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Contents

Productivity in Cleaning Industry

1. Overview of the Cleaning Industry

The cleaning industry is large and diverse. It has about 1,0011 cleaning companies as of 1st September 2014. It engages an estimated workforce of 52,000 cleaners (including 38,000 resident cleaners). The industry provides both general and specialised cleaning services, with general cleaning (commercial premises, food & beverages establishments and conservancy areas) making up majority of the services in the industry.

To increase productivity and professionalism in the cleaning industry, both the Labour Movement and the Government recognise the need to improve public hygiene standards and increase productivity of low-wage workers. The four important areas of the productivity roadmap for the cleaning industry are:

a. Capability and Standards Development
b. Training and manpower resource
c. Technology and Innovation
d. Education and Outreach

Figure 1: Diverse Cleaning Industry
Source: http://www.nea.gov.sg/public-health/public-cleanliness/cleaning-industry

The National Environment Agency (NEA) has a voluntary accreditation scheme. Companies within the cleaning industry are recognised when they demonstrate higher cleaning standards. The improvement is realised through the use of proper equipment, appropriate worker training, and good human resource practices.

The National Trades Union Congress (NTUC), Unit for Contract and Casual Workers (UCCW) and e2i (Employment and Employability Institute) intend to promote best sourcing initiatives. Service buyers will give stronger emphasis on quality rather than price alone. The $2.5 million automation and mechanisation grant scheme from NTUC will encourage cleaning service providers to undergo the accreditation process by defraying the cost of equipment purchase.

The Singapore Workforce Development Agency (WDA) has a Environmental Cleaning Workforce Skills Qualifications (WSQ) framework for workers. Its purpose is to upgrade cleaning workforce skills and cultivate a progressive path for advancement.

Figure 2: Environmental Cleaning WSQ for upgrading cleaning workforce
Source:
http://www.wda.gov.sg/content/dam/wda/pdf/L301/Environmental_Cleaning_WSQ_Guidebok_Feb2015_Final.pdf

2. What are the barriers/challenges facing the sector's productivity?

The Inter-Agency Steering Committee on Public Hygiene (ISCPH) was formed in June 2009 with representatives from the public, private and people sectors. Its purpose was to identify ways to increase Singapore's public hygiene and support the effort of public education. To be successful, it requires all stakeholders to commit to a high standard of cleanliness and hygiene. Four specific challenges faced then were:

a. There is a poor image of cleaners, leading to a lack of sufficient skilled manpower.
b. Cleaners lack proper training, resulting in compounded errors and significant expenses to correct the mistakes.

c. Service buyers require and demand high performance standards, which require skilled, well-trained staff.
d. Service buyers tend to practice 'cheap sourcing' methods, which pressures the contractor to pay low wages and use cheap, lower quality supplies and equipment.

The Environmental Management Association of Singapore (EMAS) encouraged a plan for accreditation that would identify the level of quality for each cleaning company. The result would improve performance standards within the cleaning industry, leading to increased productivity and a better image of the trade. The result is an industry roadmap developed by NEA, MOM, WDA and NTUC's e2i that includes a voluntary accreditation scheme which is in line with the National Productivity and Continuing Education Council (NPCEC). This is covered in the overview.

In addition, according to Services magazine (http://www.servicesmag.org/reviews/item/1-industry-trends-projections) annual Industry Trends and Future Projections report, green cleaning is a fundamental part of the cleaning industry, requiring cleaning companies to provide environmentally friendly services as well. OSHA defines green cleaning as products certified by independent organizations as safe to use and less harmful to your health and environment than conventional alternatives such as bleach and ammonia. In response, cleaning companies are evaluating technologies, comparing the impact to chemicals and other devices along with the wattage.

