



Land Transport Excellence Awards 2022

Land Transport  Authority
We Keep Your World *Moving*

AWARDS

Innovation Category

Most Innovative Solution

Recognises the product or service that demonstrates the innovative use of technology to deliver smart solution(s) in the land transport industry.

Young Innovator

Recognises individual(s) who has demonstrated the use of technology to innovate and deliver smart solution(s) resulting in land transport transformation.

Best Collaboration Partner

Recognises the partner(s) who has demonstrated the highest level of commitment to deliver smart solution(s) that contributes towards land transport.



Award Finalist - Innovation

Most Innovative Solution

HWA SENG BUILDER PTE LTD

Award Title : Most Innovative Solution

Award Criteria : Recognises the product or service that demonstrates the innovative use of technology to deliver the smart solution(s) in the land transport industry.

Organisation : Hwa Seng Builder Pte Ltd

Project : HSB EHS Guidebook Mobile Application

Hwa Seng Builder Pte Ltd (HSB) is a leading civil engineering contractor (BCA Grade A1), focusing its core competency in engineering knowledge, adopting advanced technology to enhance productivity, innovation and continuously taking ownership to be an accident-free and work-safe company.

Since 2015, HSB has invested heavily in the use of technology to increase its productivity and to improve work processes. The journey includes researching new potential innovations, covering both quality of work and workplace health, safety and environment issues. Digitalising daily tasks have made work easier from permits, works system to daily mandatory inspections.

HSB has also transformed the traditional workers' handbook with the development of our very own HSB mobile application, as we envisage mobile technology as an effective communication medium and training aids to effectively engage participants including new workers.

Our guidebook comes in 5 languages - English, Chinese, Tamil, Thai and Bengali, which greatly eliminate the language barrier as we believe it is important to establish good communication and provide workers with good understanding of the work before they enter worksites.

Our unique HSB guidebook consists of interactive contents, animated games, training materials with video illustrations, quizzes as well as rewards after completing a topic. Other than the general safety information, the guidebook also include the company's vision, in-house rules and practical knowledge of various work activities. Workers can share ideas and their thoughts on family issues or work, with encouragement with the inclusion of an anonymous feedback channel within the application.

HSB is celebrating its 30th anniversary this year and we are grateful to be one of the finalists in the LTEA 2022 for the Safety Excellence – Civil Contractor (Major), Best Managed Rail/Road Infrastructure – Project Partner and Most Innovative Solutions award categories. These nominations have affirmed our safety efforts & commitments as well as motivated us to do even better for many years to come.



Award Finalist - Innovation

Most Innovative Solution

HWA SENG BUILDER PTE LTD

Award Title : Most Innovative Solution

Award Criteria : Recognises the product or service that demonstrates the innovative use of technology to deliver the smart solution(s) in the land transport industry.

Organisation : Hwa Seng Builder Pte Ltd

Project : HSB Environmental AR Training

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As we progress towards digitalisation, HSB have also been exploring ways to make training more engaging and effective. The concept of Augmented Reality (AR) Environmental Training came about after our development of Safety Virtual Reality (VR) Training. The trainings helped to create awareness among our employees on the need to focus on environmental issues and impacts, which are equally crucial in our construction work process.

Our AR Environmental Training allows trainees to perform pseudo regular site inspections and experience real site training through simulations. Trainees get to learn to identify locations that require attention and learn about the consequences when non-compliances were neglected. The development of AR has also successfully shaved off training hours while achieving the same effectiveness. HSB has in return, achieved substantial improvement in addressing environmental, health and safety (EHS) issues, with the development of AR environmental and mobile guidebook application.

HSB is celebrating its 30th anniversary this year and we are grateful to be one of the finalists in the LTEA 2022 for the Safety Excellence – Civil Contractor (Major), Best Managed Rail/Road Infrastructure – Project Partner and Most Innovative Solutions award categories. These nominations have affirmed our safety efforts & commitments as well as motivated us to do even better for many years to come.



