

Technology as an Enabler to Improve Workplace Safety and Health

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Provide evidence-based, insightful and practical solutions

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Safety Moment

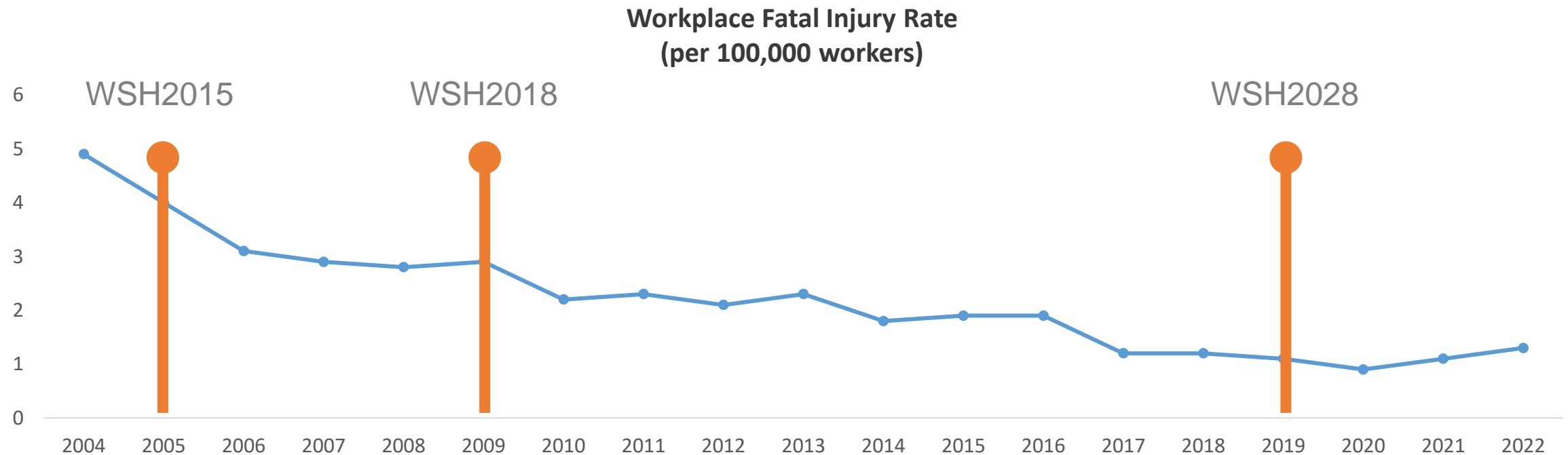


Source: [YouTube](#)

Why are we using tech to improve WSH?

Good progress in WSH outcomes

Our workplace fatal injury rate has declined steadily over the years, from 4.9 per 100,000 workers in 2004 to 1.3 per 100,000 workers in 2022



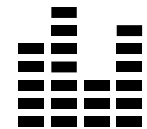
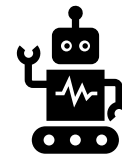
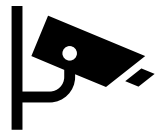
Source: National WSH Statistics, MOM

Our Aim: Sustain fatal injury rate below 1.0 per 100,000 workers by 2028.

