National Environment Agency

Manpower Study of the Environmental Services Industry

Industry Transformation Efforts Report (Cleaning Sector)

December 2021

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Executive Summary

The National Environment Agency ("NEA") and Workforce Singapore ("WSG") has commissioned KPMG Services Pte Ltd ("KPMG Singapore") to conduct an Environmental Services Industry Manpower Study ("Study"). The Cleaning and Waste Management sectors have been integrated within the Environmental Services Industry Transformation Map (ES ITM) to transform the Industry. The Study will address the manpower challenges of the Industry, evaluate the success of ES ITM initiatives, and propose recommendations for key areas of workforce transformation. The Industry Transformation Report forms the second of seven reports in this Study; it provides an assessment of the impact of Industry Transformation on the workforce.

The Cleaning sector is critical to safeguarding public health. NEA is responsible for improving and sustaining a clean and green environment in Singapore. Its role is to fight pollution, maintain public health and provide meteorological information.

1. Introduction

1.1 Study Overview

This report explores the impact of transformation efforts across all job roles, challenges faced at the organisation-level as well as by the employees, and analysis of potential challenges and opportunities at the desired transformation. The Impact of Industry Transformation report forms the second of seven reports in this Study.

The scope of the Study involves the gathering and analysis of information about the Industry. This includes its current state, impact of ES ITM initiatives, skills and training needs, career and wage progression pathways, future manpower demand and supply projections, and the recommendations to support the overall manpower development plans for the Environmental Services Industry from 2020 to 2035.

The Industry Transformation report presents a preliminary summary of the impact of transformation efforts across all job roles from 2017-2021. The information contained in this report is a consolidation of data and observations gathered from the data validation survey, stakeholder interviews, focus group discussions and desktop research.

2. Overview of the Cleaning Industry

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2.1 Overview of the Cleaning Sector

2.1.1 What it is

The sudden outbreak of COVID-19 has accelerated the demand for cleaning services especially in the area of disinfection and sterilization services. With the pandemic heightening hygiene standards, Singapore has to efficiently increase its manpower in the Cleaning sector to cope with demand alongside with developing new technologies to assist in this aspect. Therefore, plans have been undertaken by NEA to introduce legislation in the near future to raise hygiene standards, including uplifting technology adoption and inculcating new practices culturally.

At present, ES ITM comprises strategies across four pillars which are **Technology & Innovation, Jobs & Skills, Productivity, and Internationalisation.** In meeting this increasing demand, the Cleaning sector is facing significant manpower challenges; particularly in attracting and retaining local workers to a sector that is viewed unfavourably in the social domain. Many strategies and initiatives are made available to guide the sector to keep up with the rapid transformation and to optimise resource efficiently to keep up with the exponential rise in demand for services in this sector.

The purpose of this paper is to provide an analysis on how Cleaning Sector's transformation efforts, have impacted the current job roles and the potential emerging job roles that can co-exist with new technology. Challenges faced by employees and at the organisation-level will also be identified. In addition, strategies to maximise employment of older workers will be discussed in this paper in relation to Singapore's aging population.

2.1.2 Introduction to Key Transformation Efforts

The launch of the **Environmental Services Industry Transformation Map (ES ITM)** on December 2017, unveiled the strategies and initiatives to ensure a professional ecosystem with sustainable infrastructure that will provide services and solutions to help achieve our Zero Waste vision and a clean and liveable Singapore. Partnering with various Government agencies, industry, unions and other stakeholders, NEA worked to establish 33 initiatives across 12 strategies to transform the ES Industry. The first of such strategies involved growing capabilities and spurring innovations to promote Technology & Innovation. Secondly, ensuring sustainable manpower supply to achieve enhancements in Jobs & Skills. Thirdly, drive Productivity through strengthening procurement practices and establishing benchmarking indicators. Finally, promote Internationalisation by enhancing global market access and build scale to offer integrated solutions.

ES ITM is broadly grouped into four thrusts as reflected in Figure 1:

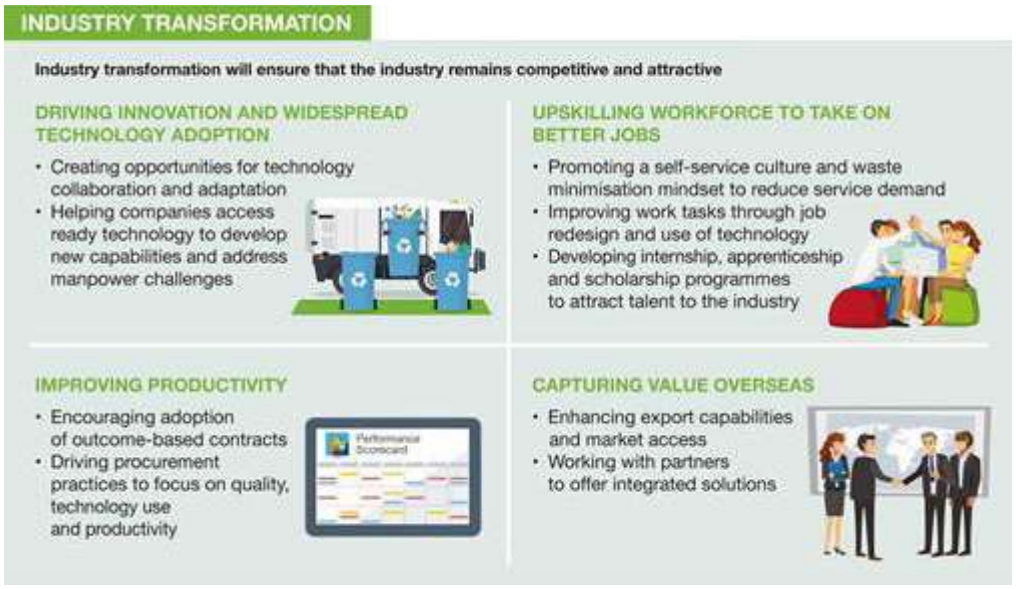

Figure 1: ES Industry Transformation Map

With these initiatives put in place, we can expect by 2025, about 30,000 people from the industry to benefit from higher-value jobs through technology adoption and skills upgrading.

Given that Headcount-based contracting is no longer sustainable and feasible due to the increasing demand for cleaning services, **Outcome-based Contracting** has been the promoted option. Through its Price-Quality method where different weightage is allocated to distinct quantitative aspects, it has driven Service Providers to digitise, adopt new technology to meet desired performance outcomes. As a result, transforming the Cleaning sector to be distinctive and future-proof.

For transformation efforts to be successful, all parties must come together. Organisations, in the recent years, see the importance of incorporating new innovations into their businesses.

These key transformation efforts contributed by government agencies and organisations will yield long term results and enable the sector to strive, improve its image and efficiently use its resources. Scale remains the biggest challenge for this sector as the number of small providers which have a headcount of 50 and below make up 90% of the entire sector. Capability building initiatives are described in section 5.1.2 on Career Progression and Internationalisation in section 7.1.4.

2.1.3 Analysis of Key Transformation Efforts

The four thrusts of the ES ITM focus on key transformation efforts in the areas of **Technology & Innovation, Jobs & Skills, Productivity, and Internationalisation**. In the cleaning sector, large amount of resources is dedicated to spur on digitalisation and encourage technology adoption using government grants.

Many issues which have surfaced in the Cleaning sector include shortages of cleaners coupled with high employee turnover rates, unstructured work and the lack of effective quality assurance systems. Technology is a clear lever to leverage to address some of the above-mentioned issues.

Toilet cleaning is a task which many local workers avoid, so new technology for toilet cleaning is being experimented by start-ups and Service Providers to address this issue. SmartClean[1], a locally based technology start-up, is an example of an enterprise that has successfully integrated new technologies such as sensors into their processes. SmartClean's co- founder, Mr. Agarwal, is convinced of the importance of coming up with solutions to tackle sanitation aspects through Internet of Things (IOT) technology and robotics automation. The organisation uses sensors, known as SmartToilet+, to help monitor the cleanliness of commercial properties and sends alerts to cleaners in real-time. For instance, the sensors can track if dispensers are filled and/or toilets are clogged. This reduces the time and effort of cleaners who will only need to be deployed when there is an issue. This also increases productivity as manpower can be more effectively allocated.

Japan which is known for its high standards of cleanliness and hygiene has also developed technology for toilet cleaning. Toto Japan[2], developed a self-cleaning toilet which has been designed to go a year without manual cleaning. This self-cleaning toilet known as Washlets uses electrolysed water to clean and sanitise the toilet bowl which is coated with titanium dioxide and zirconium to ensure nothing sticks. Another feature includes using a special wand to wash user with warm water and soft air to dry the area. Such idea helps to effectively reduce the need for toilet paper. Currently, Washlets have been successfully implemented and are available in Europe and the United States. Hence, Singapore could possibly explore this to reduce the demand of manpower needed and at the same time encourage sustainability through reduced usage of paper.

Figure 2: Toto's self-cleaning toilet

[1] https://www.smartclean.io/matrix/web/v6/#/home
[2] https://www.toto.com/en/wtjapan/exp/index.htm

Other examples developed locally for toilet cleaning include the Toilet Cleanliness Monitoring System which was developed by A* Star Institute for Infocomm Research (I2R). This system uses energy- harvesting technologies to power the sensors allowing it to be maintenance-free. The sensors help to detect the number of users going past the toilet's main door which enables cleaning companies to deploy cleaners more effectively. Improvement in its functionality such as including ammonia sensors will alert cleaners when a particular restroom requires additional attention. This technology has been effective and is expected to improve productivity by up to 20% [3].

Si-Quat, an anti-viral clear coat, is an example of innovation developed by Affix Labs to kill viruses including COVID-19 pathogens in Finland. Similarly, in Singapore, technology providers developed equipment to overcome existing manpower shortages, largely to a lack of foreign workers' available due to the COVID- 19 prohibitions in Singapore. With health-care systems requiring extensive demand for deep cleaning services, well-renowned technology provider, LionsBot launched disinfection robots within 60 days for Singapore General Hospital during the initial days of COVID-19. Furthermore, UV Bots and specially formulated anti-microbial coatings were introduced to disinfect and deep-clean the public places and surface areas.

In other countries similar efforts have been expanded to address the challenge of COVID-19. The European Institute of Innovation and Technology spent a massive amount of €0.34 million to engage Clean Air to upgrade the functionality of older air condition systems. This was an attempt to sanitise surfaces and clean the air to combat the spread of infectious diseases in Germany.

Cleaning companies together with the government has been finding new creative ways to harness the power of Internet of Things (IoT) to offer business intelligence for increased productivity. Ability to track data points with connected and integrated cleaning and maintenance applications combined with data from other IoT-enabled devices would facilitate trend identification enabling companies to better plan its resources more intelligently.