Award Finalist - Innovation
Most Innovative Solution

NATIONAL UNIVERSITY OF SINGAPORE, CIVIL AND ENVIRONMENTAL ENGINEERING

Award Title	: Most Innovative Solution
Award Criteria	: Recognises the product or service that demonstrates the innovative use of technology to deliver the smart solution(s) in the land transport industry.
Organisation	: National University of Singapore, Civil and Environmental Engineering
Project	: Remote Sensing Photogrammetry for Excavation Volume Calculation, with Post-Building Information Modelling Integration

AERIAL PHOTOGRAMMETRY WITH BIM

Earthworks such as excavation and fill are fundamental construction operations in almost every urban and rural infrastructure development project. Traditionally, the progress and volume calculation of such construction activities are based on odolite surveying and counting of dump trucks exiting the site. However, the process of odolite surveying is time consuming, labour intensive, and poses safety concerns.

In collaboration with the Land Transport Authority (LTA), an innovative integrated remote sensing solution adopting aerial photogrammetry and building information modelling, in short **A**erial **P**hotogrammetry with **B**im (AEPHOB, pronounced as A-for-B), was developed by the National University of Singapore (NUS) and successfully deployed at the Kim Chuan depot extension (world's biggest underground depot) and Tuas integrated train testing centre (first such facility in Southeast Asia). The strength of NUS' solution is the high precision of linear and volume measurements which has not been achieved elsewhere in the world.

Through these field deployments, AEPHOB was ascertained to be more superior than the traditional methods. The product is a visual 3-dimensional evidence and record of the work done. In this 3-D model, it is easy and convenient to zoom in, investigate as well as measure dimensions and volume of any particular area of the site. AEPHOB also boosts the ability to automate and obtain spatial measurements, while conventional theodolite surveying is only able to give discrete spot point information. This digital solution also resulted in greater efficiency in obtaining volume calculations, manpower productivity as well as safety at these sites. Technically, photogrammetry measures volume directly rather than methods such as truck counting which is not a direct measurement and susceptible to swelling of the soil when excavated. Results from these field deployments demonstrate the high accuracy of volume computation in comparison to objects of known volume as well as field estimates of excavation over a period of more than a year. After developing the spatial 3-D model from photogrammetry, the point clouds can be imported into the Building Information Model to facilitate decision making as well as management of information on a construction project across the project lifecycle.

Such remote sensing technology is a game-changer in the construction industry where wider adoption of this remote sensing technology could streamline and reduce double handling of construction processes as well as stronger push for greater work efficiency, lower reliance on manpower, reduced safety hazards, denser and more accurate field measurements, higher quality monitoring of site progress as well as empowering digitalisation in the industry.



Award Finalist - Innovation
Most Innovative Solution

NOVAARS INTERNATIONAL PTE LTD

Award Title	: Most Innovative Solution
Award Criteria	: Recognises the product or service that demonstrates the innovative use of technology to deliver the smart solution(s) in the land transport industry.
Organisation	: Novaars International Pte Ltd
Project	: Optical & Thermal Scanning for Bridge Inspection

ORGANISATION PROFILE

Novaars International Pte Ltd (www.novaars.com), a corporation licensed by the PE Board Singapore, has been providing civil & structural engineering services for structural inspection, investigation, appraisal, rehabilitation, design & supervision of infrastructure & buildings in Singapore and the region since 2004. Our team of engineering professionals is committed to consistently provide quality services to our clients by creating more value through continual learning, improvement & innovation. We have introduced and successfully implemented innovative Optical and Thermal Scanning techniques for remote inspection of road and rail infrastructure to improve safety, quality & speed of inspection with significant savings of costs. Over the years, we have established a successful track record of completion of a variety of public and private sector projects to the satisfaction of all the stakeholders.

OPTICAL & THERMAL SCANNING FOR BRIDGE INSPECTION

Principal inspection of vehicular bridges and flyovers requires examining the structural components at a close range to assess their condition, as well as record defects such as cracks and delamination. Conventional access equipment such as boom lifts, lorry cranes, scaffold towers were used along with temporary traffic diversions to access bridge structures at a close range. Working at height, together with temporary traffic diversions, not only posed safety concerns to inspection personnel and road users but is also costly and may result in disruptions to traffic operations.