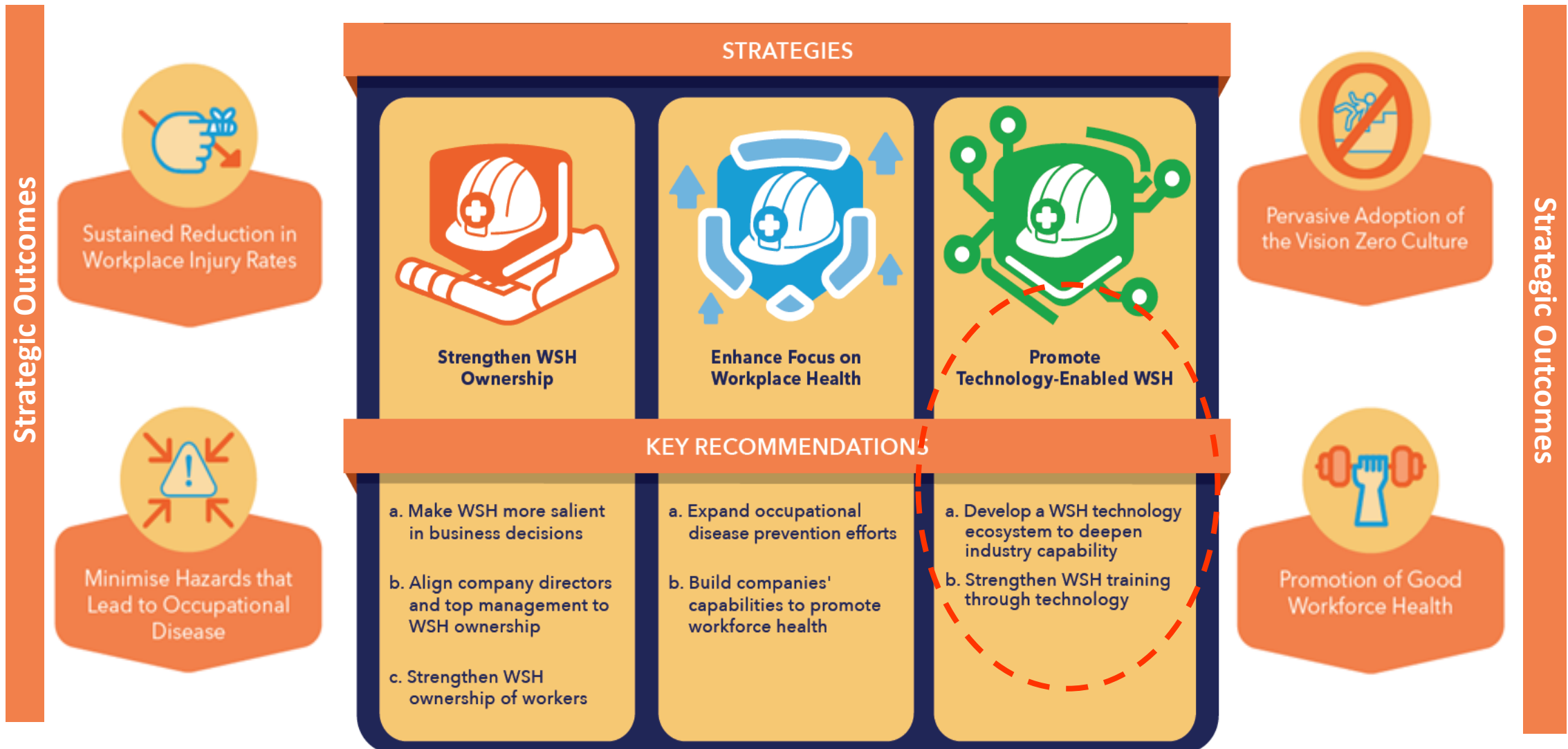
Technology as an enabler to further improve WSH

- Remove workers from risky activities;
- Improve workers' situational awareness and reduce human error;
- Deter risky behaviour; and
- Assess and alert on ill health that may increase risk of work accidents

There is immense potential for industry to tap on effective market-ready WSH solutions to disrupt unsafe / labour-intensive processes as well as value create.



Promote Technology-Enabled WSH is one of the key strategies to achieve WSH 2028 goals



Technology can help to address some of the root causes of fall from height incidents in the Built Environment sector

Common incident type (cause) for fatal and major injuries in 2022

Construction			
Type A		Type B	
Incident Type (Cause)	2022	Incident Type (Cause)	2022
Falls from Height	55	Slips, Trips, Falls	27
Vehicular Incidents	14	Machinery Incidents	19
Struck by Falling Objects	12		
Caught in/Between Objects	9		
Struck by Moving Objects	8		

Root causes



Inadequate fall prevention plan
e.g. lack of anchorage point for harness



Non-compliance to fall prevention plan
e.g. poor supervision



Unsafe behaviours by worker
e.g. climbing over barriers

WSH Tech for Built Environment

Permit to Work (PTW) application is required by law for all high risk activities, including working at height.

PTW states the measures taken to ensure the health and safety of workers, and must be approved by the authorized person before starting work.

Electronic Permit-to-Work (ePTW) improves PTW application, through better visibility and accountability of high risk work. ePTW also prevents falsification and backdating, provides audit trail and photo evidence of site conditions.