Figure 3: Orbio SC 5000 uses a salt-based process, where water passes through the system giving it an electrical charge. Orbio SC 5000 split stream water technology can clean floors, surfaces, even urinals. The solution cleans and sanitizes surfaces leaving it 99% germ free. Photo: Courtesy of Orbio

Source: http://www.theguardian.com/sustainable-business/2014/jun/25/chemical-free-eco-cleaning-commercial-sector-households

3. What are the enablers and disruptive technologies available to boost productivity in the sector?

The initiatives under the productivity roadmap for the cleaning industry focused on raising the overall standard of cleaning companies through the Enhanced Clean Mark Accreditation Scheme2 (EAS), training and up-skilling of the workforce, greater technology adoption and work process redesign, building a productivity culture, strengthening of employment practices, and best sourcing of cleaning services.

3.1 Capability and Standards Development

The Enhanced Clean Mark Accreditation Scheme2 (EAS) scheme helps cleaning companies to put in place proper structures and systems, especially in the areas of human resources and training, as well as to push for greater productivity through mechanisation, automation and redesign of work processes to allow companies to optimise their manpower. The scheme also encourages the capacity building at different levels through the training of cleaners, team leaders and supervisors.

To improve the cleaning standards and productivity of the cleaning industry worked with many agencies to develop technical references, standards, and guides to assist the cleaning service providers and buyers in assessing and monitoring the performance and quality of cleaning services. A series of Pictorial Guides for Cleaning have been developed to serve as a quick and easy-to-use guide for cleaners on the cleaning procedures and use of equipment, as well as the safety measures to abide by. The colour-coded visuals in the four official languages, aim to help cleaners remember the sequences needed to clean a washroom or an office. Cleaning companies can leverage these guides as enablers to enhance capability and provide better standards of service.

Figure 4: Pictorial guide on washroom cleaning procedures by NEA
Source: http://www.nea.gov.sg/docs/default-source/public-health/public-cleanliness/Cleaning-Industry/pictorial-guide-on-washroom-cleaning---poster.pdf

3.2 Training and Manpower Resource

To complement the EAS and raise the quality of cleaners in the industry, WDA has committed $6.1 million to train, upgrade and enable cleaners to be certified with the Environmental Cleaning Workforce Skills Qualifications (WSQ).

Figure 5: Environmental Cleaning WSQ Progression Pathways

Source: http://www.wda.gov.sg/content/dam/wda/pdf/PressRelease/19102012/ANNEX%20C%20-%20WDA%E2%80%99s%20Environmental%20Cleaning%20WSQ%20and%20Assessment%20Only%20Pathway.pdf

3.3 Education and Outreach

NEA actively works with partner agencies, cleaning companies and service buyers to build greater awareness on uplifting the standard and professionalism of the cleaning industry. NEA conducts EAS briefing sessions to cleaning companies and service buyers. Outreach efforts include one-to-one engagements with cleaning companies and facilitating industry players to share productivity initiatives and best practices.

Figure: Environment cleaning sub-sectors: Commercial and Private Residential Cleanin and Public Cleaning

Source:http://www.wda.gov.sg/content/wdawebsite/L207-AboutWSQ/L301-WSQIndustryFramework-EnvironmentalCleaning.html

3.4 Technology and Innovation

To further boost productivity in the sector, NEA has also worked with various agencies and companies to develop a “common equipment list” that companies can refer to when seeking funding support to buy equipment to enhance productivity. A sum of $9 million has been set aside under e2i's Inclusive Growth Programme (IGP) for improving the skills and pay of low-wage workers through job redesign and improved work processes. Cleaning companies can tap on this funding support to upgrade their equipment to enhance productivity.

Besides increasing quality of service and reducing costs, IoT technology can boost productivity in the commercial cleaning industry in the following ways:

a. Create a better customer experience by using sensors to track the use of customer bathroom facilities. Soap dispensers send data to a cloud-based platform when used, which records the time of use. Clients can identify when demand is high, indicating a need for attention. The cleaning services operator sets alerts based on gathered data, resulting in service when it is needed rather than random checks. The level of service results in high customer satisfaction.

b. Reduce operational costs by foregoing traditional routine cleanings. Sensors identify when the bathroom has the most and least use, creating the opportunity to adjust the cleaning staff according to need. In addition to soap dispensers, other items used in the bathroom send alerts to indicate that service is needed.

c. Lower maintenance costs by using IoT to assess maintenance needs based on equipment monitoring. It alleviates the number of customer site visits and identifies simple to fix equipment problems. Training clients to handle the simple problems reduces repair costs and down time, as well as reducing operational costs for the cleaning company.