Innovative smart solutions such as optical and thermal scanning based on high-definition digital imaging and integration, infrared thermography, computer programming and AI, have been deployed recently to facilitate bridge inspection remotely from ground to replace conventional methods. **Optical scanning** involves recording high definition overlapping images of the structures from ground and stitching them together to generate a high-resolution image of structure that is used by AI-based crack detection software to map cracks on the stitched image. It replaces manual recording of cracks and other visible defects at a close range. **Thermal scanning** involves recording of thermal imagery of the structures from ground with a highly sensitive Infrared (IR) camera connected to a computer that processes thermal data real time with the help of a proprietary software to identify defects such as delamination of concrete. It replaces the need for manual tapping of concrete structure at a close range to detect hollowness.



Comparison between conventional bridge inspection methods and Optical & Thermal Scanning



These smart solutions are reliable, safer, more productive and economical compared to the conventional inspection methods. They also produce more comprehensive and better quality digital output that help to easily monitor condition of structure and progression of defects over future inspection cycles. Optical and thermal scanning techniques are being used for current LTA bridge inspection contracts. Thermal scanning has also been successfully used for detection of delamination of concrete in MRT tunnels and carries future potential for inspection of building facades as per new regulation enacted by BCA.



Award Finalist - Innovation
Most Innovative Solution

SMRT TRAINS LTD

Award Title : Most Innovative Solution

Award Criteria : Recognises the product or service that demonstrates the innovative use of technology to deliver the smart solution(s) in the land transport industry.

Organisation : SMRT Trains Ltd

Project : Project Overwatch

The underlying concept of the Project Overwatch involves capturing and reproducing the Circle Line (CCL) Operations Control Centre's (OCC)'s Overhead Display System (ODS) in near-real time through lightweight image recognition algorithms. This faithful, near-real time reproduction of the ODS serves as a base 'canvas' upon new layers of information that can be added to support the OCC duty teams in their day-to-day operations. As an end-state, Project Overwatch aims to: (1) Strengthen CCL's train service reliability by driving down operator's errors; and (2) Enhance CCL OCC's situational awareness of CCL by providing a 'one-glance' view of CCL's operating environment.

Project Overwatch has been deployed in the CCL OCC and has successfully improved CCL's ability to keep delay durations to the minimum. Algorithms using Artificial Intelligence (AI) are used to raise alerts on detected abnormal train stoppages, for prompt responses and prioritize actions to minimise potential disruptions to commuters. Besides improving our commuters' experience through more reliable train service, Project Overwatch has bolstered CCL's ability to achieve the One Million MKBF train service reliability target set by the Authorities.

Outside of CCL, the extension of the Project Overwatch to the North-South & East-West Line (NSEWL) and Thomson East Coast Line (TEL) has been approved and scheduled. Rollout to NSEWL and TEL will begin in 2022. SMRT Power COE has also begun exploring how the concept underpinning the Project Overwatch can be applied to its power control systems.



Award Finalist - Innovation
Most Innovative Solution
SMRT TRAINS LTD

Award Title : Most Innovative Solution

Award Criteria : Recognises the product or service that demonstrates the innovative use of technology to deliver the smart solution(s) in the land transport industry.

Organisation : SMRT Trains Ltd

Project : Smart Cleaning Platform

SMRT Trains, being the largest rail network operator in Singapore, is focused on delivering a safe, reliable, and commuter-centric train service. In today's COVID situation, it is very important that good hygiene and cleanliness standards at our stations are maintained to ensure our commuters have confidence that our MRT system is safe for commute.

The SMART CLEANING PLATFORM (SCL) is a SMRT Trains customised innovation which integrates Performance Based Cleaning contracting with Internet of Things (IOT) enabled platform and Cleaning Robots to deliver improved station toilet hygiene and cleaning outcomes, and consequently better customer satisfaction and experience. The SCL achieves this by using sensors and data analytics to identify heavily utilised toilet/s and feedback in real time. It provides an overview of the toilets' conditions and alert cleaning staff when the set threshold is breached. Online Digital forms also support the vendor cleaning staff in submitting reports and update completed tasks in real time. Cleaning Robots are deployed only in CCL stations to undertake the routine basic cleaning, allowing the vendor cleaning teams to focus on spot cleaning and multi-task on other high priority areas. The IoT-enabled platform has been implemented in both NSEWL and CCL.

