Impact of Automation in the Custodial Marketplace

SourceAmerica®

About this Report

SourceAmerica® commissioned Kline & Company (Kline) to explore the effects of automation on the custodial line of business. The objective of this study is to provide critical insights regarding the near-term and long-term impact of automation in the custodial line of business. SourceAmerica needs to understand the timing of the impact over the next 10 years, the key inflection points to consider, and the skills that will be required as the use of automation increases in the custodial industry.

Kline conducted discussions with industry participants along the value chain, focusing on building service contractors (BSCs), cleaning equipment manufacturers, and end customers to understand the impact of automation in the custodial industry. These discussions, along with an in-depth analysis of publicly available data, were utilized in the development of this report. The result is a comprehensive outlook on the major trends and inflection points in automation that impact the future of work for custodial employees.

Author

Kline and COMPANY

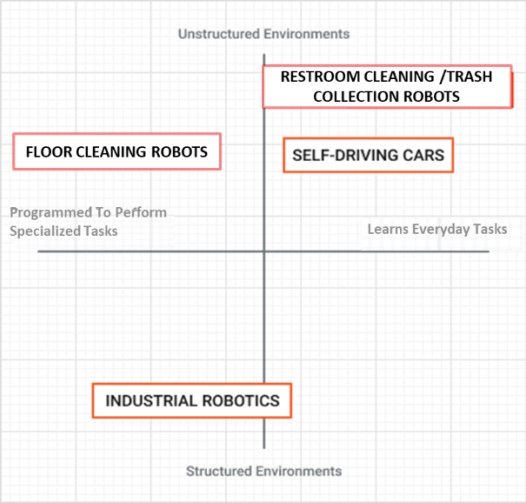
Introduction

Industries are adopting robots in varying degrees, and their effects vary among different groups. The automotive industry utilizes robots more than any other sector - around 38% of currently deployed robots worldwide[1]. Improvements in technology and automation adversely affect wages and employment through the "displacement effect" in which robots or other automated equipment complete the tasks formerly done by workers.

The custodial and cleaning industry still largely relies on people to complete most tasks. Automation industry analysts suggest that tasks performed by custodians/janitors have a moderate probability of eventually being replaced by an automated solution. Proponents suggest that the role of the custodian will evolve in a positive way, providing opportunities for learning new skills and allowing for better, more efficient job performance.

The custodial automation systems, often called frontline service robots, are designed for an unstructured and dynamic world.

Exhibit 1: Development of Robots in a Structured vs. Unstructured Environment and Complexity of Tasks[2]



The U.S. custodial and cleaning industry is largely derived from the commercial market, and includes various commercial, government, and industrial buildings, such as offices, schools, retail spaces, lodging, warehouses, etc.

The custodial industry provides a wide variety of services, such as:

- Sweeping, mopping, scrubbing, and vacuuming
- Cleaning restrooms
- Gathering and emptying trash
- Stripping, sealing, finishing, and polishing floors
- Dusting furniture and walls
- Requisitioning supplies or equipment needed for cleaning and maintenance duties
- Other (cleaning ducts, chimneys, and flues; cleaning laboratory glassware; patching and painting walls; replacing light bulbs)

[1] Sara Brown, *A New Study Measures the Actual Impact of Robots on Jobs. It's Significant.*, (MIT Sloan, 29 July 2020)

[2] *"X - The Everyday Robot Project: Teaching robots to help with everyday life",* (X Development LLC, 2019)



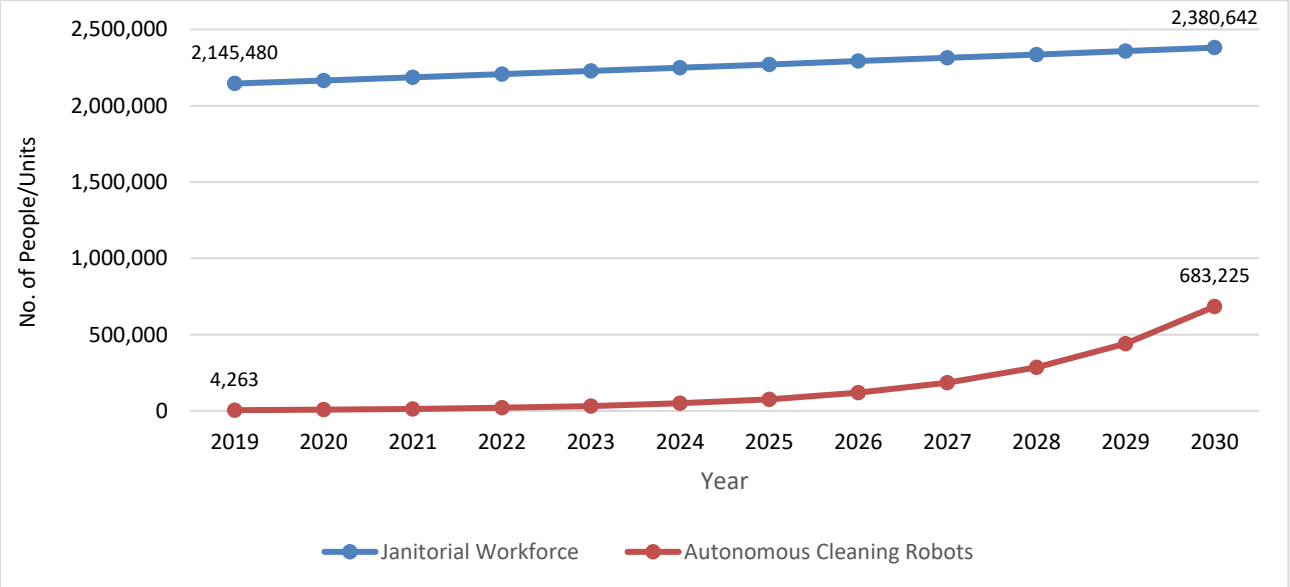
Automation in custodial services is presently mainly focused on floor-cleaning. There are companies, including Avidbots, that build ground-up robots, and others, such as Minuteman, Tennant, and Kärcher, partnering with Brain Corp to retrofit commercial style floor scrubbers with automation. There have also been a few developments in restroom cleaning robots by start-up companies, which are early in the commercialization phase.