Electronic Permit-to-Work (ePTW) can enhance the PTW process by:

- Improving safety through audit trail – ensures qualified persons approve the PTW.
- Capturing the location for each stage of PTW to ensure users are at the specified place to conduct physical checks on site.
- Providing full visibility of high risk activities that are active or closed. Dashboard can help safety supervisors identify conflicting works and overdue permits.
- Increasing productivity – reduces paperwork and waiting time; assigns to other staff easily to cover staff absences.
- Being printer friendly – for displaying hard copy PTW where necessary

ePTW provides visibility and accountability, and ensures adequate fall protection plan is in place for WAH activities

Audit is important for PTW to be effective. ePTW allows ease of auditing compared to paper PTW.

Example:

- Does the timestamp make sense? i.e. PTW was applied and approved before work starts
- Are the checklist submitted filled in correctly?
- What is the quality of the write-up? i.e. Can the safety measures in the write-up be seen in the photos?
- Are the workers doing the job trained and qualified to do the job?



Photos provide evidence and give next party a sense of the work environment.

Good photos should show:

- What measures are in place before work starts, i.e. barricades, safety lifeline
- Condition of housekeeping, - slips trips falls risk
- Are there other FFH hazards at the location, i.e. uncovered access opening



Enables "smart monitoring" of PTW compared to looking through hundreds of paper.

Record inspection findings, progress report and safety lapses in one place.

Dashboard can show which are the high risk activities across multiple site/locations so safety supervision can be prioritized to these locations accordingly.



Communicate effectively with workers, supervisors and stakeholders, and build confidence on project delivery.

Company testimonial after using ePTW



Smart inspection tools facilitates compliance to fall prevention plans

Smart inspection using 360 cameras digitalizes safety inspections and progress tracking, enabling better work coordination and improved tracking of safety hazards.

Supervisors can virtually walk through the site after the physical walk about to review and annotate hazards. This ensures easy and clear communication to workers on where the hazards are, and digital tracking of hazard resolution.



360 cameras for site inspection



Source: Airsquire

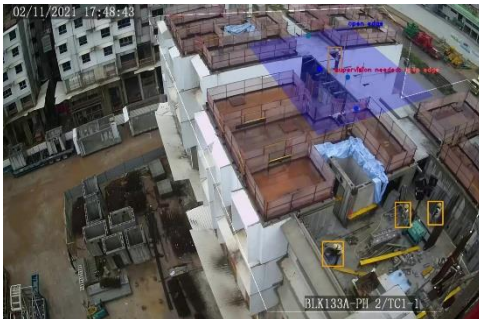
Video analytics enhances supervision to detect unsafe workplace conditions and worker behaviour

Use case for safety

- Real time detection for early intervention to prevent accidents
- Deters workers from unsafe acts
- Enables review of safety compliance via digital dashboard
- Enables geofencing – exclusion zone for high risk areas
- Customized used cases can be developed

Productivity benefits

- Higher efficiency and effectiveness compared to manual monitoring by workers
- Tracks workers/assets for more efficient resource deployments
- Tracks work progress



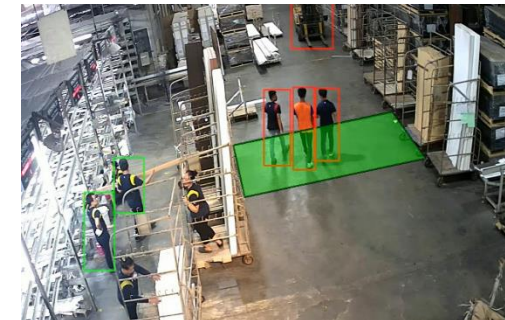
Open edge detection



PPE detection



Detection of worker using
hook/harness



Geofencing

Video detection of workers near open edge



Robots and drones can eliminate work at height risks by replacing workers who are tethered to ropes or on gondola lifts



Building façade cleaning robot



Drone for building façade inspection

Safety

Work is safer than deploying workers on gondolas and ropes.

