFC connectivity; and to control cameras, conference dialing, and volume adjustments. If voice activation is impractical, a single display touch pad for managing all AV devices will minimize touch to a single device.

SOCIAL AREAS

Wellness Spaces

Using the Room Reservation feature, employees can book time at the fitness center, or nursing mother's room. The app can be calibrated to block reservations if social distancing threshold are exceeded.

Pantries and Cafeterias

Refrigerators, drawer and faucet handles, and coffee pots tend to have the highest concentrations of germs. Installing automatic faucets, soap and towel dispensers, and replacing refrigerators and coffee pots with touchless vending machines will minimize contact contagion. These machines allow users to make selections and pay for them on their mobile devices. Data collected on purchasing patterns and preferences will facilitate providing the right product mix and restocking cycle.

For workplaces with cafeterias, the Automat may make a comeback. Basically an elaborate vending machine, the first Automat opened in 1902. Chefs would fill the compartments of the automat with fresh food which was then kept at the right temperature. Through AI, today's versions can be completely contactless.

Restrooms

Digital displays outside each restroom will display the number of occupants inside. Color coding of the display will advise whether social distancing occupancy limits are being maintained. Touchless technology will open and close stall doors, flush toilets, turn faucets off and on, and dispense soap and paper towels.

CONCLUSION

With any great disruption comes great change. As organizations adjust toward the future, visionaries can glimpse the possibility of building a better tomorrow. The foundation stones for the autonomous workplace have already been laid and used in haphazard ways across the globe. Perhaps a greater good that will come from the Covid-19 pandemic is the rapid development, deployment, and integration of these disparate systems to improve the effectiveness, safety, and community of the modern workplace.