Background

More than 2.1 million janitors and cleaners were employed in the United States in 2019, with 45% of the workforce employed in Administrative Support, Waste Management, and Remediation Services, according to the U.S. Bureau of Labor Statistics (BLS). This figure is estimated to grow by less than 1% over the next 10 years.

The autonomous cleaning robot population in 2019 was estimated to be over 4,200 units, or just 0.2% of the number of janitors and cleaners employed. However, the 10-year growth estimate for autonomous equipment is much higher than that of traditional labor, at around 55%[3]. Based on the 5-year life of autonomous robots, their 2030 population is expected to cross 680,000 units (28% of janitors and cleaners employed).

Exhibit 2: Janitors and Cleaners Employed in the United States vs. Cumulative Autonomous Cleaning Robot Population: 10-Year Forecast (Source: BLS and Kline Estimates)



[3] *"Webinar: The Cleaning Robots Are Here...Now What? - ISSA."*, (ISSA, June 2020)

Comparing Autonomous Robot Cost vs. Traditional Custodial Workforce and Return on Investment (ROI)

Exhibit 3: Cost Comparison between Autonomous Robots vs Traditional Custodial Workforce and ROI

Type of Cost	Autonomous Floor-Cleaning Robots	Commercial Grade Scrubber Rider Run by Janitors
Upfront Cost	$30,000–$50,000	$15,000
Monthly Cost	$500 monthly service plan (includes all software upgrades and maintenance)	$2,250 (Janitor's monthly salary)
ROI	18–24 months	

Autonomous cleaning robots generally cost in the range of $30,000 to $50,000, depending on the model, with a service plan of typically $500 per month. By contrast, a commercial-grade rider-style scrubber that a laborer would operate costs roughly $15,000 upfront + labor cost (on average, U.S. building cleaning workers are paid $27,000 a year). **Therefore, the investment in a robot will pay off in about two years, with 20 hours a week of use.**

Alternatively, some companies are offering robots under the Software as a Service (SaaS) model. Under this plan, robots are offered at a monthly fee without any upfront capital expenditure. For example, some of the autonomous robots can also be rented for $2,500 a month, including maintenance and software, on a minimum three-year contract.

As a rule of thumb, customers who are looking to buy robotic floor cleaners expect to get their ROI in 18 to 24 months. The typical life of a robotic cleaner is around 5 years, so any ROI that is above 2.5 years is not considered attractive. This is one of the reasons Brain Corp does not retrofit commercial floor cleaners that have already been deployed. The useful life of a scrubber for the purpose of typical depreciation is three to five years, and customers get rid of the equipment after it has depreciated completely.

Commercial Cleaning Robots–History and the Way Forward

Phase I: Robotic technology for floor-cleaning has been in the market for a few decades. The first model was launched in 1987 under the RoboKent brand. Over the next decade other manufacturers emerged, such as Cyberworks Robotics, Midi Robotics, Robosoft Technologies, HEFTER cleantech, and Cybernetix.

However, commercial success was missing due to two major factors:

- Operational challenges
  - High cost
  - Inadequate performance (Lack of accurate navigation, obstacle avoidance, facility mapping, operator training)
- Technology barriers
  - Lower processing power
  - Self-learning software was not available
  - Sensing technology was still a new concept

Phase II: It was not until TASKI (a Diversey brand) bought Intellibot in 2016 that the first inflection point came for the commercial success of cleaning robots. Cleaning robots were still a new concept commercially in 2015 and 2016. Cleanfix and Avidbots were just getting started, and Brain Corp had spun off from Qualcomm. TASKI made a big splash when it acquired Intellibot, because this was the first time an industry leader (Diversey was a $3 billion chemical company) was driving automation in the cleaning space. Other companies, such as Minuteman, Kärcher, and Nilfisk, noticed this change and started their own robotics programs. Currently, there are two types of autonomous equipment that are prevalent in the market: floor-scrubbing robots and vacuum sweepers.