We share a few examples of technologies that are and/or have the potential to disrupt the cleaning industry.

3.4.1 Toilet Cleanliness Monitoring System by A*Star Institute for Infocomm Research (I2R)

The Toilet Cleanliness Monitoring System is maintenance-free as it applies energy-harvesting technologies to power the sensors that count the number of users going past the toilet's main door. Cleaning companies can deploy their workers more effectively to clean the toilets according to their 'cleanliness level' using this technology.

Figure 6: Toilet Usage and Cleanliness Monitoring System by A*Star
Source: http://www.i2r.a-star.edu.sg/sites/default/files/ready-technologies/Toilet%20Cleanliness%20Monitoring.pdf

The system is scalable as it also has the option to include ammonia sensors and 'on-demand' requests to alert the cleaners if a particular toilet needs additional attention. This technology is expected to improve the productivity of cleaning companies by up to 20 percent. Usually, public toilets are cleaned at regular intervals, regardless of the number of times the toilet is used. This results in manpower wastage. Cleaning companies can deploy this deploy this system, under A*STAR's Technology Adoption Programme (TAP).

3.4.2 TiO2 Self Cleaning Technology by A*Star Singapore Institute of Manufacturing Technology

This uses sunlight to activate the titanium dioxide (TiO2) nanoparticles, resulting in high oxidation power and superhydrophilic effect. This results in rain water forming a sheet of water and drains easily from surface (washing effect). It provides a self cleaning effect on building façade e.g. painted surface, glass windows and panels. The self-cleaning effect can last 5 years. This technology dramatically reduces building maintenance cost (man-power, water, detergent s, chemicals and access costs).

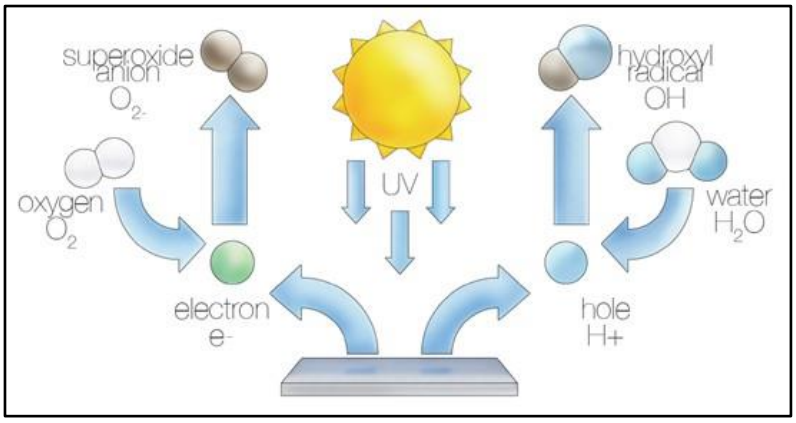

Figure 7: TiO2 Self Cleaning Technology by A*Star
Source: http://www1.simtech.a-star.edu.sg/MPTC/productivity-showcases/ensure-effectiveness/tio2-self-cleaning-technology.aspx