SCL effectively provides visibility of areas of need based on sensor and online commuter feedback, allowing the optimisation of manpower deployment in day-to-day cleaning operations, workflow and thus increasing productivity. Over time, such data allows the vendor to anticipate the needs required and support better resource prioritisation and forward planning.

On SMRT side, the SCL collects and measures the performance of the cleaning vendor through quality assessment using prescribed Acceptable Quality Level (AQL). It has also enabled SMRT to work with the cleaning vendor to adopt a more dynamic cleaning system, as compared to working based on a fixed cleaning schedule. This has enabled all SMRT stations in achieving a 4-star Toilets certification and awarded with the LOO Award Organisation Category from Restroom Association (Singapore) for 2019 and 2020.



Award Finalist - Innovation
Most Innovative Solution
SMRT TRAINS LTD

Award Title : Most Innovative Solution

Award Criteria : Recognises the product or service that demonstrates the innovative use of technology to deliver the smart solution(s) in the land transport industry.

Organisation : SMRT Trains Ltd

Project : Virtual Reality Training in SMRT

The adoption of Virtual Reality (VR) technology has changed the way SMRT Trains carry out workplace training. VR training allows staff to increase their confidence through various workplace scenarios and tasks in Rail Operations, Maintenance and Engineering through high fidelity virtual simulations that include realistic workplace environments, conditions, and activities. Staff can train in a completely safe environment without incurring any actual risk and repercussions, such as accidents or train disruptions due to erroneous actions during training.

Learning through VR technology provides options for staff to be trained in conditions and scenarios that include:

- High safety risk at actual work area with high risk of damage caused to equipment and/or disruption to operations during training
- Workplace equipment not being readily available for training purposes
- Real time team-based and/or cross-team collaboration training being required
- Complex training scenarios which cannot be replicated for training in real life e.g., train disruption, crisis etc.
- Highly immersive and emotive experience needed - realistic interactions / risks / "shock factor" experience

VR training applications are designed based on the respective business cases and learning needs. If need be, step-by-step instructions, in-built learning performance tracking system, warning notifications for safety hazards, and clear learning report analytics that further reinforce staff proficiency in targeted areas of improvement and cultivate a safety-centric mindset can be included in the training environment.

Initial research has indicated that VR training has been warmly received by SMRT Trains employees and has improved their learning efficacy:

- 95% of learners described the overall VR experience as 'good' or 'excellent'
- 90% of learners affirmed that the VR experience felt real to them
- 91% of learners described their level of knowledge retention after the VR as 'good' or 'excellent' with further research indicating that knowledge retention and work performance confidence has increased by an average of 50%-75%
- 100% of learners want to have more VR in their training

As of today, a total of 4 VR training projects have already been implemented, contributing to greater levels of staff competency and confidence with an improved mindset towards safety.



Award Finalist - Innovation
Most Innovative Solution
ST ENGINEERING

Award Title	: Most Innovative Solution
Award Criteria	: Recognises the product or service that demonstrates the innovative use of technology to deliver the smart solution(s) in the land transport industry.
Organisation	: ST Engineering
Project	: Variable Pitch Platform Screen Door

Background and problem

With a rising number of platform accidents, authorities around the world have been looking at Platform Screen Doors (PSDs) as a two-pronged solution: to serve as a physical safety barrier as well as environmental and/or climate control barrier to help prevent loss of air-conditioning in metro stations.

PSDs were first introduced in 1972. Metro and railway systems then were usually designed and constructed without consideration for PSDs, resulting in multiple train types operating on the same line. Conventional PSDs, which have a fixed door pitch, can only match specific types of train door and/or car pitches. Thus, operators around the world face a common problem of not being able to implement the PSD system onto train platforms due to differences in door pitches for different train types.