The Government recently made an announcement on jobs and skills where cleaning professionals are required to complete at least two modules (increased from 1 currently) under the Technical Skills and Competencies within the Skills Framework for Environmental Services by December 2022. Beyond 2025, WSQ modules for general Cleaners will be increased to three, and those at higher job levels must complete four modules. Cleaning companies who were interviewed mentioned that induction programmes and On-Job-Training courses are offered to ensure new employees are equipped with the necessary skills to carry out cleaning tasks effectively and efficiently.

[3] Singapore Productivity Association

At present, a series of simple pictorial guides have been developed to direct cleaners in using the right equipment and the safety measures to abide by. Colour-coded visuals also enhance its visibility for cleaners to improve efficiency without compromising on the quality. This helps facilitate the evaluation of performance and quality of cleaning services (see Figure 3).

Figure 3: Guide on washroom cleaning procedures by NEA

Transformation efforts on technology adoption, productivity, jobs and skills will drive Singapore's Cleaning sector to be more competitive and potentially achieve world-class standards. Continuous effort to adopt good practices and learn from mistakes by other countries especially those in a similar context will allow us to implement an effective framework. Learning from the failures and successes of countries tackling these challenges, would be of value to Singapore as it works towards adapting and enhancing its schemes to manage newer and more complex hygiene requirements.

Other initiatives include a voluntary accreditation scheme introduced by NEA where cleaning companies are recognised when they demonstrate high service standards. To further support these companies in meeting the standards, the National Trades Union Congress (NTUC)[4] has a $2.5 million automation and mechanisation grant scheme to interest cleaning Service Providers in accreditation through the use of subsidies for the purchase of equipment.

The other programme which has been in the sector for several years is the Enhanced Green Mark accreditation. This programme helps cleaning companies to put in place appropriate structure and systems. Productivity can be optimised through redesigning of work, automation, and mechanisation. Under this programme, 50% or 75% of cleaners, team leaders and supervisors need to be trained in any two modules to be eligible for the Silver and Gold award respectively.

[4]https://ntuc-lhub-wordpress-static-prod.s3.ap-southeast-1.amazonaws.com/wp-content/uploads/2021/03/19160912/Press-Release-SME-Digital-Reboot-FINAL.pdf

3. Impact of ES ITM on Job Roles

3.1 Impact of ES ITM on Job Roles

3.1.1 Impact on Most Prevalent Job Roles
3.1.2 Roles at Risk of Redundancy
3.1.3 Extent of Impact on Job Roles
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3.1 Impact of ES ITM on Job Roles

3.1.1 Impact on Most Prevalent Job Roles

The labour-intensive nature of work in Environmental Services (ES) industry suffers from an image problem. The Cleaning sector consisting of approximately 1500 companies is often viewed as low-skilled and low-tech. It is often over-looked by young job seekers due to the lack of career prospects.

But this will soon change. With the adoption of more wide spread use of robotics and automation as well as the elevation of the circular economy in waste management, it will transform the ES industry to become sleeker and more sophisticated with a brand-new image, through the support of relevant enterprises and a skilled workforce.

Industry transformation through innovation is crucial to improving productivity in the cleaning industry. This section highlights extensive adoption of technology across the value-chain segments and their associated implications on job roles requirements. With raising adoption of technology, it has effectively relieved the heavy reliance the sector currently places on manpower. In the years to come, we would expect to see the demand of new emerging roles replace or work in conjunction with existing roles that are still relevant and essential. Significant change will be evident in the job roles of the Operations, Supervisors and Technicians as these roles will need to be redesigned or augmented to incorporate Robotics and Automation, RFID/Sensors, SMART and IoT into the daily rigours of work.

As an example, given that hiring locals for cleaning has been a challenge, Eng Leng, a medium size Service Provider complement the use of technology with technicians who can handle and operate the equipment. Moving forward, the organisations across the sector have plans to hire more younger tech savvy technicians who can handle and operate the process and technology more efficiently.

Productivity being one of the focal points in the Environmental services ITM, makes it a necessity for Singapore to benchmark with other nations their experiences on the impact to job roles they have introduced. Strengthening procurement practices coupled with meticulous design of job roles and upskilling is a sector endeavour which requires the participation of all key stakeholders.

3.1.2 Roles at Risk of Redundancy

Occupations within an Industry can be categorised according to the level of competency required and importance to the business. Based on these criteria, the following categories may be observed:

Critical: Jobs requiring a high competency in specialised technology and skills that are critical to long-term business success (high competency level and essential to the business)

Core: Jobs which require a lower competency in technology and skills but are important to the delivery of products and services (low competency level and essential to the business)

Functional experts: Jobs which require a specific competency in technology and skills which support business operations (Specific competencies and less essential to the business)

Non-core: Jobs which require minimal competency in technology and skills, and are not focused on strategic direction (low competency requirements and less essential to the business)

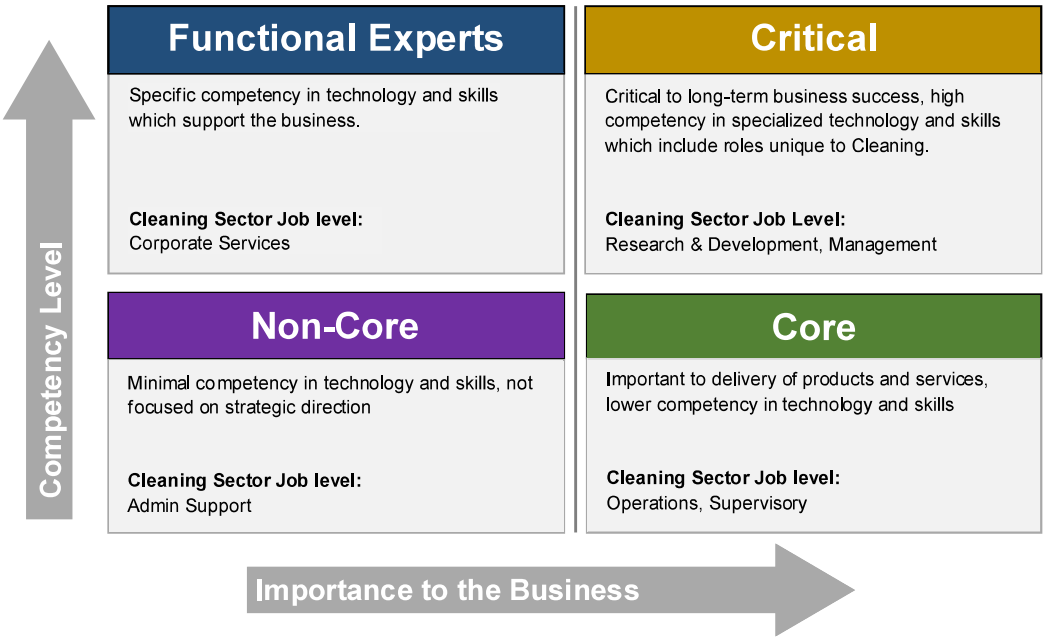


Figure 4: Categorisation of occupations

Non-Core category comprises of roles which do not possess high competency level in specialised technology. Such roles are often at risk of redundancy since competencies can be easily substituted by automation. The concept of automation has offered an alternative to traditional approach. Automation calls upon other technology such as AI and machine learning to automate various tasks. For instance, Service Providers use a software to create invoice without the need of manual writing for every single transaction. This reduces the need for admin support and handles one of the most time-consuming tasks internally. It is also argued that such transformation will reduce human errors which can potentially cause major consequences.

In essence, roles that are of less importance to the business and require little to low level of competency will face the challenge of elimination.

For example, the domain knowledge held by employees in the Critical category such as the Research and Development job level are also important to the Industry. Employees at this level possess an advanced understanding of Cleaning and a specialised knowledge of the job scope they are in. Employees at the Management level tend to have worked within the Industry for an extended period. These employees leverage on their experiences to forecast operational requirements (i.e. manpower forecasts) and conduct business development work. The knowledge possessed by Research and Development and technical expertise gained by Management employees is unlikely to be substituted by technology in the next few years and are hence considered key occupation jobs and competencies which are non-substitutable by technology.

Out of the categories identified within the Manpower Study, occupations within the Critical and Core Categories were identified as key occupations due to the importance of these roles for the sustainability of the Cleaning Sector. While these roles will be subject to redesign due to evolving technology, substitution of the role would be low with reskilling and upskilling.

Recently, Uberisation has garnered interest leading to the demand for existing roles like General Cleaners and Multi-skilled cleaners being augmented instead of being at risk of redundancy. This phenomenon is the result of the gig mentality amongst the younger workforce who prefer contractual, short-term work to augment an existing role he/she may have. For instance, Helpling App helps to connect users to their huge network of providers. The app offers a range of services from cleaning, plumbing to pest control. Like Uber, users can book cleaning services online and pay automatically via the platform once the job is completed. Prices are also kept affordable from S$20 per hour with a minimum booking of 2 hours. Therefore, with the raising demand for such services through appointments, manpower deployment will increase accordingly. To support the employment of Singaporeans, Helpling only hires locals while ensuring high quality services through multiple thorough interviews.

Whilst the term suggests unskilled labour, our recommendation is the use of a group of contractual trained workers who have attained the requisite WSQ qualification as well as the new environmental services qualifications. With the introduction of advanced technology, the nature and scope of the cleaning work are likely to change. Supported by an application supported network like Helpling, which consolidates the data for such employees, this group can be a supplemental resource for the sector.

As mentioned in a report on France's digital transition[5]. The ES industry is still hugely manual in the tasks that is undertaken, and the current capability of the workforce limits the level of digital transformation that can be introduced. This has led to a very uneven adoption across the SMEs. However, given the slowing growth of the workforce and increased availability of government grants, more Service Providers are committing to the use of digitalisation and adoption of new tools. They are aware that they will be faced with the risk of extermination if they do not transform their business and their workforce.

3.1.3 Demand for Existing Roles

Career levels referenced throughout this paper are defined as follows according to SkillsFuture Singapore.

As seen below, under cleaning operations, we analyse the degree of impact on job roles in these categories when trends like Robotics and Automation and Virtual Reality takes place in the near future. Cleaning can also be categorised in 3 components namely Conservancy, F&B establishment and Office & Commercial.

Trends/Job Families	General Cleaner	Multi-Skilled Cleaner	Cleaning Operations Executive	Operations Director/ General Manager
Connected Mobility	▼	▼	▶	▶
Robotics and Automation	▼	▼	▲	▶
'Uberisation'	▶	▶	▲	▲
Virtual Reality	▲	▲	▼	▶
Changing Client Expectations	▶	▲	▲	▲
Online Platforms and Software	▼	▼	▲	▲

Figure 5: Demand for Existing Roles

▼ Skill redundancy or threat of job loss ▲ Opportunity for skill adjacency, wage progression or increase in mobility demand ▶ Nominal or minimal impact

We would not expect a mass substitution of people by autonomous machines since transformation in the Cleaning sector has been taking place gradually resulting in moderate impact in the demand for existing roles. In addition, with demand for deep cleaning and better sanitation to rise, manpower is expected to magnify as well. The following paragraphs highlights the anticipated changes for the various roles in the sector.