Quality and productivity

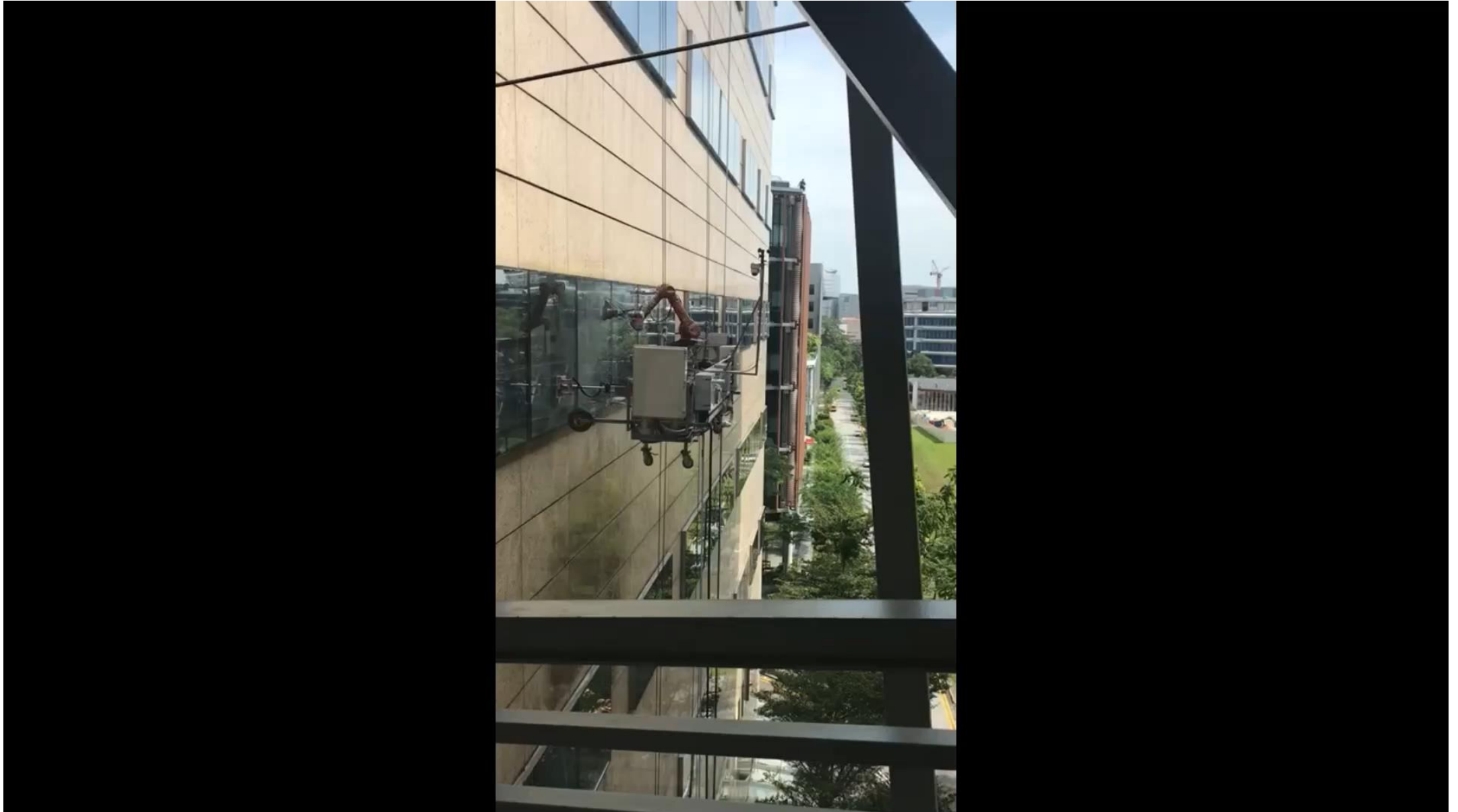
Robots can clean the exterior of tall buildings quickly and efficiency, with each surface/section cleaned to a consistently high standard.

Drones can simplify inspection of difficult-to-access areas & buildings with complex design. AI can facilitate image processing and identification of defects.

Cost effective

While the initial cost may be high, it can be cost effective in the long run. Using robots and drones to complement the workforce also means less reliance on workers.