The solution

ST Engineering designed the Variable Pitch Platform Screen Door (VP-PSD) a first of its kind that can accommodate different door pitches for various train types on the same line.

This revolutionary VP-PSD uses a dual-drive mechanism that can dynamically align and adjust the PSD to match with the various train's door pitch. As the VP-PSD is a free-standing structure, it can be easily incorporated into both greenfield and brownfield projects without the need to disrupt revenue services.

In addition, with the incorporation of a Safety Integrity Level 3 system, the VP-PSD ensures that risks are mitigated and rail operators will be able to enjoy its safety and benefits. The VP-PSD has also been future-proofed. With the trend moving towards Communication-based Train Control signalling systems, transport authorities and operators will be able to convert conventional signalling to a driverless system which needs to be paired with PSD systems to ensure commuter safety.

The outcome

In December 2019, the VP-PSD made its official debut to the rail industry at AUSRail Plus, the largest rail industry event in the southern hemisphere hosted by the Australasian Railway Association. The VP-PSD has seen keen interest from transport authorities around the world and is projected to have an estimated market potential of over S\$800 million.



Award Finalist - Innovation
Most Innovative Solution

ST ENGINEERING INFO-SECURITY PTE LTD

Award Title	: Most Innovative Solution
Award Criteria	: Recognises the product or service that demonstrates the innovative use of technology to deliver the smart solution(s) in the land transport industry.
Organisation	: ST Engineering Info-Security Pte Ltd
Project	: Cyber Security Early Warning and Detection System

The Pulse of Cybersecurity Landscape

The acceleration of the digital economy and global pandemic has resulted in the spike of cyber-attacks. Such cyber-attacks on Critical Information Infrastructures (CII) supply chains can disrupt or cripple economies and disrupt daily lives. Real-time cybersecurity situation awareness and detection capabilities are key for CII to stay ahead of the evolving cyber landscape.

Pioneering Cyber Advantage

ST Engineering has provided cyber defence solutions for CII for more than two decades. Backed by our deep domain knowledge across extensive domains in building and operating critical information infrastructures, we have designed and implemented the Cybersecurity Early Warning and Detection System (CSEWDS) to build up cyber resilience for Singapore's Rapid Transit System (RTS).

Empowering Cyber Resilience

CSEWDS is designed to work seamlessly with existing infrastructures and allows future monitoring technologies to be easily incorporated into the current setup without disruption to operations. CSEWDS analyses raw network traffic traversing through the RTS systems, providing real-time situation awareness of the network infrastructures and alerts LTA and Public Transport Operator (PTO) when potential threats are detected, enabling swift mitigation of cyber threats. To further enhance cyber network resilience, the CII systems are also protected by a unidirectional gateway (Data Diode) site to prevent unintended data from flowing back to the CII network. The Data Diode is certified under Common Criteria (CC EAL 4+) and NITES by the Cyber Security Agency of Singapore (CSA).

Approach to Secure What Matters

Our deep engineering expertise plays a crucial role in achieving continuous innovation to address strategic cybersecurity needs and pressing challenges. We believe that our people is key to Secure What Matters.





Award Finalist - Innovation
Most Innovative Solution

ST ENGINEERING

Award Title : Most Innovative Solution

Award Criteria : Recognises the product or service that demonstrates the innovative use of technology to deliver the smart solution(s) in the land transport industry.

Organisation : ST Engineering

Project : Retrofitting of Diesel Bus to Full Electric

The Project:

In 2017, ST Engineering embarked on a proof of concept (POC) programme with the Land Transport Authority (LTA), being the first in Singapore to retrofit an existing MAN A22 single deck diesel bus into an electric bus, in support of LTA's commitment to achieve a 100% cleaner energy public bus fleet by 2040.

A successful POC would maximise bus asset utilisation and demonstrate that retrofitting diesel buses into electric buses could be a technically and commercially viable alternative to complete replacement. The retrofitted electric bus should also match a new electric bus in terms of performance. In addition, the retrofitted electric bus would have to meet operational requirements, with low electricity consumption and make economic sense for retrofitting on a larger scale, while proving its roadworthiness for Singapore's public bus service routes.