It was during Phase II, which extended from 2015 to 2019, that all the development took place. Cleaning robots became more mainstream, and robotics companies began to successfully convey to customers how to integrate these robots into their existing workforce. Large organizations, such as Walmart, were already adopting such robots to clean its retail stores and warehouses. During this time, two types of autonomous equipment emerged: Purpose Built and Kit Development.

Exhibit 4: Types of Robotic Floor Care Products in the United States

Type	Robotic Floor Care Products
Purpose Built: Equipment that has been designed to perform autonomously	
Kit Development: Equipment that was not initially designed to be autonomous but has been modified to perform as such	

Brain Corp is the pioneer in kit development automation and has made large strides in this product segment. Its success in the market has been a clear indication that the retrofit model works, predominantly because of the amount of development and investment required to create entirely new autonomous robots.

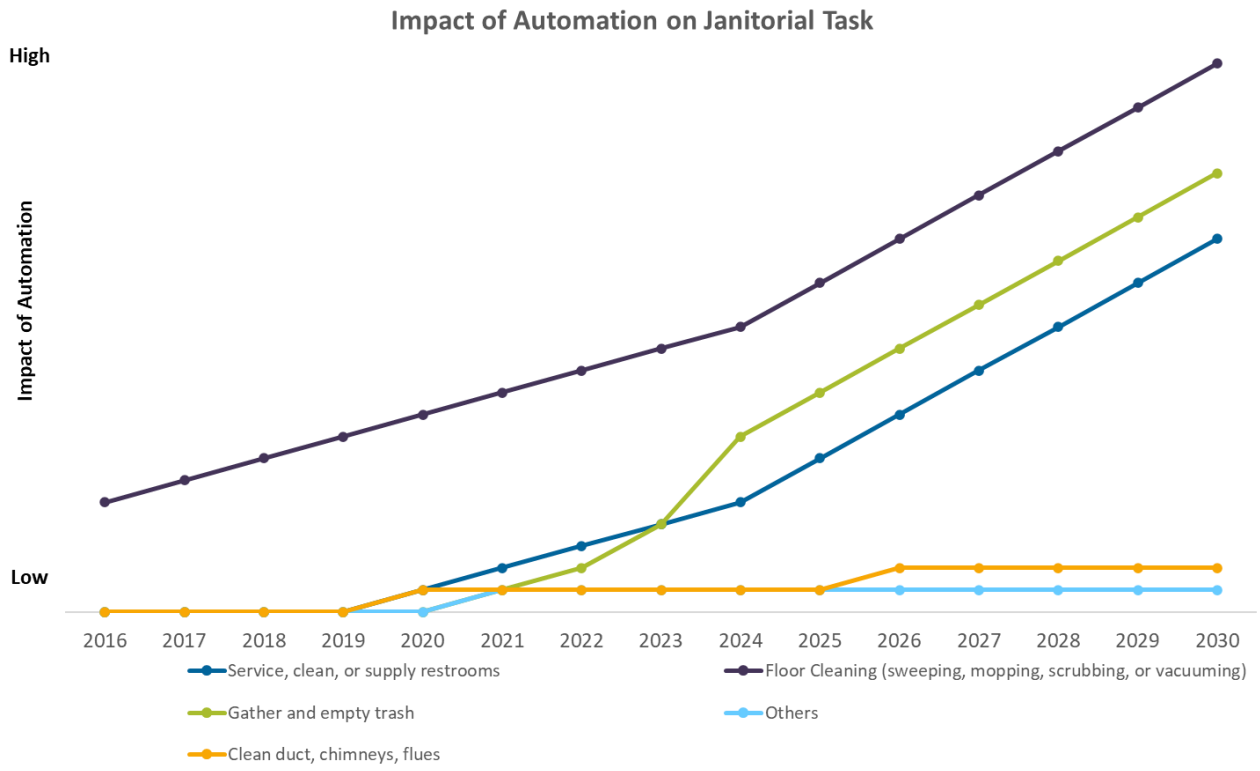
Phase III: The current market is in Phase III, which is expected to last another five years (from 2020 through 2025). Robotics companies expect an exponential compound annual growth rate (CAGR) of around 55% for the currently available floor-cleaning robots (scrubbers, vacuuming, sweeping). These companies are also expected to branch out beyond floor-cleaning and focus on other repetitive daily tasks, such as trash collection and restroom cleaning.

Phase IV: The outlook for 2025 and beyond will be driven by the success in Phase III and how customers, such as commercial customers and BSCs, adopt robotics into their business and day-to-day routine. Industry experts believe that robotic solutions will still be focused on repetitive daily tasks due to the fact that the custodial

industry is labor intensive. Cleaning robots are regarded more as “frontline service robots.” They interact with the public in a dynamic environment and have to follow safety protocols. Therefore, their growth is also dependent on external factors compared to standard “service robots,” which are used, for example, in a manufacturing environment.

Going forward, the three core custodial tasks—sweep, mop, and vacuum floors; clean restrooms; and empty trash—are expected to see an increased presence of automation compared to other tasks.