3.4.3 Colloid Micelle Cleaners (source: Intellectual Property Intermediary (IPI) Singapore)

The heart of this new chemistry is the technology used to create a colloidal micelle, a highly concentrated bio-based cleaning product which utilises the unique properties of colloidal micelles in order to tackle almost any kind of cleaning situation. The micelle molecules are able to break down organic molecules such as hydrocarbons and can be formulated into effective cleaning, degreasing, emulsifying and encapsulating agents. Each micelle measures one nanometer across which is equivalent to the size of ten hydrogen atoms. The encapsulation action of these nano-scale molecules enable then to penetrate through and emulsify hydrocarbons such as wax, grease or oil and remove stains. These micelles offer inherent advantages over traditional chemicals in reduced application rate, more rapid and reliable activation and extended long-term effect. It provides a platform for various cleaning formulations with a broad spectrum of applications ranging from food processing to industrial and commercial cleaning. It is also highly effective for a myriad cleaning applications in industries such as automotive, marine & offshore, janitorial maintenance, manufacturing, hospitality, medical care, schools and food & beverage processing. It can be formulated to work with a variety of surfaces, including metal, plastic, fabric, vinyl, rubber, painted surface, and even leather.

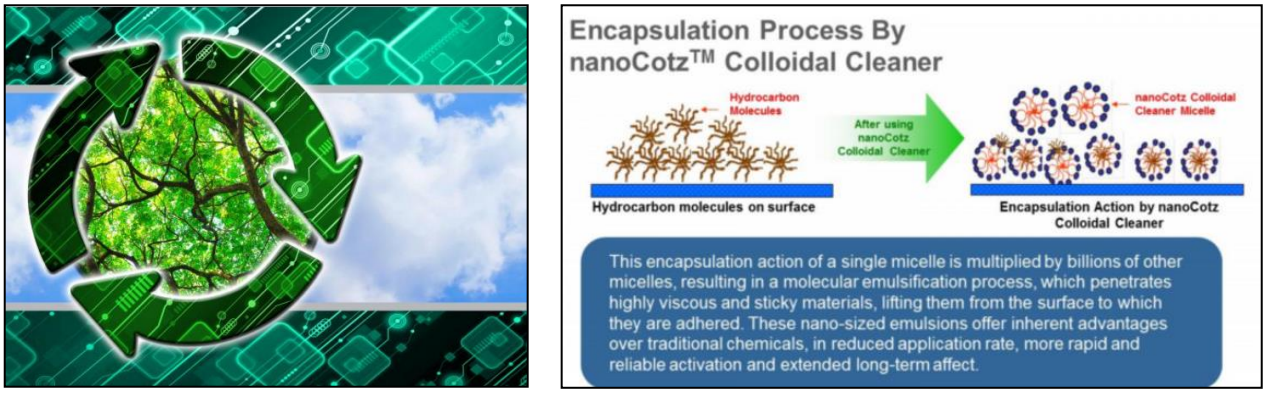

Figure 8: Colloid Micelle Cleaners
Source: https://www.ipi-singapore.org/technology-offers/colloid-micelle-cleaners

3.4.4 Robotic Technology

Total operational savings, cleaning standardisation, and labour productivity are three obvious benefits of using robotic technology. Maintenance costs are decreased by using a self-cleaning effect on glass windows and building facades. It is an eco-friendly, safer way to wash windows, particularly on high-rise buildings. The HydroBot from Intellibot is touted as the most advanced robotic commercial floor cleaning machine in the world.

Three popular features are:
a. On-board water purification to reduce waste.
b. Remote wireless monitoring for easier management.
c. Hands-free operation that increases productivity and reduces costs.

Figure 9: Intellibot's artificial intelligence technology
Source: https://www.thebig5hub.com/innovative-products/2015/may/sealed-air-and-diversey-gulf-launch-robotic-cleaning-technology/

In April 2015, Diversey Care (USA) purchased Intellibot Robotics and set into action new methods for commercial cleaning and hygiene industries. Dr. Ilham Kadri, president of Diversey since 2013, created the name and philosophy of 'The Internet of Clean' (IoC). It utilizes smart devices like beacons, dispensers, and machines in a facility and connects them to enhance overall goal of cleaning and hygiene. The IoC goal is reinforced with Intellibot. Its Artificial Intelligence produces the opportunity for companies to use remote monitoring of its automated floor cleaning capability. Intellibot cleans and disinfects floors faster and more efficiently than humans. The equipment saves money because it needs no training and remains committed to the task for which it was designed. The IoC gathers data and trends to provide additional suggestions for efficient methods that benefit building owners/operators and service contractors.