The Solution:

ST Engineering overcame technical challenges and operational constraints to ensure the feasibility and optimisation of the design, turning retrofitting into reality.

The innovative solution deploys opportunity charging as the primary mode of charging, and a Combined Charging System (CCS2) plug-in charger as the secondary mode of charging. Opportunity charging suits the local operating profile where buses make frequent layovers, allowing optimal range with sufficient battery capacity while not overloading the bus chassis. In addition, electrical components can be fitted into the spaces previously occupied by the diesel powertrain, and the smaller battery capacity ensures that passenger capacity does not need to be sacrificed while maintaining LTA's stringent side stability requirement.

Despite major modifications, the bus is certified under UNECE R100 and has successfully undergone homologation testing in Europe. It is roadworthy-ready to serve public bus service routes in Singapore and is able to allow its performance to be monitored.

The Outcome:

The retrofitted electric bus demonstrated that electricity cost savings could amount to 17 cents per km mileage, with carbon dioxide emissions reduced by 0.2kg per km mileage travelled. Its maintenance cost is also one third that of a diesel bus. By reusing as many of the original diesel bus components as possible, retrofitting cost is reduced.

Taking into account the overall capital investment for retrofitting and subsequent operating costs, the POC demonstrated that the retrofit design is commercially feasible and scalable. Bus asset owners and public transport operators now have a realistic benchmark to evaluate the performance, reliability and savings from retrofitting on a large scale. Finally, besides promoting a sustainable transport ecosystem, this can accelerate the pace of electrification of public bus fleets as other bus models can potentially be retrofitted into electric buses.



Award Finalist - Innovation
Most Innovative Solution

TRITECH ENGINEERING & TESTING (SINGAPORE) PTE LTD

Award Title : Most Innovative Solution

Award Criteria : Recognises the product or service that demonstrates the innovative use of technology to deliver the smart solution(s) in the land transport industry.

Organisation : Tritech Engineering & Testing (Singapore) Pte Ltd

Project : Tunnelling and Excavation Monitoring System

In major civil engineering and underground construction projects, huge amount of instrumentation data related to the progress of the excavation & tunneling, as well as the impact on the environment and tunnel boring machine (TBM), are generated.

The **Tunneling and Excavation Monitoring System** (TEMS) was developed by Tritech Engineering & Testing (Singapore) Pte Ltd ("**Tritech**"), which was incorporated in Singapore in 1999. It is a leading specialist contractor for Geotechnical Instrumentation and Site Investigation. The strength of Tritech lies with the spirit of relentless pursue of technology advancement and quality and productivity improvement. Over the 20 years, Tritech has gained firm standing and high recognition by governmental authorities, clients and fellow partners in the industry.

The **TEMS** allows storage, viewing, management and analysis of the large amount of complex and diversified data collected during construction. These data are housed in a centralised repository storing instrumentation monitoring data, geological information, TBM operation data and construction activities.

The TEMS is an innovative digitalisation platform with the following features:

- Highly secured internet web-based application,
- GIS-based system allowing data to be presented in context of the surrounding environment,
- Cloud-native and robust cloud computing enabling fast real time response,
- Big data analytics and intelligence algorithms enabling smart analysis,
- Availability on mobile platform allowing closer monitoring and field response,
- User friendly interface with numerous built-in visualisation functions such as soil profiles, instrumentation charts, across-section view, settlement contours, critical interfaces and customised dashboard.

The TEMS enables the following functions for tunneling and excavation works:

- 24/7 construction performance real time monitoring and data processing,
- 24/7 construction risk rating and safety alert,
- Smart solutions to rate risky instruments and make scenario-based alert of construction risks,
- Enhance efficiency & effectiveness in construction quality and performance control,
- Help verify, improve and optimise design,
- Ensure public safety with Instrument Risk Rating Concept (i.e., risk identification, risk monitoring & risk predication),
- Increase project productivity by reducing manpower.

The TEMS has been widely used for major land transport construction projects in Singapore.