Exhibit 5: Mid-Term and Long-Term Impact of Automation on Custodial Tasks



Floor-Cleaning (sweeping, mopping, scrubbing, or vacuuming): Autonomous floor scrubbers and vacuum sweepers are the "commodity” of robots currently available in the custodial market. As the adoption of autonomous floor-cleaning robots increases, more suppliers are expected to come into the market, which will result in further uptake, lower prices, and better ROIs.

Restroom Cleaning: Building robots for restroom cleaning has higher technological barriers compared to autonomous floor-cleaning robots. Restroom cleaning involves multiple tasks as well as dexterity, which requires a higher degree of deep machine learning to build robots that are able to perform them. This is one of the primary reasons why there are a limited number of companies pursuing this opportunity. Currently, only two types of restroom cleaning robots are available for commercial purposes in the United States: Peanut Robotics and SOMATIC. Both companies are in the early stages of commercialization. The robots are designed to clean bathrooms (tubs, sinks, toilets) in commercial spaces, such as hotels, airports, and offices. The initial price to lease such robots is in the range of $1,000 to $1,500/month. Typically, customers employ them for two eight-hour shift needs ($2,000/month) to justify the economics.

The key drivers for customers to use these restroom cleaning robots are:

1. Cost Savings: The operational cost for such robots is anywhere from 25% to 50% lower compared to the standard cost of using a custodial worker (~ $6 to 8/hour compared to $12/hour for a custodial worker, plus cost of insurance, recruiting, training etc.).
2. Quality Cleaning: Robots provide precision cleaning every single time compared to workers who sometimes take shortcuts to get bathroom cleaning done quickly to avoid staying there for long.
3. Lower Staff Turnover: Bathroom cleaning is regarded as the least interesting part of custodial tasks, resulting in higher turnover.

Automation in restroom cleaning is expected to pick up as technology evolves further and becomes more affordable. According to BSC's, restroom cleaning is also one of the most problematic areas, receiving the most complaints from customers. Robotics will help clean restrooms multiple times a day at a lower cost.

Trash Collection: Trash collecting robots are still at a very early stage to be put to commercial use. Just like restroom cleaning, trash collecting involves dexterity, and therefore, a higher degree of technological expertise. Emptying trash cans is a time-consuming task for both customers and BSCs. Robots designed to pick up trash and empty it into centralized bins are expected to be commercialized in the near future.

Currently, Dussmann Group, one of Germany's largest cleaning companies, is deploying robotic cleaners for its offices, which can autonomously detect dirt on the floor or waste that needs to be removed.

Google's Alphabet X is working on an "Everyday Robot Project," for robots to assist in daily home and office tasks, such as sorting through waste to make sure that items are trashed in the correct recycling bin.

Duct, Chimneys, Flue Cleaning: Most of the BSCs clean vents and return vents but not inside the vents of HVACs, because this is a very specialized task, and only a few companies offer such solutions. However, cleaner ducts result in less dust accumulation inside the building, which results in time saved for custodial employees to manually clean the surface. The overall impact is expected to remain low. However, more companies that offer robots designed specifically for the task of crawling through air ducts and cleaning dust and debris there are expected to come into the market. As these types of robots become more prevalent in the market, there will be reduced need for labor in this area.

Other: Other tasks are mostly done weekly, monthly, or quarterly and do not justify the investment in robotics in the future. Some of these tasks include:

1. Stripping and Waxing: This task is becoming less prevalent as buildings are moving towards natural stone or polished concrete due to aesthetic and sustainability trends.
2. Cleaning Windows and Glass Partitions, Dusting Furniture, Cleaning Walls: By its very nature, these tasks are much more difficult to automate, and the frequency is not enough to justify the investment.
3. Steam Cleaning, Shampooing Carpet: There is not enough carpeted commercial floor space to justify an investment in automation.
4. Cleaning Laboratory Equipment (such as glassware): There are liability issues with cleaning surgical or laboratory equipment. If it is not 100% correct, for example, traces of bacteria or chemicals can lead to infections or other mishaps. For this reason, the impact of automation for this task is expected to be low,

and human labor will continue to be required due to the sensitivity of the equipment and level of cleaning required.

Market Drivers

There are various market drivers along the custodial and custodial service value chain that incentivize the adoption of automation.

Diminishing Labor Pool

Cleaning and custodial work is for the most part entry-level, low-wage employment. As a result, high turnover (~200%) and poor quality of work are constant challenges. The cleaning workforce is over-represented by older workers (55% of custodial staff in the United States are over 45 years old)[4], and many of the younger workers who choose to go into cleaning, are doing it temporarily rather than as a career. Additionally, much of the workforce is made up of first-generation immigrants[5], and as immigration policies become increasingly restrictive, service companies are finding it difficult to fill their staffing requirements satisfactorily. Also, cleaning is done on the second and third shifts, which increases the absenteeism, turnover, and quality concerns**.** With rising labor costs as well as the challenges of finding and retaining employees, many BSCs are finding that they need to offer wages up to $2/hour more than they previously offered.