[5] The Digital Transition in the Cleaning Sector in France, EFCI

The **General Cleaner** carries out operational duties using mechanical multi-functional trolley in accordance with the assigned schedules. He/she pulls and manage heavy equipment ensuring that all areas are cleaned up within the time frame of the shift. With the introduction to Automated Robots, activities such as dust cleaning, damp mopping, sweeping and vacuuming can be replaced by technology integrated with Artificial Intelligence with autonomous scrubbing features and other functions for areas like high floor window cleaning. Such roles may be at risk of redundancy since large number of cleaners are no longer necessary.

For the **Cleaning Operations Supervisor and Executive**, the opportunity for skills adjacency will be relevant when Connected Mobility is adopted. Given that this is most prominently seen in the Cleaning sector; in an environment where services are provided at clients' premises, there is a need for Supervisors and Executives to be comfortable with operating it. With such telecommunication tools readily available anywhere with mobile devices, it will allow live updates of staff's location and quality standards to be continuously monitored. This will improve effectiveness and efficiency of resources while being able to upskill employees through training to guide them in using these technologies in their daily routine. Additionally, with systems put in place using intelligent algorithms, sensor like SmartToilet+ acts like a 'virtual cleaning supervisor' may reduce the manpower required for cleaning operations executive.

General Managers may be required to be able to quickly grasp and navigate Workforce Management system which are specifically designed for them. This system alerts them on the resolution of the issues by the cleaners. This will improve its efficiency and productivity level in real time. The job role of these individuals will be largely retained as they are primarily responsible for deciding the overall direction of the organisation within the guidelines set up by the board of directors or a similar governing body. Since this role requires deep understanding of processes, he/she will face nominal or little impact when new technologies emerge. They will continue to strategise and direct operational activities with changing client requirements. Knowledge of the use of robotics and technology, eco-friendly products and/or a more effective disinfection or microbiological products would be key considerations in this role. Predictive trend analysis and big data will begin to feature in a larger way as it will become an area of competitive advantage.

Skill framework for ES should be taken into consideration as well. Technical Skills & Competencies (TSC) can be measured through proficiency levels (level 1 to level 6)[6] in the areas of Cleaning Chemical Handling, Horizontal Surface Maintenance, Vertical Surface Maintenance and Furnishing Maintenance etc.

[6] Overview of Technical Skills & Competencies (TSC), SkillsFuture Singapore

In a research conducted by the Organisation for Economic Co-operation and Development (OECD), it is estimated that 14% of jobs are at high risk of automation[7]. Despite this, in2012-2019, employment grew in all OECD countries. This proves that a high risk of automation does not necessarily mean association with lower employment growth. Despite an increase in productivity and automation, demand continues to grow, and this promotes employment growth. However, the degree of automation impacts the level of employment growth. For instance, occupations at higher risk of automation (6%) are seen to face a lower employment growth when compared to occupations at low risk (18%). Low-educated workers were also more concentrated in high-risk occupations since 2012 and the low growth has not led to a drop in the employment rate for this group of workers.

Going forward, it is likely that automation will be accelerated reducing the reliance on manual labour work and affect the demand of existing roles that require lower level skills. A culture of continued innovation with an open mindset to upskill, will keep jobs secure especially with a small nation. Jobs adjacency can address challenges with redundancy and minimise impact to livelihoods.

3.1.4 Demand for Emerging Roles

Technology is constantly improving and introduction to new job roles naturally occur but emerge gradually. To efficiently allocate resources such as trainings and innovations, we can look into categorizing the roles under Short term and Long term to determine which job roles should be invested first.

In the short term, perhaps in the next 2-5 years, roles such as **Disinfection Specialist** may continue to be more prevalent due to its raising demand at current state of transformation coupled with COVID-19. As mentioned by Mr. Tony Chooi, President of Environmental Management Association of Singapore (EMAS), cleaning is a 'sunrise industry' and increase demand for disinfection services will be the new normal. This increased in demand is also highlighted during the Visioning workshop, where we would expect disinfection courses to be a prerequisite in joining the cleaning sector. Through the introduction of new roles like the above, it can result in more employment opportunities for locals. For example, Ngee Ann Polytechnic, offers Environmental Infection Control and Management for Environmental Services as a course under Continuing Education & Training (CET) to promote continual development in cleaning sector.

AI Hygiene Controller and the RFID/Sensor Controller is another role that can be considered in the next 2 – 5 years. With the increase usage of AI machines and/or robots, it will be necessary for one to understand how to operate these 'Smart' technologies. Such an approach would greatly increase productivity level of workers and allow operators to perform their assigned duties without being exposed to an unsanitary environment. This could be less of a deterrent in attracting locals into the sector.

[7] Future of work, OECD

RFID/Sensor Controller administers sensor-based technology. For instance, the sensor-based smart washroom systems alert Cleaners to replenish toilet papers or handwash liquid when required allowing them to focus on other Cleaning tasks. As such, it would greatly increase productivity levels of the workers, facilitate effective deployment and optimise the deployment of resources; allowing operators the autonomy to plan their route which can train their critical thinking skills to efficiently maneuver around the island.

The role of the **Quality Assurance Specialist** is less mature when compared to the other roles which will emerge in the next 2 – 3 years, however given the transition into outcome-based contracting in the immediate term, it will be necessary to reinforce its implementation in the sector. These specialists will assist in the development and implementation of quality assurance guidelines for stakeholders within the Cleaning sector. They will have knowledge of the local legislative policies, contract specifications as well as an understanding of the organisation's policies on hygiene, waste and other sustainability components.

When we look beyond (long term), roles such as **Data Analyst, Process Improvement Specialist and Integrated Environmental Services Facilities Manager** may not necessarily be required in the immediate term however once the transformation efforts have been put in place and stabilised, such roles will be in demand. Integrated Environmental Services Facilities Manager will be a role that requires in depth knowledge not solely on Cleaning services but also in the area of Waste Management and Pest Management in order to strategise and plan for the entire location and have regulatory knowledge to ensure compliance across all specific environmental areas.

The pace of change is expected to be rapid due to trends taking place concurrently. In the ES industry, there is an increase in consumer demand and expectations as Singaporeans have high standards towards public hygiene. With a better educated workforce, searching for a pipeline of workers in this sector is a challenge and there is also the intense competition with other industries for manpower. If job roles are not redesigned, it will be difficult to attract new entrants due to its nature of work.

Emerging job roles with interesting job descriptions together with unique role titles could potentially captivate local workers. With the increasing concerns of COVID-19 and the higher standards expected for hygiene and sanitation, specialisation and better compensation will be the levers for employment in this sector. Improved employment legislation and policies will spur interest from locals and accompanied by grants for new technology adoption, transformation would be accelerated.

4.1 Organisation-Wide Challenges in Implementing Workforce Transformation

4.1.1 HR Practices
4.1.2 Technology Adoption and Digitalisation
4.1.3 Legislation and Policies
4.1.4 Infrastructure
4.1.5 Service Contracts

4.1 Organisation-Wide Challenges in Implementing Workforce Transformation

4.1.1 : HR Practices

At an organisation-level, implementing workforce transformation can be complex due to challenges such as attracting talents, changing perception towards re-training and job re-design. With Singapore's limited pool of local and highly trained staff, many of whom prefer to work with international MNCs.

Attracting new entrants & mid-career switches

ESG's Local Enterprise and Association Development (LEAD) programme supports EMAS and WMRAS initiatives that build up their core capabilities to better support sector transformation in their subsectors. To create pipelines to draw new talents into the sector, internship opportunities are created for students to provide them the introduction and skillsets required to kick-start their career in this sector.

Apart from attracting new entrants, Workforce Singapore's Career Conversion Programmes (CCPs) seek to reskill locals to allow them to develop new capabilities to take on jobs in growth areas or redesigned job roles. Programmes are customised to companies' requirements as well as individuals' development needs to equip them with the relevant skills and competencies for a successful career in the new/ enhanced job role. For example, the Cleaning Specialist (Disinfection Services) CCP arisen out of the COVID-19 pandemic.

Feedback from qualitative interviews and the Visioning Workshop indicate that salaries are crucial to improving the attractiveness of the Sector to local talent. Similarly, results from the survey indicate that poor pay and benefits were believed to be the top reason behind job seekers' negative perception of the Sector. Anergy is an example, has been paying its cleaners higher than the standard PWM model. However, this is not the case for many companies as they are faced with pricing pressure, rising operating costs and resultantly thinning profit margins, Service Providers struggle to leverage this crucial component of the Employee Value Proposition to build a stronger pipeline of manpower.

Workers' attitudes to skills upgrading

Motivating individuals, especially aged workers, to undergo new skills trainings is often seen as a challenge as mindsets are difficult to change but it is necessary to achieve a more efficient workforce. Thus, with appropriate guidance, incentives and relevant information, workers can make well informed decisions for themselves.

One way would be using real life examples of success stories of how automation has changed and benefited the way one works. Rewarding workers could be another way by allowing them to take time off to attend trainings. The lack of interest may be due to a lack of awareness of what is available, a lack of support from their employers or the strongly held perception that operators are not required to hold any form of cleaning qualifications. Job roles are changing due to environmental pressures and government policy, with the likelihood that demands for new skills will evolve for employees in areas such as disinfection and robotics and automation. Nevertheless, organisations need to recognise and be mindful that promoting these approaches will take time to see its positive effects. For example, Chye Thiam pays special attention in this aspect to persuade its workers to upskill themselves and continually participate with the sector's initiatives to work towards doing things better.

Job Re-design

Job redesign is a method for re-evaluating job responsibilities and work environments to improve workers' performance and safety by simplifying processes through new technological solutions, which ultimately leads to greater productivity and job satisfaction level.

According to the types of job re-designing as shown below, reassignment of roles and responsibilities should first begin by determining which job scope needs to be further expanded, modified, or removed. Apart from reviewing job tasks, it is also necessary to take into consideration the needs of workers with disabilities to better cater to their needs and empower them to perform their roles optimally.

Work processes are required to change to effectively redesign the job. Process redesign may be in the form of introducing new technological systems, reallocation of resources and/or challenging existing norms in the Service Provider to identify areas for improvement.

Another area could be in making changes in work arrangements. For instance, to encourage older workers in the workforce, implementing flexible working arrangements like staggered hours can be carried out. In addition, displaying a flowchart of the tasks required to be completed or through colour coding can effectively benefit employees especially older workers in remembering the steps; subsequently perform impeccably.