TEMS 1.0 is the Winner of the Merit Award in the MOT Minister's Innovation Award 2015. TEMS 2.0 is the Winner of the Distinguished Award of the MOT Minister's Innovation Award (MIA) 2020.



Award Finalist - Innovation
Young Innovator

DR. LI YUNYUE ELITA

Award Title : Young Innovator

Award Criteria : Recognises individual(s) who has demonstrated the use of technology to innovate and deliver smart solution(s) resulting in land transport transformation.

Organisation : National University of Singapore, Civil and Environmental Engineering

Nominee : Dr. Li Yunyue Elita

Dr. Li Yunyue Elita is jointly affiliated with the Department of Earth, Atmospheric, and Planetary Science at Purdue University as a Mary J. Elmore New Frontiers Associate Professor in Data Science and with the Department of Civil and Environmental Engineering at the National University of Singapore (NUS) as an adjunct assistant professor. Dr. Li's research group at NUS works on geophysical applications in urban environments for smart cities and their sustainable developments. By integrating geophysical remote sensing techniques, ambient noise data analysis, and distributed sensor networks, her group focuses their research efforts on the developments of non-invasive, high resolution, and real-time systems to solve pressing urban challenges in space, water, security, and sustainability. Dr. Li was the recipient of the J. Clarence Karcher Award from Society of Exploration Geophysicists (SEG) in 2018. She was also awarded the SEG South & East Asia Honorary Lecturer for 2022.

Dr. Li is nominated for the Young Innovator Award under the Innovation Category for the LTEA 2022 in recognition of her innovative contributions of applying geophysical methods in solving various geotechnical challenges in the complex as-built environments in Singapore.

Planning Stage

Dr Li and her team developed non-invasive site investigation technologies that harvest urban ambient vibration noise, including traffic noise, construction noise, and ocean wave energy to resolve the underground geological structure such as layer boundaries and soil-bedrock interfaces. The technologies have been tested out across the island and have reached remarkable accuracy ($\pm 10\%$ for both shallow and deep bedrocks) with minimal input energy and a short data acquisition time.

Construction Stage

Dr. Li and her team designed a highly flexible look-ahead system to provide essential information for unpredicted geological conditions and manmade structures ahead of the TBM tunnel face. Not only is this system the first completely non-destructive and non-disruptive system that is compatible with any TBM in any geological environment, it also achieves unprecedented high resolution and long-range detection. This system is currently being tested and [JC1] [WNC(2)] has demonstrated its superior ability in detecting both known and unknown obstructions ahead of the TBM.

Operation Stage

Dr. Li and her team utilised roadside vibration sensors innovatively to monitor the traffic flow and pavement health. The vibration-based monitoring technique provides high temporal resolution traffic flow information in real-time, without raising road users' privacy concerns. Moreover, when the monitored data are calibrated and benchmarked, they can be readily used for infrastructure health monitoring and preventive maintenance. This technique has demonstrated its performance during Singapore's circuit breaker period, when detailed traffic information was obtained remotely and in real time.



Award Finalist - Innovation
Young Innovator

MR ONG JONG CHUAN

Award Title : Young Innovator

Award Criteria : Recognises individual(s) who has demonstrated the use of technology to innovate and deliver smart solution(s) resulting in land transport transformation.

Organisation : ST Engineering

Nominee : Mr Ong Jong Chuan

Inspired by how 21st century innovators can transform an everyday object into a new and essential product, mechanical engineer Ong Jong Chuan wants to improve quality of life with innovative solutions. He joined the Mobility Rail business at ST Engineering in 2018 and came up with the concept for a first-of-its-kind Variable Pitch Platform Screen Door (VP-PSD) solution that addresses the issue of dissimilarity between train types and door pitches on rail platforms to enhance commuter safety and comfort.

Background and problem

With the rising number of platform accidents, authorities around the world have been looking at Platform Screen Doors (PSDs) as a two-prong solution: to serve as a physical safety barrier as well as environmental and/or climate control barrier to help prevent loss of air-conditioning in metro stations.