Market Competitiveness

The custodial business is becoming more commoditized. Therefore, service companies are driving innovation and using technology to improve performance and the quality of the cleaning outcome to differentiate themselves from other traditional companies. Robotics helps commercial cleaning companies bridge the physical and digital gap, bringing performance management and analytics to real-world tasks.

Conservative estimates based on a survey by Gallup indicate that the cost of replacing a single employee can range between one-half to two times the employee's annual salary[3]. Supporting cleaning staff with robotics could reduce the physical strain and monotony and could reap significant savings. Workers' safety and compensation claims is another reason that robotics is replacing some of the mundane tasks, such as vacuuming, which results in a strain on the back muscles and wrists. There is also the risk of a worker slipping and getting injured while cleaning the floor, especially when stripping and waxing. Companies that utilize automated cleaning equipment are more likely to experience less turnover than their competitors.

Customers

With the help of automation, customers are getting cleaning services that are reliable and cost-effective, and that meet their performance standards. Robots offer customers increased cleaning coverage and consistency.

Customers realize cost savings in services such as floor care, where 70% to 90% of the cost is on labor and can be reduced in the longer term by switching to autonomous robots, especially for large sweep areas. Historically, the two largest areas of cost for facility managers have been custodial service cost and utility cost. Because facility managers are unable to negotiate lower prices with utility companies, they have been forced to reduce their spend through custodial contractors, which has resulted in unreliable quality of cleaning in the last five years. For example, buildings may opt to have their floors scrubbed and trash collected only three days a week, rather than every day. Automation is able to bring back the quality of cleaning at same or even lower cost.

Technological Advancement

New technology advancements will further enhance and expedite product development and market acceptance. Robot Operating System (ROS) is an open source software framework that has been growing in popularity and enables developers to build products faster and more easily on a common platform. At present, the automation

[4] SoftBank Robotics Team, *"5 Ways to Curb Costly Employee Turnover for Your Cleaning Company*." (SoftBank Robotics, March 2020)
[5] "*Janitors and Building Cleaners: Occupational Outlook Handbook."* (U.S. Bureau of Labor Statistics, Sept. 2020)

focus is on replacing repetitive or monotonous daily tasks that consume large amounts of labor hours. However, as technology improves, more complex tasks are expected to become automated.

Exhibit 6: Pros and Cons of Current Robotic Floor Care Products

Pros	Cons
○ Can reduce floor care labor costs up to 85% without compromising quality ○ Cleans on average 10,000 square feet per hour, which is twice as much as an average cleaner ○ A single battery set lasts 4 hours ○ Communicates and tracks data using wireless technology ○ Produces productivity reports on demand	○ Not yet cost-effective to use in facilities less than 25,000 square feet in total area, because of the high upfront investment ○ Some of the autonomous floor robots require minimum six feet room width; therefore, no small hallways ○ Needs a trained employee on-site to prep, position, and troubleshoot issues

Impact of Automation on Custodial Workforce Displacement

The idea of robots taking away jobs in the custodial industry is a misconception; custodians have a scope of work that is very big, and they only have so much time.

In the current market, the function of a cleaning robot is much more limited than that of a custodian. The primary function of a robot is to scrub or vacuum the floor, whereas custodians also clean windows, empty trash, clean restrooms, disinfect tables, etc. The prospect of robots performing all these tasks is still distant, with exception of emptying trash cans and cleaning restrooms, where there have been some developments of autonomous robots. All other tasks are still expected to be performed manually by the custodian as the frequency of task and complexity of automation required does not justify developing robots.

Current robotics initiatives support task automation, not job automation. With task automation, robots can do the repetitive and monotonous work, such as floor scrubbing. This allows workers to take on more meaningful and essential work, such as disinfecting surfaces. The current robotic commercial cleaners easily integrate into the process with minimal disruption. This is also one of the key drivers for their adoption given that property managers and commercial cleaners rarely have the luxury of downtime (shutting down a building or office for days). For example, with autonomous vacuum sweepers, at unboxing, the cleaners build the route map for the devices so that the vacuum sweepers can begin cleaning and learning right away. For future cleans, the devices remember the route on their own, and smartly navigate around any changes in their environment. The workers who used to vacuum the floors now focus on other tasks in the building that require a human touch.

Shortage of labor is a major concern in the industry. As such, the value proposition of automation is also helping service companies stay above water by keeping up with demand. A BSC would be hard pressed to eliminate one person for one robot (depending on the kind of team they have and services offered). If a BSC has 10 workers, they can potentially go down to nine with the addition of a robot, but they cannot do that with smaller teams.

Therefore, the current shortage of labor and increased demand in cleaning services posed by the COVID-19 pandemic is currently being settled through automation, which is augmenting the custodial workforce rather than displacing it.

Skills Required with Increased Use of Automation

With the various major technological changes that have taken place, there has been a paradigm shift in the evolution of traditional jobs and in the emergence of potential new jobs. These jobs would require new skill sets,

command higher pay, and would replace many of the older jobs. For example, robot operators (co-bots) who control and monitor multiple robots on-site or remotely, will be paid at significantly higher rates than a traditional custodial employee. This will result in a redistribution of tasks between custodians and robots.