Figure 6: Types of Job Redesign

The 4D Job Redesign Framework designed by Workforce Singapore (WSG) helps to guide cleaning companies which are embarking on a journey to redesign jobs through a four-step process;

- Discover;
- Diagnose;
- Design;
- Deliver

Cleaning Service Providers will first need to **Discover** by identifying problem areas across key aspects such as people, process, environment, and technology to come up with an effective job redesign solution. Once this step is completed, we can move on to the **Diagnose** stage by defining problem statements or the areas of inefficiencies. This includes determining the root cause of the issue as well as the key objective. **Design** step would mean adopting pre-fitted solutions or relevant job redesign techniques. Companies can use these pre-fitted solutions alongside with process redesign and technology. For instance, for Multi-Skilled Cleaners, they will be required to learn how to operate appropriate ride-on machinery and/or equipment with supplies as directed. At the final step of **Deliver**, implementation of job redesign initiative will take place together with evaluation of outcome. A human capital transformation plan will be developed, and outcome measurements can be done so through productivity indicators.

In addition, complementing with the 4D framework, job redesign techniques can be utilised through Enlargement, Enrichment, Reconfiguration and Job Simplification respectively. [8]

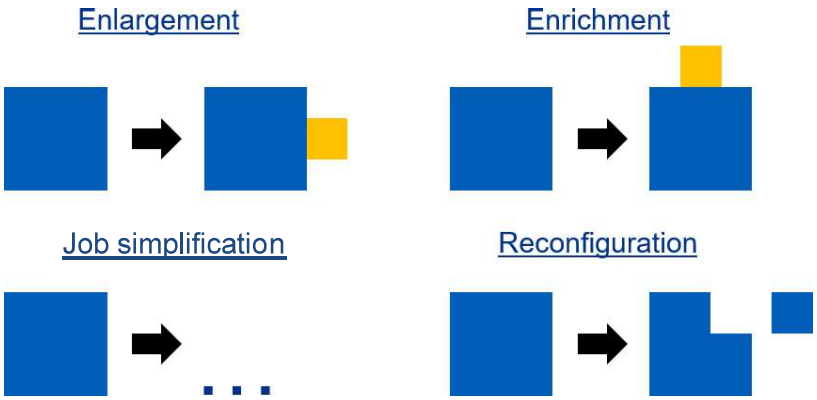


Figure 7: Job Redesign Techniques

Enlargement involves retaining the original scope of a job amidst of introducing a new set of tasks for the same job grade. This can be used to fill any gaps left behind by an eliminated job to reduce down-time or to accommodate changes in technology and skills requirements through amalgamating existing tasks into current roles or creating new tasks. Hence, increase value-added work, task variety, employee engagement and job satisfaction.

Enrichment, unlike Enlargement involves retaining the original job scope but introduces a value-added component that comes from a higher job level. With this additional value-added component, it will require increased responsibility and accountability; and provides new opportunities for building skillsets and enable effective succession planning.

Reshuffling of tasks to achieve a different set of objectives can be done so with **Reconfiguration**. Identification of gaps in terms of efficiency and effectiveness of a job need to be evaluated together with a full review of existing scope of a job; to integrate recommended solutions to close these gaps. Thus, such valued added work will bring about increase task focus and variety.

Lastly, **Job Simplification** takes place where identified tasks and/or jobs are deemed as redundant. Streamlining roles of personnel will help to minimise redundancies and unnecessary duplication of task to reduce work fatigue and job monotony.

[8] Job Redesign Methods, Workforce Singapore

Under the Productivity Solutions Grant (PSG-JR), companies can implement JR projects with support from pre-approved JR Consultants. Through this transformation, quality of jobs can be enhanced by making jobs more productive and attractive for locals and lastly, drive business growth further.

WSG's plug and play Career Conversion Programme, 4D and the PSG-JR schemes are intended to work as complementary tools for sourcing of new entrants as well as redesigning jobs. The take up unfortunately has not been high despite the publicity of the job redesign incentives and workshops conducted. The Service Providers who have successfully adopted this utilised a hybrid set of measures which include job redesign as well as branding initiatives.

For example, Eng Leng contractors is a company which truly believes that machines can never be a replacement of humans. As such, they are injecting various efforts to attract the younger generation and locals by transforming the sector image and re-designing more technical roles relating to robotics.

In an interview session with another progressive Service Provider, YS Yong Services, which mainly focuses on cleaning services (90%); it was revealed that through job scope revision, it brought about additional upskilling opportunities in the company and in the process attracted more mid-career and a younger workforce into the sector. Young talents felt more enticed to join since the use of exclusive robotics and automation will level up their skill set and make them more marketable across other sectors. Job redesigning helps to debunk the notion of what the Cleaning sector does and changes its image through integration of new technology.

4.1.2 : Technology Adoption and Digitalisation

It is important for the Cleaning sector in Singapore to have an increased focus on the adoption of relevant technology. The use of technology is a key enabler in alleviating the manpower challenges faced in the Cleaning sector by transforming businesses processes, standardising cleaning performance, and enhancing the overall image of the Cleaning Sector. Through the provision of grants and incentives, the government is encouraging the adoption of new technology and digitalisation. These grants and incentives make it less onerous on the Service Provider as opportunities to pilot then scale becomes more attractive for the organisation

The Infocomm Media Development Authority (IMDA) in partnership with NEA developed the **Environmental Services Industry Digital Plan (IDP)** for the Waste Management and Cleaning Management sectors within the Environmental Services Industry. The intent of the plan was to guide SMEs in this sector on their digital transformation effort.

SMEs can use IDP to assess their digital readiness and identify key skill gaps to support their digitalisation. Under this plan, Digital Roadmap (Training) developed by SkillsFuture Singapore, Ngee Ann Polytechnic and the Institute for Technical Education and provides the

sector workforce with the necessary skills to adopt digital solutions and be ready for imminent changes in the sector. IDP will also be regularly updated whenever new technologies are introduced to ensure its relevance as the sector progresses.

Figure 8: Key Components of the Environmental Services IDP

As seen above, the Digital Roadmap provides a reference on solutions relevant for SMEs in Environment Services industry across 3 stages:

- Stage 1: Getting Digital Economy Ready *(Digital Operations, Optimised Resources)*
- Stage 2: Growing in the Digital Economy (Integrated Sensing, Dynamic Response)
- Stage 3: Leaping Ahead *(Autonomous Operations, Intelligent Business)*

Following through the steps (Step 1 to Step 4), SMEs can reap the full benefits of going digital by engaging the digital project management services (Step 5) to support their implementation solutions. Through business processes re-engineering and job redesign, SMEs will therefore yield a more sustainable digitalisation outcome.

The above steps also guide businesses to decide on the suitable training programmes that their employees will be taking to upgrade their digital skills. This training is also aligned tothe digital skills and competencies of the Skills Framework for Environmental Services.

NEA introduced **Regulatory Sandbox Projects** under the ES ITM to encourage innovation in Singapore's Environmental Services Industry through the creation of an environment where it is conducive to trial and experiment. This allows the regulator to assess the impact of new

solutions before implementing them on the premises and commercial properties.

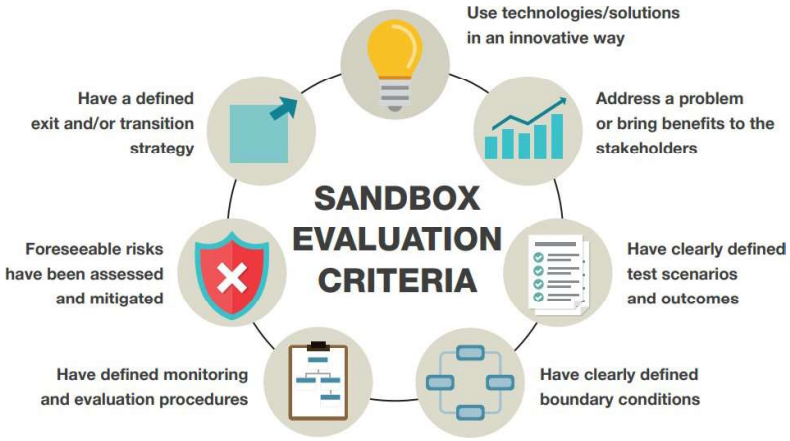


Figure 9: Regulatory Sandbox Infographic

INCUBATE programme was also launched under the ES ITM, in partnership with progressive premises owners in 2017 to provide 18 partners the opportunity to create technologies for the ES sector, conduct trials and implement these technologies in INCUBATE partners' premises. Some solutions created were smart compactors and the use of in-sink grinders. Premise owners involved in this programme include Heartbeat@Bedok, Centre for Healthcare Assistive & Robotics Technology, NTU, NUS, SIT, Ngee Ann Poly, Changi Airport Group and Pan Pacific Hotels Group. Through these innovations, it helps to lessen and removeworkers' pain points. For example, HeartbeatBOT is one that helps automates the task of regular floor scrubbing especially in this COVID-19 period, allow cleaners to devote more time on cleaning high-touch points like escalator handrails and handles.

Figure 10: HeartbeatBOT

With this programme, Mr. Darren Teng, Heartbeat@Bedok's senior manager in facilities and

management saw a productivity improvement in its ES workforce by 30%. Moreover, with a huge floor area of 43,590sq m, it can be overwhelming and taxing for the cleaners. Hence, with the help of these robots, it has greatly improved the welfare of these cleaners while it leveled up the operational efficiency indicators. There are many big players who are investing in technology such as LionsBot who invest in technology that are mostly aligned with NEA. In comparison, although smaller firms are voluminous, they do not invest much in technology. This group are challenged to use expensive but face funding limitations in initial investments hence, they prefer practicing the traditional methods. The above-mentioned grants can greatly help smaller Service Providers and encourage the adoption of new technologies.

To position Singapore as the technology centre of excellence, the government has put in place various other schemes and grants to encourage locally developed new cleaning solutions. Firstly, the Enterprise Development Grant (EDG) is provided by Enterprise Singapore (ESG) to fund organisation's projects of up to 70% of the cost to encourage them in upgrading their business, innovate or even venture aboard. Secondly, EDB also incentivises organisations who engage in R&D capabilities and technologies.

With ESG funding their investments in R&D capabilities together with Proof of Concept (POC) grants, Chye Thiam is able implement autonomous scrubbers after almost a year with discussions still ongoing on making it commercially viable. These bots reduce time to clean up interiors freeing up more time for cleaners to focus on disinfecting high touch points such as lift buttons and escalator handles. During interviews with its employees, many found that incorporating automated products have resulted in numerous positive impacts; especially when these machines are easy to operate. For instance, Sapari, one of the 80 workers trained to use this machine, could reduce his working hours at a hotel by having the ability to carry out his tasks efficiently now.