4. Possible Immediate Actions

Competition in the cleaning industry requires management to rethink business practices. Possible immediate actions to increase productivity may help your business survive, such as:

4.1 Diversify your services. Add another element to your current cleaning business. Provide residential and commercial cleaning or offer cleanup services after weddings and other special events.

4.2 Think outside the box by picturing what can draw in additional business. Ask employees, friends, and family members for suggestions and why they believe the ideas will work.

4.3 Maximise workers' productivity while reducing operating costs. Work in specific areas each day to save on travel expense and time.

4.4 Update software and use technology to make the business competitive and efficient.

4.5 Arrange training for everyone in the company, including yourself. Explore opportunities for no-cost or subsidised training. Excellent service by skilled professionals is a proven way to keep and attract customers.

4.6 Get to know your customers and become familiar with their expectations. Maintain contact so they put a face with the company name. If there is a complaint, correct the situation first. Investigate the problem afterwards and take steps to prevent further misunderstandings.

Case Study

Case Study: Singapore – Robotic Cleaners Assist Local Cleaning Company with a Three-Fold Increase in Productivity – Clean Solutions Pte Ltd

Robotic cleaners, first launched in Singapore in mid-2014, have made a positive mark on Asia's cleaning industry. Ms Grace Fu, Minister, Prime Minister's Office and Second Minister for the Environment and Water Resources and Foreign Affairs, introduced the creations from Intellibot Robotics during the CleanMET Asia Exhibitions 2014, held at the Marina Bay Sands.

The first local cleaning service to invest in this type of robotic technology is Clean Solutions Pte Ltd. Commercial robotic cleaning machines are available in a variety of sizes, shapes, and capabilities. They are currently used to clean common industrial and commercial areas, including hospitals, warehouses, and hotels. In addition, they efficiently clean ventilation ducts, toilets, and swimming pools.

Figure 10: Commercial robotic cleaning machines
Source: http://cleansolutions.com.sg/

Case Study: Global - Self-Cleaning Toilet (Toto Japan)

The eco-friendly self-cleaning intelligent toilet from Japan is making an appearance around the world. It is designed to go a year without manual cleaning. Chemical cleaners are unnecessary during that time. Known as a washlet, Toto's system uses electrolysed water to clean and sanitize the toilet bowl, which is coated with titanium dioxide and zirconium so nothing sticks. A special wand uses warm water to wash the user and soft air dries the area. There is no need for toilet paper. The cover lifts automatically when a person draws near. It closes once the person moves away, inducing the flushing action. The toilet is available in Europe and the United States.

Figure 11: Self-Cleaning Toilet (Toto)
Source: http://gb.toto.com/products/productlist/Product/indexByCategory/category/Shower-Toilet-WASHLETs/

5. Conclusion

Cleaning companies are finding creative ways to harness the power of the Internet of Things (IoT) offers business intelligence to enhance productivity, increase customer satisfaction and grow revenue. Companies are able to track thousands of data points from connected cleaning and maintenance equipment in their facilities, and combine data from other IoT-enabled devices, including floor scrubbers, sanitising dispensers and environmental systems. This helps with trend identification, such as days of the week when traffic increases and enables the company to plan its resources more intelligently. IoT-connected devices are giving forward-thinking companies the power to analyse data for better business decisions and operations. We invite you to get on board as well.

Recommended Readings

Website Title	The Cleaning Hub
Webpage Title	Cleaning and Maintenance Issues
Publisher	Cleaning and Maintenance
Website	http://www.cleaninghub.net/issues

Website Title	Cleaning & Maintenance Management
Webpage Title	Cleaning & Maintenance Management Magazine
Publisher	ISSA. Reprinted with permission from Cleaning & Maintenance Management Magazine
Website	http://www.cmmonline.com/publications/1

Website Title	INCLEAN
Webpage Title	Technology
Publisher	INCLEAN
Website	http://www.incleanmag.com.au/category/technology/

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