Manufacturers of automated equipment, such as Nilfisk, play an active role in the training of custodians employed at a customer's site. Their primary focus is to make the equipment user-friendly by using simple command buttons, such as Pause, Play, and Stop, to reduce the amount of training required to operate the equipment. Once a particular machine has mapped out the cleaning route, it can be left unmonitored unless it encounters an unexpected obstacle. In this case, the worker will be required to intervene and troubleshoot the problem, which is also included in the training programs offered by equipment suppliers.

In the future, as automation takes on an increasing number of cleaning tasks involving more complex automation (e.g., a restroom cleaning machine with a robotic arm), extensive training programs will be essential for re-training the existing workforce to take on these new responsibilities.

Engineering positions, such as a software engineer or automation engineer, will likely remain with the equipment manufacturers. As previously discussed, it is quite common for autonomous equipment to be purchased via the SaaS model, where the equipment manufacturer provides the maintenance and software services, and these associated skills are not required from custodians.

Impact of COVID-19 on Custodial Automation

Robots help keep the custodial staff safe by autonomously cleaning various areas and thereby limiting the physical exposure of the staff. Given the current pandemic, the demand for commercial cleaning has skyrocketed, and new, stricter standards for cleanliness have emerged virtually overnight. This sudden shift has left commercial cleaning companies scrambling for resources. In response, many businesses have turned to automation and robotics to keep up with the demand. In this economic downturn, facility managers and BSC's are not necessarily cutting down on the headcount but are often implementing hiring freezes. This prevents operations managers from getting people to help with the increased workload of disinfecting and sanitizing. They are finding that capacity by re-tasking some of the scrubbing workload to robots and reallocating people to disinfection tasks. New disinfecting machines, such as foggers and electrostatic sprayers, have also been instrumental in assisting custodial workers with the increased disinfecting workload. This allows the BSC's to maintain same level of staffing or even operate with a reduced workforce.

Xenex, based in San Antonio, Texas, is a leading provider of UV-light zapping germicidal robots. The company has shipped hundreds of its LightStrike bots around the world, including to nearly 70 Veterans Administration hospitals in the United States and to 10 sites run by the U.S. Department of Defense. Similarly, UVD Robots, which is headquartered in Denmark, is exporting its fully autonomous ultraviolet-light-disinfection robots to the United States and other countries around the world.

Typically, customers paying for cleaning services would like to see the custodians cleaning. Customers tend to question when a cleaning force is reduced, for example, from five people to three people, even though a robot was added to maintain the same level of service. COVID-19 has begun change this mindset, and customers are starting to prefer fewer people and more robots when it comes to cleaning their facilities.

Future Workspaces

Many companies are adopting new remote working policies, but the change in workspace concept is still new. Tech companies, such as Google, have announced plans to extend the work-from-home model through the summer of 2021. As other companies follow suit, commercial cleaning companies are not going to be able to charge as much as they were charging, because the spaces will not be as dirty. Therefore, the cleaning robotics forefront is not expected to be in commercial real estate. Instead, it is expected to be in universities and schools. Typically, in those environments, the custodial staff is older. With older staff having underlying health

conditions, coupled with the current pandemic, robotics may be preferred in order to reduce exposure and minimize risk.

Commercial real estate owners and operators are considering several potential longer-term effects of COVID-19 and the required changes that it is likely to bring. For example, the pre-pandemic trend toward densification and open-plan layouts may be reversed sharply. Public health officials may amend building codes to limit the risks posed by future pandemics, which would affect standards for square footage per person and the amount of enclosed space. The future of commercial real estate remains uncertain. The response from industry experts range from highly optimistic (an increase in demand for larger spaces to maintain lower occupancy density) to rather pessimistic (a complete shift to remote working models, resulting in a drastic drop in the commercial real estate space needed). However, what remains certain is that enhanced custodial and cleaning services will be essential in all forms of future commercial workspaces.

Cost of Automation in the Future

The SaaS is going to stay. Looking at existing SaaS models, such as Windows, Office, Adobe, even cable TV, ISP, mobile phone monthly service fees, the fees always go up. The potential area where automation cost could go down is with the hardware. Hardware costs could be reduced with less expensive sensors (replacing LIDARs with cheaper cameras) and economies of scale in manufacturing, but it would represent, at most, 5% to 10% of the total hardware cost. A change in ROI will be driven mostly by rising labor rates rather than by product and service costs. The United States has seen very low federal minimum wage for a long time, and rates are expected to increase in the next few years (a change in the political landscape will impact any subsequent changes to the federal minimum wage).

Conclusion

The purpose of this report is to understand the impact of automation in the custodial service market now and in the future. The trends cited in this report suggest that currently automation is able to displace tasks and not necessarily the workers. In the future, automation will further increase but will be limited to those tasks that allow workers to take on more meaningful and essential tasks. With an aging workforce, the custodial industry faces serious turnover issues. Service contractors and facility owners are looking at automated cleaning equipment as a way to address the shortage of labor.