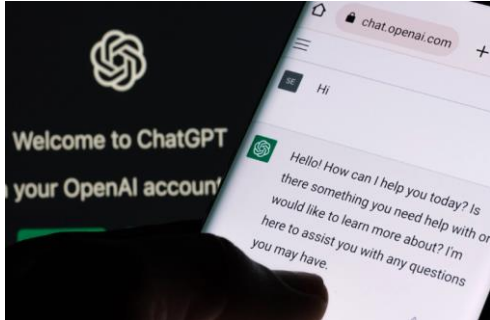
Video demo of building façade cleaning robot in action



Source: ELID

New possibilities with generative AI

Creating conversational dialogue



Generating images

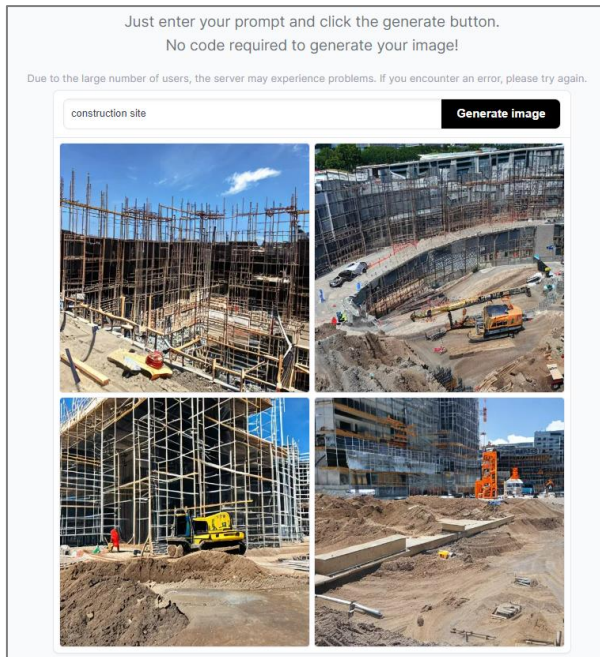


Image / video analytics?



View other drafts



Based on the image, I can see several safety concerns with the scaffolding in the picture.

- **Lack of guardrails.** There are no guardrails on the platforms, which means that workers could fall off if they lose their balance.
- **Loose planks.** The planks on the platforms look loose, which could cause them to collapse if a worker steps on them.
- **Overhead wires.** There are overhead wires near the scaffolding, which could pose a risk of electrocution if a worker touches them.
- **No fall protection.** None of the workers in the picture are wearing fall protection equipment, which means that they are at risk of serious injury or death if they fall.

Support for industry

Funding support under the Productivity Solutions Grant (PSG) and Advanced Digital Solutions (ADS) Grant

gobusiness SINGAPORE Start a Business Run and Grow a Business e-Services Resources About

HOME / PRODUCTIVITY SOLUTIONS GRANT / ALL PSG SOLUTIONS

All PSG Solutions

Overview

Solutions for specific sectors

Select the sector your business is in to see the solutions you are eligible for. This should be based on the SSIC that you have registered with ACRA.

Advanced Manufacturing

Building & Construction

For more information, please refer to [BCA's PSG website](#).

IT Solution

- 3D Modelling, Immersive Visualisation & Analysis
- Integrated and Smart Worksite Monitoring and Inspection
- FM Workflow Automation
- e-Permit-to-work (e-PTW)
- Digital Wearables for Workers' Health and Safety
- Quantity Surveying and Valuation
- Coordination Tools and Collaboration Platform

<https://www.gobusiness.gov.sg/productivity-solutions-grant/all-psg-solutions/>

INFOCOMM MEDIA DEVELOPMENT AUTHORITY About IMDA Programmes & Grants

About Call for Proposals (CFPs) Project

ADS projects

These are the type of projects supported under ADS

List of supported ADS projects

- Generic
- Construction
- Facilities Management
- Healthcare
- Sea Transport

<https://www.imda.gov.sg/advanceddigitalsolutions>

Solutions

- Drones for building façade inspection
- Robot for facade cleaning, painting, visual inspection and water-tightness test

Collaboration with STAS and solution providers on lite solutions

Identify and customize lite solutions for SMEs in the Built Environment sector.

1. Project Management / ePTW app
2. Smart inspection using 360 cameras
3. VSS with AI to detect unsafe conditions / unsafe worker behaviour

1. Project Management App

Using digital tools for project management, electronic Permit to work, inspection photos to show site conditions before conducting high risk activities.



2. Site inspection digitalization tool

Using 360 cameras to facilitate smart inspection - digitally capture 360 view of site conditions, and show where are the safety hazards



3. Active site monitoring using portable CCTV with AI

Setup CCTV at work at height location for SMEs, and use VA to detect PPE, open edges, and harness and hook detection



Technology is not a silver bullet, but can be an important enabler for WSH



Thank You



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