With businesses integrating sustainability into their business models in ways that benefit both the environment and the economy, it is crucial for the government to collaborate with them as these redesigned business models will create new, good economic opportunities and jobs for the future economy. The biggest challenge for this sector is to onboard the smaller firms which are voluminous in this sector. This group do not invest in technology as their concern is survivability and have funding limitations. Grants and other financial support would help these smaller Service Providers and encourage the adoption of new technologies and stay competitive. At a recent event by the Senior Minister of State for Trade and Industry Koh Poh Koon, he reiterated government support for the development and deployment of robotics solutions to enable businesses to enhance productivity resulting from better products and services.

Grants for the lease of some pre-selected technologies is a way to allow Service Providers to quickly adopt and try out and integrate these new technologies into their current processes. One relevant example is Lionsbot, the world's first company to allow cleaning robots on a subscription model so that cleaning companies can utilise these robots without having the need to invest in one and engage in maintenance cost. Such cleaning robots are also made affordable at monthly fees ranging from $1,350 to $2,150.

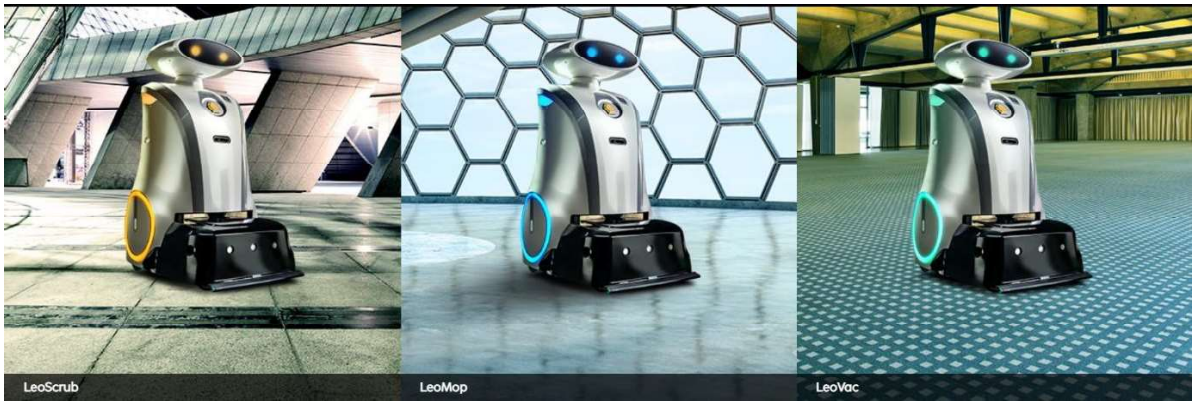


Figure 11: LionsBot cleaning robots

Tennant is another company from US which recently introduced TennantTrue® Leasing and Financing service providing convenience and flexibility for Service Providers to secure Robotic Floor scrubber Rentals.

Figure 12: Tennant's automated products

4.1.3 : Legislation and Policies

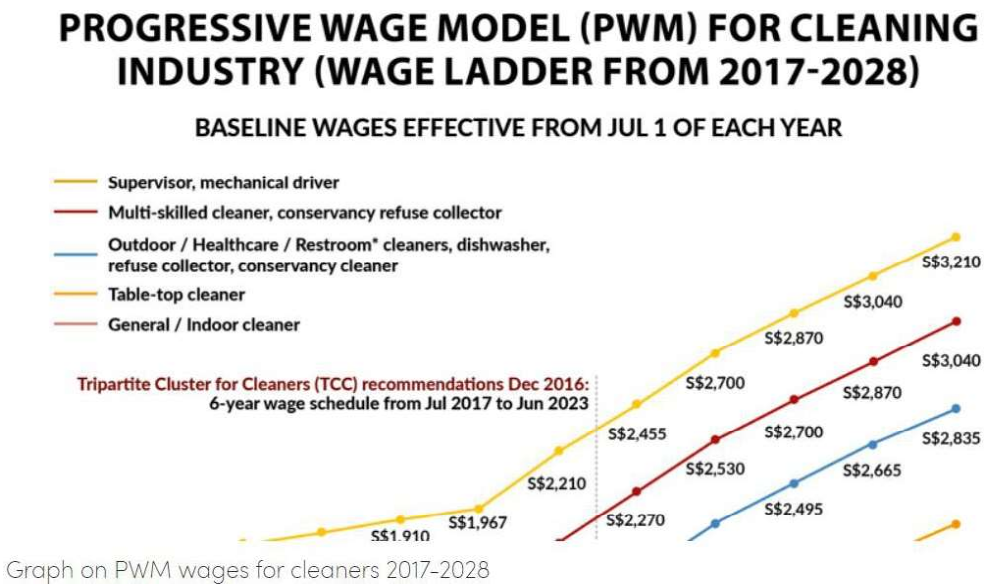
The government has been actively involved in the transformation of the Cleaning Sector. Over the years, the following schemes and legislations have been introduced by the government:

Under the ES ITM Initiative, NEA launched the **Productivity Solutions Grant (PSG)** to raise the operational efficiency and productivity of the ES Industry through technology adoption. Due to COVID-19, the grant cap was increased from $250,000 to $350,000 and funding support has increased from up to 50 per cent to up to 80 percent.

Jobs Growth Incentive (JGI) is another scheme introduced in September 2020 to support employers in expanding local hiring across all sectors during this extenuated COVID-19 period. This scheme will be available till March 2022 where up to 12 months and 18 months of salary support for non-mature local hire and mature hire respectively are provided. Under this scheme, it also encourages companies to give people with disability or ex-offender an opportunity. This scheme has been successful with more than 140,000 locals hired since November 2020[9]. Chye Thiam is one example which benefited from this scheme with over 100 Singaporeans joining the company. This helps to cushion the negative impact of shortage of workers arising from the sudden outbreak of COVID-19 where 10% of their workforce had to return to their hometowns.

Under the **Progressive Wage Model (PWM)** for Cleaners in 2013, the basic wages for Cleaners had to be complied with to ensure that Cleaners are remunerated fairly and equitably. The PWM has since been revised and a revised rate has been published June 2021. Base wages of Singaporeans and Permanent Residents are expected to raise each year over a

period of 6 years amid COVID-19 labour crunch. This amount will increase by at least $170 each yeartill 2028 benefitting at least 40,000 resident cleaners employed by more than 1,500 cleaning companies.



Graph on PWM wages for cleaners 2017-2028

Figure 13: Recommended PWM Increments

[9] Jobs Growth Incentive Scheme, The Straits Times

Based on the announcement of the Tripartite Cluster for Cleaners (TCC), this wage growth can reduce the gap with workers earning median wages. This review is an attempt to recognise the importance and value of work shouldered by our cleaners especially during this difficult period as well as to tackle the challenge Service Providers faced in terms of attracting new entrants through increasing wages. For instance, ISS Facility Services, Anergy and Eng Leng are among the many Service Providers who use and benefited from this model.

Prime Minister Lee Hsien Loong also announced in August 2021 that progressive wage paying companies will be accredited with a Progressive Wage Mark.

Transforming the Cleaning sector also requires the involvement of citizens. The Tray Return Campaign was launched in June 2021 for hawker centres and will be launched for coffee shops and food courts in January 2022. These efforts improve the productivity of the sector and creates opportunities for more value-added work to be done by the workers in this sector.

4.1.4 : Infrastructure

Infrastructure limitation is one of the key challenges faced among Service Providers, hindering the adoption of technology. Service Providers often attributed the low technology adoption to the current infrastructural limitations on accessibility.

Hawker Centres Transformation Programme has been introduced to incorporate sustainable design and technology. Through these transformation efforts, we will see improvements in efficiency of hawker centre set ups. Three upcoming new hawker centres located in Canberra, Sengkang and Bukit Panjang will commence in 2021 and early next 2022.

Figure 14: Hawker Centres Transformation Programme

Changes will include spacing out of aisles and tables to minimise crowding and providing designated rest areas for cleaners. Deployment of sensors will be used to measure the crowd and facilitate maintenance. Food waste, rainwater harvesting, and solar panels will be tested out in Senja Hawker Centre before implementation in other hawker centres. Such experimentation with new sustainable infrastructure will change the way hygiene and sanitation will be undertaken and redesigning the work of cleaners in these locations.

4.1.5 : Service Contracts

Currently, Service Buyers have feedback that it is always difficult to evaluate the performance of Service Providers hence they use more traditional methods for evaluation which are largely headcount based. Service Providers, on the other hand, have indicated that they are challenged to demonstrate their delivery quality and competence to customers.

In Singapore, NEA introduced **Outcome-based Contracting** given that Headcount-based contracting is no longer sustainable and feasible due to the increased demand for cleaning services. Outcome-based cleaning contracting involves encouraging Service Providers to digitise, adopt new technology to meet desired performance outcomes. Through Price-Quality method, different weightage is allocated to various quantitative aspects. The evaluation criteria are divided into three components namely Eligibility Critical Criteria, Price criteria and Quality Criteria[10]. Undesirable procurement practices that service buyers need to be aware of include over-emphasis on low price and short contract durations which may raise suspicions. Such undesirable practices may result in greater cost and resources to manage poor performance.

Figure 15: Outcome-based contracting scoring system

As seen above, to meet the **Eligibility/Critical criteria**, Service Providers will be required to achieve two consecutive 'Clean Mark Silver/Gold Awards' by NEA under the 'Enhanced Clean Mark Accreditation Scheme' (EAS). In addition, they must be able to meet a certain financial grading and attend the compulsory site or briefing (if any) to participate in the tender. These criteria ensure that Service Providers have the capabilities to bid and deliver high standards.

[10] Guide on tender evaluation for Outcome-based contracting, NEA

In terms of **Quality criteria**, it can be broken down into 5 components namely Operations plan, Human Resource Management, Quality Management & Business Continuity plan, Productivity & Innovation plan and Track Record. This would mean Service Providers have to develop a comprehensive manpower deployment plan together with the list of tools, equipment, cleaning chemicals expected to be used which falls under the Operations plan. Wages and employees' welfare should not be compromised, and detailed training plan needs to be provided to build the competencies and skills of their employees. To demonstrate Service Provider's commitment on quality, it would be compulsory to have a service quality management system alongside with a business continuity plan in the event of crisis, disasters, outbreaks, and other unforeseen circumstances. Adoption of technology is highly encouraged to automate the cleaning processes to improve the efficiency of cleaning operations. Lastly, service buyers should look at the performance appraisal from current and previous similar projects to better evaluate Service Providers' competency.