Automation also provides the prospect of new and exciting jobs in this industry, which will require different skillsets. For example, robot operators who control and monitor multiple robots on-site or remotely, will be paid significantly higher. Extensive programs for retraining the existing workforce will be critical and the foundation for a successful change.

About SourceAmerica

SourceAmerica connects government and corporate customers to a national network of over 700 nonprofit agencies that hire a talented segment of the workforce – professionals with disabilities. Established in 1974, SourceAmerica is committed to increasing economic and social inclusion and advocating for a more accessible future of work for people with differing abilities. As a leading job creator within the disability community, and distinguished as an AbilityOne® authorized enterprise, SourceAmerica harnesses the momentum and boosts the capability of its network and customers. To learn more, visit SourceAmerica.org and follow the organization on Facebook (@SourceAmerica), Twitter (@SourceAmerica), Instagram (@SourceAmerica), and LinkedIn (@SourceAmerica).

Appendix A

Exhibit 7: Janitors and Cleaners Employed in the United States, 2019 (Source: BLS)

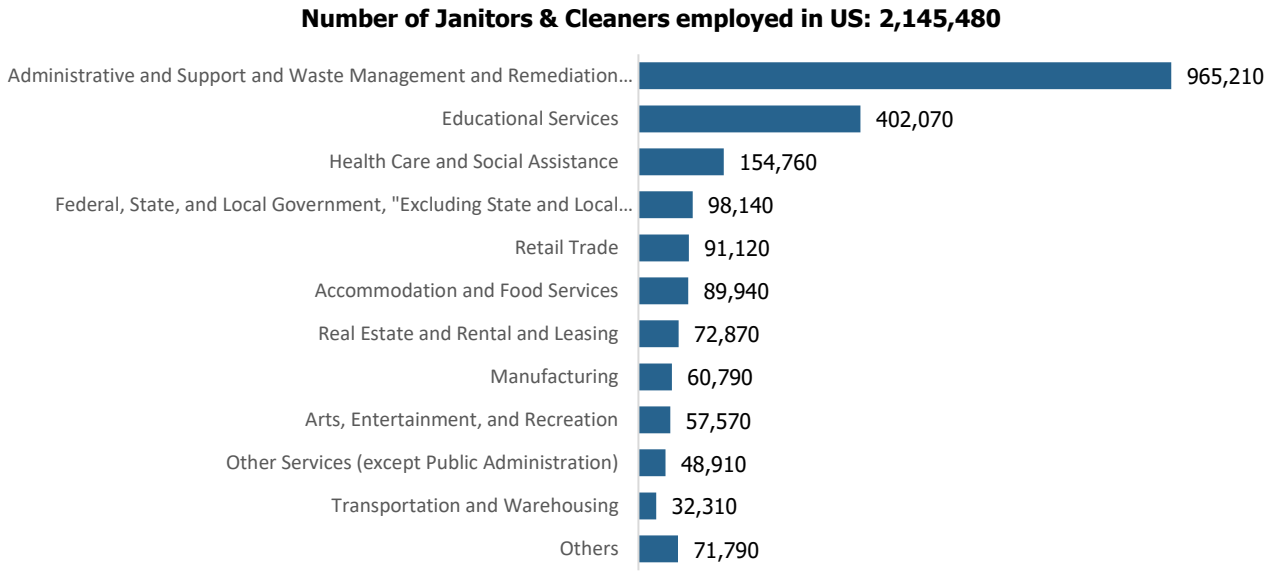
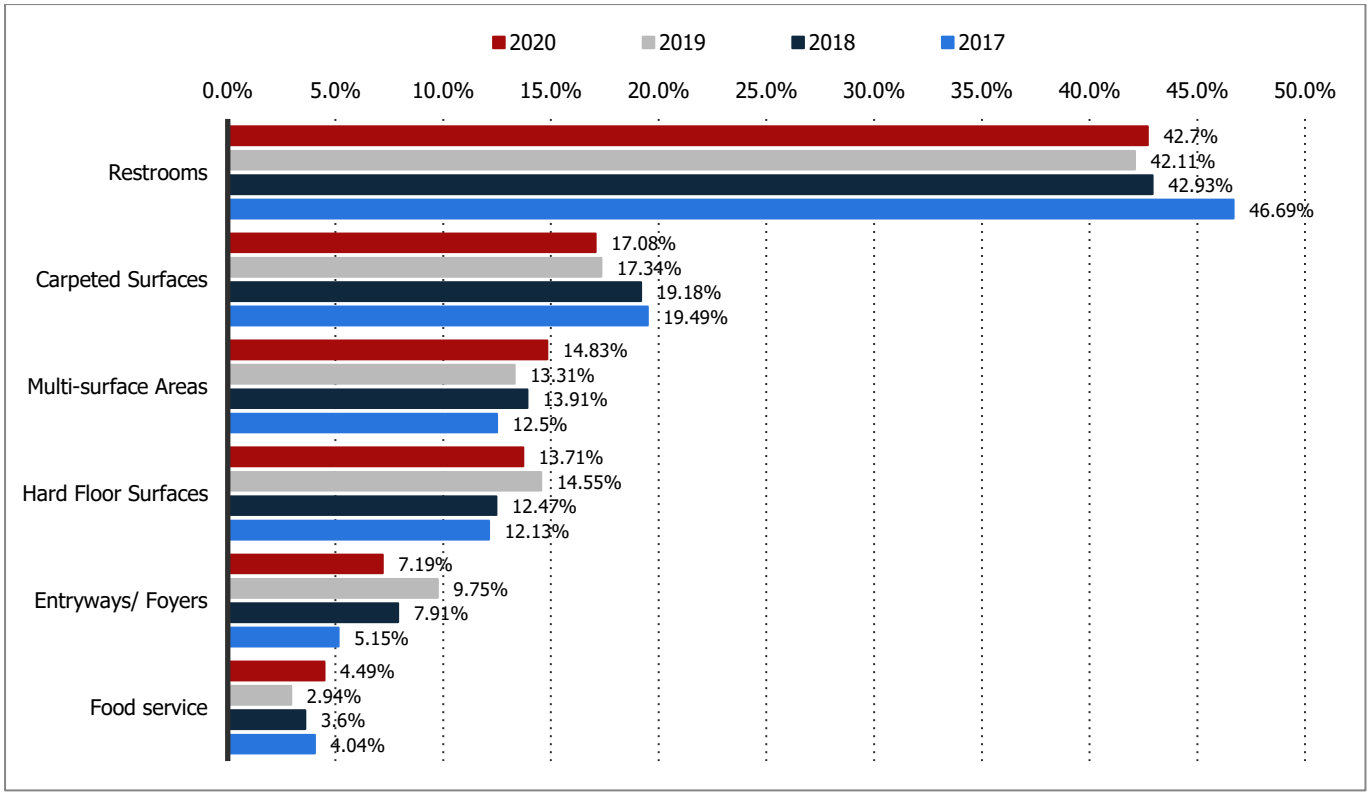