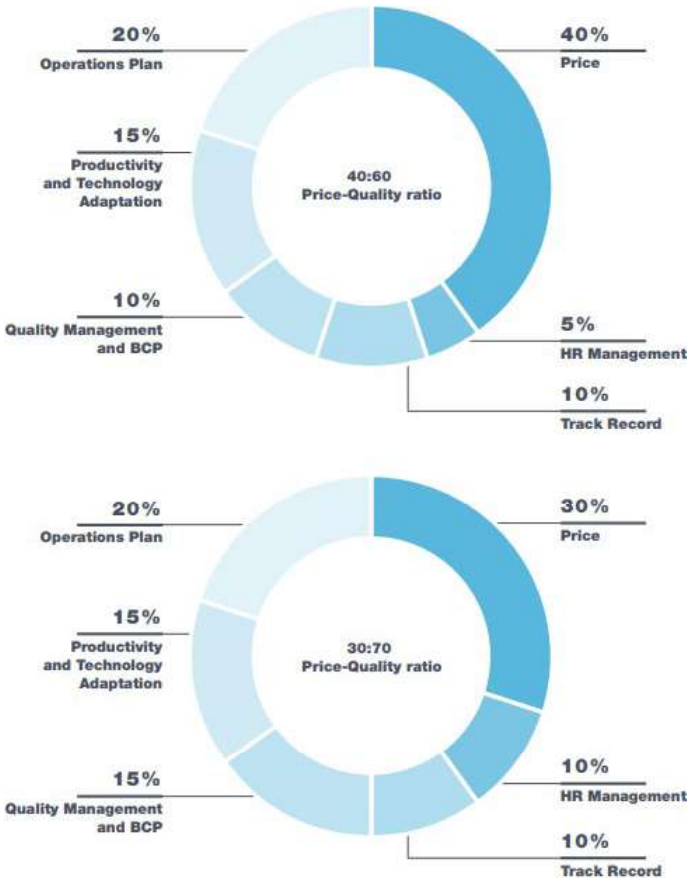


Figure 16: Examples of 40:60 & 30:70 PQ ratio to its assigned weightages

Greater emphasis on quality in Outcome-based contracting has led to a recommended Price-Quality (PQ) ratio of 40:60. This ratio serves as a guide and can be readjusted according to the Service Buyer's priority on how critical the quality requirement is. Thus, a higher-weighted quality component would essentially drive Service Providers to propose better solutions to meet buyer's needs. This is then translated to the overall score for the bid based on the combined scores from the Quality and Price aspects.

Service buyers can adopt a point scoring system to assess the Quality Criteria. An example can be found below:

Example of Point Scoring System:

Point	Definition
5	Deployment proposal exceeds the requirement
4	Deployment proposal satisfies the requirement with some additional benefits
3	Deployment proposal satisfies the requirement
2	Deployment proposal satisfies the requirement with minor reservations
1	Deployment proposal satisfies the requirement with major reservations
0	Deployment proposal does not meet the requirement

Figure 17: Price-Quality Method

In an interview with Eng Leng Contractors, a company which has been in the sector for over 30 years, 60-70% of their current contracting model are found to be outcome-based. It was also mentioned that only a few in private sectors prefer outcome-based; with most still opting for headcount-based model. They cite the challenge of evaluating the performance of Service Providers as a main obstacle for the transition. The education and provision of the benefits of engaging in outcome-based contracting will potentially increase the uptake for Service Buyers.

Additional factors which can be considered is the mandatory transition to outcome-based contracting for Service Buyers if they wish to participate in the **Productivity Solutions Grants (PSG**) programme.

The European Cleaning and Facility Services Industry (EFCI) has shifted its focus to emphasise quality and performance attributes instead on solely price itself, much like how NEA propositions to the Service Buyers in Singapore. EFCI adopts the Proportional Model[11] to evaluate. As seen in Figure 7, the increase in price will result in greater difference in the points awarded. Therefore, it pushes Service Providers to propose higher value-add solutions to drive higher productivity rates. For instance, technical innovations in energy efficiency and techniques as well as daytime cleaning to bring about work-life balance.

[11] EFCI's recommendations for quality-based procurement of cleaning services
[12] Annual Industry Trends and Future Projections Report

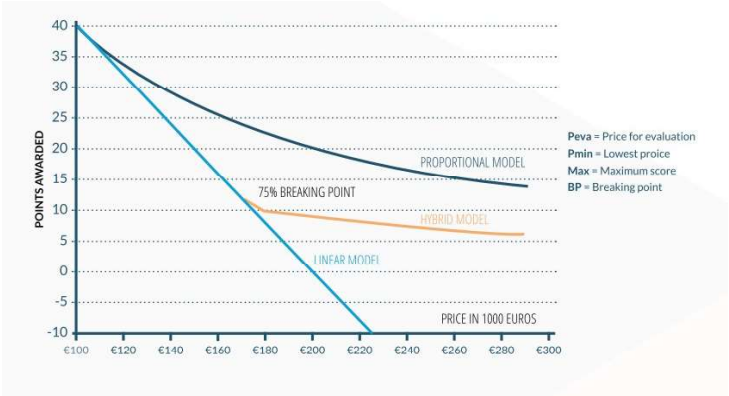


Figure 18: Proportional Model

In addition, Green Cleaning, defined as the products certified by independent organisations that are safe to use and less harmful to people and the environment is rapidly gaining ground momentum overseas.

With green cleaning becoming a fundamental aspect of the cleaning sector, many Service Providers are now evaluating the type of cleaning products they are using and subsequently adopting mechanisms to measure its toxicity. Although not a sector wide feature yet in Singapore, MNCs who have global guidelines to adhere to are rapidly requesting for this to be included in their cleaning contracts.

5. Employee-Level Challenges in Implementing Workforce

5.1 Employee-Level Challenges arising from Workforce Transformation

5.1 Employee-Level Challenges in Implementing Workforce Transformation

5.1.1 : Mindset Shift

Mindset shift is crucial to inspire younger generations to join this sector and convince workers that it is not a low-skill sector. Many initiatives have been rolled out to integrate technology to current processes and systems.

Employees may also be resistant to transformation changes. Perhaps in their current tasks allocated to them, they are already accustomed to following a certain standard protocol. For instance, employees are accustomed to following through stages A, B, C in order but with automation and increased reliance on technology, employers may want employees to stop applying the standard protocol and use Stages X,Y,Z instead. Although such improvement in technology may make processes simpler but to employees it might be more complex for them to comprehend and apply.

Furthermore, the motivation behind attending such trainings and course may be lacking. Employees might find it taxing for themselves especially after long hours at work and the reduction of time they could possibly spend on leisure and lifestyle. Furthermore, employees also may not see an importance of having such trainings and question the need for revamping and upskilling themselves when they are already comfortable with how they approach their tasks.

In essence, organisations need to paint the bigger picture to encourage employees to participate. Monetary rewards must commensurate with the knowledge and skills acquired so that the interest level amongst the workforce will increase. A consideration is to use a flexible system of a tiered certification pathway where the acquisition of knowledge and skills across defined levels of proficiency will result in an uplift of wages.

Efforts to award employees in this sector can be used to show how the sector has evolved and increased educational flexibility to provide opportunities to those interested. In 2018, Republic Polytechnic launched a Part-Time Diploma in Applied Science (Environmental Services and Management). This is a Work-Study programme (WSPs) providing opportunities for participants to deepen their skills and knowledge to dive into a career in ES industry. E.g. Cleaning Supervisor. In this programme, the partnering company will provide an 18-month structured on-the-job training and mentorship to better support participants' transition into the workforce.

SSG also introduced a study award to encourage early to mid-career Singaporeans to develop and deepen their skills in key sectors to gain relevant working experience in these sectors. Singaporeans can learn robust skillsets to increase competencies. As such, apprenticeship and scholarship programmes like NEA-Industry Scholarship programme serve as a method to attract and retain talent especially at the levels of Associate Professionals and Technicians (APT) and Professional, Managers and Executives (PME).

EFCI's report in 2020 also reported that with increasing number of companies, the demand for employees has increase significantly as well over the years leading to a raise in employment growth in this sector. With average turnover per employee reaching almost 30 thousand-euro, productivity is also observed to rise by almost 15% since 2013. At present, the European Cleaning Industry has since employed 4.1 million employees, an increase of 154 thousand from previous year[13].

Figure 19: Annual increase in number of companies (in %)

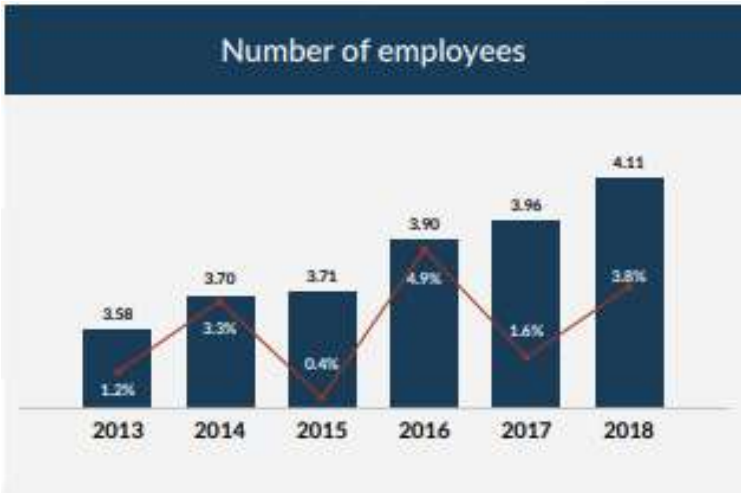


Figure 20: Annual increase of number of people employed (in %)

With over 1.1 million people, the German Cleaning sector has since employed over a quarter of all workers from the European Cleaning industry. Europe is able to successfully attract people into the sector by shifting locals' mindset through rebranding the jobs with new occupational names as well as offering part-time roles which is aligned to the locals' preference of working part time. This has encouraged locals to work for relatively shorter working hours which makes this sector relatively attractive to them.

[13] The Cleaning Industry in Europe, EFCI report

In promoting the shift in mindset, the Cleaning sector must progressively rebrand itself into a sector requiring highly skilled individuals. The Work-Study Programme was introduced to empower Service Providers to participate. For example, Chye Thiam has worked with institutions such as Temasek Polytechnic and Nanyang Polytechnic to provide students the exposure and in doing so hope to change their perspectives of the cleaning sector.

5.1.2 Career Progression

To progress into the respective roles, skills upgrading is necessary to enhance employee capabilities to prepare them to perform more complex tasks and stay relevant in the workforce. To align these skill developments with career progression, a career progression roadmap must be designed to present possible career options within the sector. These career options should then be clearly articulated and translated to suitable training and wages. To address an employee's challenge of staying relevant in the sector and to be able to apply their learnings, job redesign can be initiated.

Through redesigning jobs, employers can create quality jobs to address concerns which employees may have in terms of the potential career progression this sector offers. Incorporating more lateral pathways across cleaning value chains can provide a sense of career development for the employees. Integrate roles across multiple value chains will further enable workers to deepen their understanding of the Cleaning sector.

Currently, all employees in operational and supervisory must attain the training requirements for licensing to progress up the career progression ladder. By Dec 2022, all employees in the Cleaning sector who are in operational and supervisory roles will complete one mandatory Workforce Skills Qualification (WSQ) module in Workplace Safety and Health (WSH) and one core WSQ module. However, flexibility is given to cleaning businesses to choose the specific core module that would best suit their and their clients' needs. By Dec 2025, the requirement will be extended to 3 or 4 modules depending on job level inclusive of the mandatory Workplace Safety and Health module.

Upskilling has been the key drive for the sector so in the future career progression pathways will and must tie together with the required skill sets for the next job. This will create greater resilience and earning opportunities for the employee. As such, a series of possible career progression opportunities focusing on vertical movements and rotational opportunities across department with horizontal movements by career levels will enable the employees to take up additional skillsets. Performance indicators should also be transparent to empower employees to be responsible for their own individual learning. Therefore, they can stay motivated and look forward to opportunities to further hone their skills.

One example is the case of Shahrul Baktiar bin Benny Arianto, who joined Chye Thiam as a multi-skilled cleaner and has been in this Cleaning sector for 3 years. For him, working in a "less glamourous" sector was not his concern since his family does cleaning as well. He looks forward to progressing in his career should the opportunity arise. Hence, good performance together with a positive attitude to learn and a tiered certification pathway will greatly support and guide workers to reach the next level in their career pathway. Chye Thiam also encourages job mobility whereby its workers can experience working in various locations to better understand different challenges faced. For instance, the opportunity to work in both indoor and outdoor environments.

It can be tremendously difficult to encourage employees to upskill because of the fear instil in them due to a lack of confidence to meet the expectation of employers. However, job redesign and offering career progression will the boost confidence of employees in the sector and reduce the concerns an employee might have when the sector progresses into a more digitised environment.

5.1.3 : Technology Adoption

Globally, most of the firms are moving towards automation and technology and SmartClean is one amongst them. The introduction of sensors enabled them to report, monitor and track effectively and efficiently. Organisations strongly believes that automation can never be a replacement of human. Hence, it is necessary that efforts are put in place to assist employees to utilise technology to its full potential in a shorter period of time; since one of the major challenges which Cleaning sector faces, is the ability to attract locals due to their lack of confidence in acquiring the requisite knowledge and skills in digitalisation. SmartClean also mentioned that the cleaning workforce is not tech-savvy due to the lack of skills. For example, in India, percentage of workforce being formally skilled is merely 4.7%[14]. Bridging the skills gaps through retraining is thus, essential to keep up with the pace of technology.

Technology Proficiency Level

Dividing employees based on their individual's technology proficiency level will be useful in allowing organisations to develop more personalised training modules to cater to certain group of workers who require more time to pick up new skillsets. Trainings offered should also be based on an employee's job grades. For instance, all operational employees will be required to learn how to operate new machineries while employees at the management level who are advanced digital users will be offered more complex subjects such as using data analytics tools.

[14] Disrupting the Cleaning Market of Today, Singapore Business Federation

It is also not a surprise that employees may resent the organisation's decision to integrate new technology into their processes or systems since they are so used to a workflow, they can undertake the work without much preparation. However, with more user-friendly innovation, it can encourage workers to adopt and use technology comfortably.

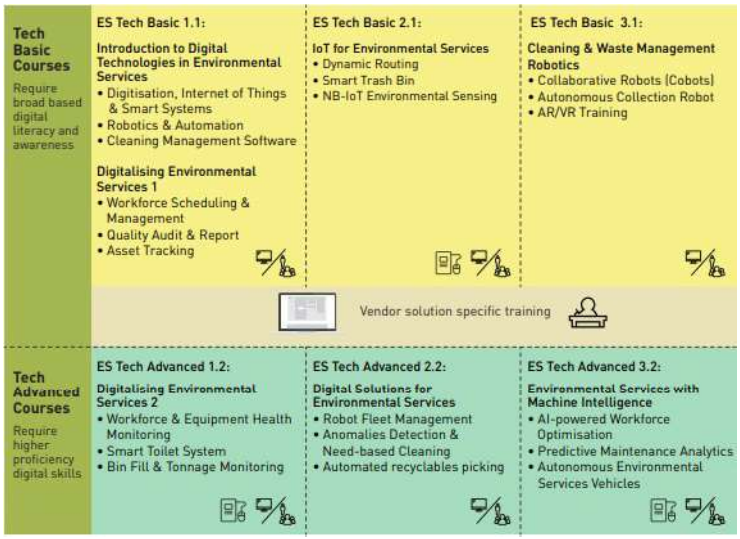


Figure 21: Basic and Advanced technology courses

Above are the programmes that are identified under the Environmental Services Industry Digital These were designed by IMDA and NEA. Completion of these programmes will enhance an employee's technology proficiency level making them work more efficiently and drive the organisation's productivity level. The Introduction to Digital Technologies in ES course is catered for new entrants and existing practitioners. Coaching provided by ITE will allow participants to acquire foundational understanding and insights to the digital solutions trends in the ES industry. With hands-on activities, it provides participants the opportunity to perform tasks using new robotics and automation.

Platform to understand more details

Often, employees are keen in upgrading their skillsets but are not able to access the opportunities if these are not made available to them. To increase the accessibility to these courses, employees can now self-assess their digital readiness on their own using a self-assessment checklist. Individuals can also seek assistance from a business advisor at an SME Centre which is supported by a Trade Association and Chambers (TACs). For employees who are at looking at advanced digital advisory, principal consultants at the SME Digital Tech Hub will be able to advise them.

With sufficient information of course availability, together with courses that suits one's need, this will result in a reduction of jobs mismatch and support the individual's potential making the workforce in the sector highly efficient.

6.1 Challenges and Opportunities in Maximising Employment of Older Workers

Asia-Pacific (APAC) is the fastest aging region in the world, with an expected increase of 200 million elderly people (aged 65 and above) between now and 2030 contributed by the increased in life expectancy and a decline in fertility rates. In particular, Singapore has the highest life expectancy at birth (84.8 years) and healthy life expectancy at birth (74.2 years) in the world[15]. With societal aging, this has serious implications on the workforce.

In Singapore, this challenge is coupled with the decline in labour productivity. With projected retirement and re-employment age raising from to 65 and 70 respectively by 2030[16], Government and organisations must join efforts to plan for a future, where older workers represent an increasing proportion of the workforce, from minimising the challenges that organisations may potentially face to providing more opportunities for older workers to upskill and meet expectations. This would enable our older workers to thrive in the future economy and keep Singapore competitive and adaptable despite its maturing workforce.

Additionally, in a survey conducted by the Ministry of Manpower (MOM) on the impact of COVID-19 on the labour market, we notice that the employment rate for older workers aged 65 & over continued to increase, from 27.6% in 2019 to 28.5% in 2020, reflecting sustained efforts to raise their employability and higher demand for essential services like cleaning, waste management and security amid the COVID-19 outbreak.

Challenges

Maximising employment of older workers is often seen as a challenge due to reasons such as productivity loss, resistance to change and slow adoption of technology. Such risks can potentially cause rising fiscal burden for companies. Thus, many hold stereotypical views of older workers, detrimental to age-diverse workplace.

Older workers may present challenges related to higher healthcare needs and this in turn may lead to productivity loss from sickness absenteeism. Sickness absenteeism per employee is estimated to increase by 89 percent from 2016 to 2030 due to the aging of workforce.

Moreover, in today's context, many processes are now automated. Older workers who are resistant to change may find themselves excluded from the new ways of doing things.

The Singapore government is highly cognisant of this and have mounted campaigns to support the seniors in this endeavour. There will be more outreach efforts to help seniors go digital by partnering with companies as well as enhancing training programmes and schemes. To date, more than 100,000 seniors have benefitted from digital skills training conducted by the SG

[15] Source: 'The Burden of Disease of Singapore, 1990-2017', Institute of Health Metrics and Evaluation and the Ministry of Health
[16] Source: '2020 Labour Force survey findings, Ministry of Manpower Statistics

Digital office since it was launched in June 2020. 200 roving counters will be set up in the community in addition to the 47 community hubs already present.

Further, lower-income seniors will be able to enjoy affordable mobile access for a longer period. The current scheme offers eligible seniors a basic smartphone with co-payment starting from S$20 bundled with a S$5 monthly mobile plan that offers 5GB of data for one year.

The increase of hawker stalls offering e-payments now number 60% which encourages the customers to use digital methods of payment. Seniors who are regular consumers at hawker stalls must learn this method of payment settlement to continue to enjoy their favourite foods.

At the formal set up of enterprises and offices, the fundamental change in attitudes of employers towards older workers is a critical component of maintaining longevity of the workforce. Employers must be fully persuaded about the potential value-add that older workers can offer to their organisation.

Ultimately, the most crucial challenge is to promote fundamental change in attitudes of employers towards older workers. Employers must be fully persuaded about the potential value-add that older workers can offer to their organisation.

Opportunities

To create inclusive and dynamic workforce, some key areas to maximise the employment of older workers are:

- Redesigning jobs to raise productivity and workplace longevity
- Personalised career planning sessions
- Provide more part-time re-employment opportunities
- Restructure medical benefits provided by employers (Hospital, Insurance schemes, Medisave)
- Tap on various grants to create age-friendly workplaces

Senior Worker Support Package was introduced in February 2020. In this package, Senior Worker Early Adopter Grant and Part-time Re-employment Grant can be used to support employers in implementing key recommendations by the Tripartite Workgroup. Under the Senior Worker Early Adopter Grant, it provides funding support of up to $125,000 to progressive employers who are willing and able to raise higher internal retirement and re-employment above the prevailing statutory ages. Therefore, to promote the employment of older workers.

To match appropriate jobs to older workers, it will be useful to gain insights regarding their interests and health conditions through individual career planning sessions to customise and find suitable jobs for them. To further support part-time opportunities for our older workers, the Part-time Re-employment Grant is introduced where it provides up to $125,000 to employers who are committed to a re-employment policy. Under this policy, employers will offer part-time

re-employment opportunities to eligibly senior workers who request for it. Such arrangement will benefit seniors who prefer less manual work and motivate them to stay in the workforce.

Furthermore, in 2019, it was announced that the Central Provident Fund (CPF) contribution rates for older workers will rise to enhance older workers' financial security. This is clearly a move by the Government to encourage seniors to stay relevant and encourage them to continue to contribute to the workforce. Older workers (>50) also tend to stay longer (6-10 years) and are more dedicated to the work compared to the younger workers (30-40) as mentioned during the stakeholder interview.

ISS Facility services has also indicated that with older workers nearing their retirement age, they are inclined towards working part-time as such, they provide flexi-arrangement to cater to this group of workers in their workforce.

All in all, despite the challenges presented, many methods are put in place to maximise the employment of our older workers. As Singapore is facing an aging population, it would certainly be a pity not to proactively harness the potential and strength of older workers.