Exhibit 8: Building services Contractors: Areas/Surfaces They Received Complaints About 2016-2018 (Source: CMM Survey)



Appendix B: Interviews

Representative Quotes from In-Depth Interviews

Building Service Contractors

- "Customers wanting their desks wiped down is less of an opportunity, but in the common areas, if there was a robot wiping down surfaces or walls, those seem to be the big talking points and areas of complaint. Restrooms typically account for 3% of the coverage in a building, but account for over 90% of the complaints. Emptying and cleaning trash cans is one of the biggest tasks and also time consuming. If a BSC has a robot that was actually emptying trash cans day in and day out, then that becomes a game changer."
- "The reason I would utilize (robotics) is because labor is getting harder and harder to find. By utilizing the technology we're finding solutions to getting the jobs done."
- "I think entering these spaces, you need to be able to reduce the amount of time that the employee is in those spaces with potential exposure. You can turn a robot loose and let the worker do a light wipe-down and a trash pickup."
- "I think as the pandemic continues to linger, schools are going to be a huge target area."
- "People call in sick; robots don't."
- "The robot is available 24/7 and there are very few cleaners that are that reliable. If someone doesn't show up, someone else still has to clean that space."

Robotics Companies

- "In the current market, the only function of a cleaning robot is to scrub or vacuum the floor. The work of a janitor is much more: clean windows, empty trash, clean restrooms, disinfect tables, desk, door handles, cubicle etc. The idea of robots doing all these tasks is very distant. A BSC would be hard pressed to eliminate one person for one robot (depends on kind of team they have, and the services offered). If a BSC has 10 workers, maybe they can go down to 9 with addition of robot, but they can't do that with smaller teams."

Cleaning Equipment Suppliers

- "Autonomous equipment allows you to either free up employees to do some other non-repetitive tasks, but more often it means that you don't have to 'rehire' as many people."
- "What we are finding in today's world with COVID-19, it is very clear that a rider scrubber can't save lives. You are not getting any health benefit aside from maintaining slip and falls. Whereas if you have a robot cleaning, you would be utilizing that employee to disinfect touch points. Getting the individual off the machine also plays another role in terms of decreasing property maintenance stresses. There are a lot of injury reports of people running into walls, elevators, and posts with a ride-on scrubber."
- "With automation it has less to do with the tool. It is designed for the everyday cleaner. The whole idea is that we want to be able to hand it to a person and spend a day or two to teach the person how it behaves and operates. Having simple controls like a Play, Record, Pause, button (like in a DVD or Netflix, etc.) makes it very user friendly."
- "Office tower cleaning frequency has dropped dramatically, to the effect of massive layoffs for those cleaning companies. Robotics will probably play a large role in schools, once they reopen with more rigorous disinfecting standards. Again, the idea here would be a "co-bot" system where the janitor is freed up to disinfect as a cleaning robot takes care of the floor scrubbing tasks."

Industry Advocacy Group

- "Robots are being built to enhance the workforce, not to replace them."