7.1 Opportunities and Outlook for the Sector

7.1.1 : Technology & Innovation

2025 VISION: High degree of automation & innovation

To achieve the desired transformation of the Cleaning Sector, respective stakeholders are required to work collaboratively to manage the challenges faced and these include relevance of job roles, maximising employment of older workers, poor sector image, mindset and culture, and finally receptance to the use of technology.

With increasing development of autonomous robots, new ways of communication are embedded into the ubiquitous software and the Internet of Things and this transformation will definitely bring about a comprehensive change in the way cleaning companies operate and develop today. According to Mr. Gan Thiam Poh, Member of Parliament for Ang Mo Kio GRC (Fernvale), adjusting to a more technologically advanced and innovation-driven economy where everyone is upskilled will set Singapore apart from other counties, where intangible assets become a key differentiator[17].

Service Providers' concerns in implementing workforce transformation is being debated with the Government in tandem with the move towards digitalisation to meet the increased demand. Service Providers, for instance, ISS Facility Services has proposed re-designing toilet working system with Tripartite Partners and currently partnering with Republic Polytechnic to develop it.

In the coming years, adoption of sensors and robots will be readily available. In view of this, NEA has embarked on the Innovation and Curating Better Automation and Technologies for Environmental Service (INCUBATE) programme since 2017. As of May 2021, there are 21 partners on the programme, including CapitaLand, Changi Airport Group, the Esplanade, Marina Bay Sands and various Institutes of Higher Learning (IHLs) such as Nanyang Technological University (NTU) and Ngee Ann Polytechnic.

Changi Airport also implemented a centralised 890-square-metre facility that provides end-to-end hassle-free cleaning services for all its outlets should they decide on outsourcing. This new service is operated by GreatSolutions where all types of tableware ranging from plates and utensils to bento boxes and clay pots. The automated dishwashing machine can maximise water efficiency without compromising on its quality. In addition, process of washing and sterilisation are aligned to safety and hygiene standards and regulations; certified by ISO, bizSafe and Cleanmark. Therefore, productivity can be enhanced by freeing up manpower and space.

[17] Raising Productivity, the only way to keep improving jobs and lives, Budget Debate 2021

Figure 22: Changi Terminal 3's central dishwashing area

By 2025, it is estimated that 30,000 people in cleaning and waste management sector will acquire higher-skilled jobs will increase more opportunities for retraining and technology implementation[18].

Nevertheless, roadmap must be reviewed and adjusted to external factors such as technology advancement, changes in policies, waste conditions and public expectations. ES ITM's strategies are interlinked which means that improvement in one aspect would greatly increase the chances of improvement in another.

[18] Environmental Services Industry Transformation Map (ES ITM)

7.1.2 : Jobs & Skills

2025 VISION: Skilled and manpower-lean workforce

It is crucial to maintain the relevance of current and emerging job roles. Continuous effort to understand the demand and emergence of certain job roles will provide insights on the re-design of suitable jobs and thus, improve skill capabilities of workers. When supplemented with the use of appropriate technology will bring out exponential changes in efficiency in the sector.

Poor sector image would only aggravate the manpower shortage situation in Cleaning sector. There is a strong stigma associated with this sector as both workers themselves and general public view these jobs to be of low value.

Public campaigns and roadshows can act as gateways to re-brand the sector to attract younger talent by highlighting the emerging roles and new technologies. For example, NEA together with WSG can work with Institutes of Higher Learning (IHLs) to attract younger generation to the sector by increasing internship opportunities. To improve the perception of such industries, sector wide appreciation events were organised to recognise ES professionals for their commitment and excellence in their work. Within the Service Providers establishments, more progressive efforts have involved monthly team sessions where lunch or dinner was served (pre COVID-19) or packet lunches or dinners distributed as well as bursary and scholarships for individuals as well as their children.

Based on study findings, Robotics and Automation Application was rated as the lowest skill as employees are not convinced of the importance of it in the future. The need for machinery, maintenance and skilled labour are some implementation concerns which Service Providers have raised as well. New technologies such as Robotics should be encouraged through updating cleaning specific courses curriculum to keep up with the sector developments and through reviewing SkillsFuture Skills Framework. In addition, CET units can also be incorporated as a renewal of workers' certificate/license as a way to ensure that individuals are recertified with updated knowledge of the Cleaning sector.

With the reduction in foreign workers' quota and an aging population, attracting a younger generation of Singaporeans becomes critical. In an interview with Lendlease, it was mentioned that redesigning of job scope would greatly increase the standards and give a better reflection of a sector that embraces technology. Programmes to guide the transition would be helpful for Service Providers and Buyers as the case studies of organisations who have valiantly adopted technology into their processes can furnish learning lessons to support the acceleration of its use in the sector.

In achieving a manpower-lean workforce, technology is clearly a lever, however maintaining and increasing the workforce to meet ongoing demand is a combination of hiring across the population from the older workers to ex-convicts, women and those with disabilities. The programmes for the latter two have been undertaken intermittently with some employers but the strategy going forward should be more collaborative where training is provided prior to these individuals going on site.

7.1.3 : Productivity

2025 VISION: Best in class with productive enterprises

Productivity and Technology & Innovation are pillars which Singapore could possibly work on to upgrade further. Singapore has always positioned herself as one with exceptional sustained economic performance and business-oriented nation, a result of decades of committed economic policy. Given how Singapore's workforce already comprises of many highly skilled foreigners, we could provide more opportunities for locals to take up positions that match their capability. Industry webinars and workshops can be held to raise Service Buyer's awareness on the benefits of technology adoption and awarding contracts to Service Providers who utilise technology can enhance productivity.

Increase adoption of Outcome-based contracting will ensure that high-quality execution is met through a strict criterion for Service Providers and this will force them to continuously seek ways to take up new technology to automate systems and processes. Comprehensive training sessions can be followed to encourage workers to be more competent resulting in more efficient allocation of resources to raise productivity levels.

In the recent 2021 Budget debate, Deputy Prime Minister Mr. Heng See Keat mentioned that raising productivity through transforming the way firms works is the only way to continously enhance the lives and jobs of Singaporeans. Seeing this importance of enhancing productivity, $24 billion is set aside for business and worker transformation to be ultitise in the next 3 years.

It is essential to not only maximise workers' competencies but also drive technology to gain competitive advantage through continuous effort to be open to international capital and technology. Venturing into new technologies which are unique and exceptional in its innovation or adapting technology from other frontiers can help provide the visibility and economic and financial benefits for both Singapore and the enterprise.

Addressing all considerations of technology, jobs and productivity together is the nucleus of the change. While much technology experimentation is already in progress, scale is often the biggest impediment to the transformation. To achieve this, ease of access to the use of the technology available and affordability is central to the transition strategy. A strong push towards outcome-based contracting will strengthen the equation of cost and benefit and make the business case more realistic. The final outcomes are enhanced productivity where fewer workers are required and new jobs and skills with a different profile of workers and this will ultimately allow expectations for higher wages, better benefits to be paid to the qualified workers in this sector.

7.1.4 : Internationalisation

2025 VISION: Environmental services companies with a global footprint

Given that Singapore has a small economy, it is necessary to support our SMEs international expansion. To do so, it is crucial to organise networking sessions to cultivate stronger ties and connect with foreign companies. For example, the Building and Construction Authority (BCA) has always been supporting Singapore construction firms in their internationalisation since 1999 through multiple measures and bilateral collaborations. Best practices can thus be referenced to inform and inspire the development of local solutions.

Figure 23: BCA Networking Sessions

Besides working on improvement in Cleaning sector in Singapore, Singapore also sees the importance of working with other countries to drive environmental sustainability and in managing increasing demand. SmartClean, a local technology start-up, is an example of a company who has ventured into the markets of Australia, Malaysia and Indonesia. Such market access allows new technology capabilities to be shared, and possible project collaborations can be achieved among countries to offer integrated solutions.

In promoting internationalisation, SmartClean continuously ventures into the various regional markets. Australia is seen as the top choice due to its similarity with Singapore in terms of rate of technology adoption. Such similarities in economic and social considerations, make it much easier to push solutions to customers abroad since they faced similar issues of high labour costs, lower skilled labour and high turnover.

Apart from SmartClean, Service Providers like Chye Thiam, has plans to extend their services abroad and is the first cohort of companies nurtured by the Ministry of Trade and Industry (MTI) and ESG. They have built on the foundation established and is ready to begin its implementation once the COVID-19 situation gets better.

NEA regularly organises international platforms and events namely, the CleanEnviro Summit Singapore, with the purpose of connecting local companies with an international audience by showcasing products, services, and innovative solutions. In-depth discussions, roundtables and sharing of best practices also take place. The success of this event can be reflected from the participation numbers collected. In the last event, over 24,000 visitors from more than 120 countries and regions and over 1,100 participating companies were engaged in the event.

7.1.5 : Culture of Citizens

Transforming the Cleaning sector also requires the involvement of citizens. Similar to the Clean Table Campaign launched in February 2021, the Tray Return Campaign was introduced as part of SGClean before the enforcement of fines which commenced in September 2021. Many attempts have been made to spread the words of this campaign such as through video advertisements and posters around hawker centres.

Figure 24: Sample of Tray Return Poster

Along with advertising, SGClean Ambassadors have also been deployed to various hawker centres to advise patrons to return their trays and used crockery, and to dispose their used tissues or wet wipes after their meals since June 2021 when dining in was resumed. Despite the deployment of ambassadors, it was found that only 60% of diners complied when advised upon. As part of an effort to help diners adjust to new changes, no enforcement actions will be taken until Aug 31. Nonetheless, from September 1, those who did not to comply face enforcement actions.

The Clean Table Campaign which commenced in February 2021 resulted in strong public support, but weak action and practice observed on the ground. It is imperative that the citizenry adjust their behaviours and support the movement toward keeping the environment clean and hygienic especially as we now live in an environment with the presence of endemic viruses such as COVID -19. With the cooperation of citizens, it will progressively be easier to keep up with the rising demand for cleaning together with technology and innovations.

The transformation of this sector requires collaboration with Service Providers and volunteer organisations in partnerships with government agencies, equipment and technology providers, service buyers, associations and citizenry. While we strive to continue to achieve world class attitudes towards cleanliness and hygiene through our individual behaviours, the assembly of practices of technology use, governance and skill qualification must move in tandem to enable us to achieve the outcomes for the desired state of the sector.

8.Conclusion

8.1 Conclusion

The sector is evolving with new environmental needs which is evident with COVID-19. To level up the standards, it is important to note that recommendations are encouraged to be viewed collectively and adopted through different phases (short and long term) for sector transformation to be successful. Tracking of performance should be implemented and consistent to identify the necessary changes/approaches to take. With concerted efforts from various sector stakeholders such as Service Providers, service buyers, trade associations (EMAS), IHLs, employees themselves and the Government, the transformation journey can be a triumph as we envision the future Cleaning sector to be vibrant, sustainable, and professional.

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