PSDs were first introduced in 1972. Metro and railway systems then were usually designed and constructed without consideration for PSDs, resulting in multiple train types operating on the same line. This created an issue for conventional PSDs which have a fixed door pitch that matches to a specific type of train door and/or car pitches. Operators around the world faced a common problem of not able to implement the PSD system onto train platforms due to differences in the door pitches for different train types.

The solution

Armed with a deep understanding of the PSD system and its potential, Jong Chuan came up with the concept of transforming the PSD to suit the different door pitches of each train types with the Variable Pitch Platform Screen Door (VP-PSD).

The VP-PSD uses a dual-drive mechanism that can dynamically align and adjust the PSD to match with the various train's door pitch. As the VP-PSD is a free-standing structure, it can be easily incorporated into both greenfield and brownfield projects, without the need to disrupt revenue services.

In addition, with the incorporation of a Safety Integrity Level 3 system, the VP-PSD ensures that risks are mitigated and rail operators will be able to enjoy its safety and benefits. With the trend moving towards Communication-based Train Control signalling systems, transport authorities and operators will be able to convert conventional signalling to a driverless system which needs to be paired with PSD systems to ensure commuter safety.

In December 2019, the VP-PSD made its official debut to the rail industry at AUSRail Plus, the largest rail industry event in the southern hemisphere hosted by the Australasian Railway Association. The VP-PSD has seen keen interest from transport authorities around the world and is projected to have an estimated market potential of over S\$800 million.



Award Finalist - Innovation

Best Collaboration Partner

GO-AHEAD SINGAPORE PTE LTD

Award Category : Best Collaboration Partner

Award Criteria : Recognises the partner(s) who has demonstrated the highest level of commitment to deliver smart solution(s) that contributes towards land transport.

Organisation : Go-Ahead Singapore Pte Ltd

Go-Ahead Singapore (GAS) is a subsidiary of the UK-based Go-Ahead Group, a multi-modal international public transport operator delivering over one billion annual journeys. Operating on a devolved management structure, we retain our ability to provide quick responses to the changing needs and conditions of a local market independently. As a local public transport operator, prides itself on collaborating with the LTA to benefit the local transport network.

At GAS, we believe in staying one step ahead to identify opportunities and lead the change. To achieve this, we have built strong relationships with our suppliers, partners, stakeholders, and LTA, working collaboratively to achieve positive results. Our efforts are focused on collaboration projects that deliver smart solutions and help to grow a sustainable and inclusive public transport industry in the long term.

GAS had trialed Singapore's first fully electric bus between November 2016 and May 2017 to assess the suitability of electric buses for public transport in Singapore. The trial was successful with zero breakdowns, and positive feedback were received from bus captains and commuters. 81% of 300 people surveyed had positive impressions of the vehicle performance. Throughout the trial, GAS had involved our internationally recognised experts from Go-Ahead London to support LTA and share our experiences from introducing electric buses in London. Go-Ahead London also hosted a visit for the LTA to visit its award-winning Waterloo electric bus depot.

Leveraging on our experience from a trial of similar technology in the UK, GAS has fitted ultra-thin solar panels on the roof of two buses for a proof-of-concept trial in Singapore. They are used to charge the batteries on the buses, which would otherwise have to rely on the vehicle's alternator, thereby reducing the load on the bus engine and consequently, fuel consumption. We were in constant consultation and collaboration with the LTA in every stage of the project, from the initial concept formulation, technical discussions to the final installation and approval. The relevant departments in LTA had provided guidance and advice leading to the eventual implementation of the project. Technical roundtable discussions were organised with the LTA, bus manufacturer, and system installer, which proved pivotal in the successful solar panel installation.

Following a fact-finding visit with representatives of LTA to the UK in early 2020, GAS introduced the 'Helping Hand' initiative aimed at enhancing the commuting experience for people with physical or invisible mobility impairments. As an active participant in the Caring SG Commuters Steering Committee, GAS is committed to transforming Singapore's public transport system to be more caring, welcoming, and inclusive.

Demonstrating extensive knowledge in a range of areas including sustainability and inclusivity, GAS understands how to implement new technology and initiatives effectively. We will sustain collaborative efforts with LTA on projects that drive the transport industry forward and make the service better for our commuters.



Award Finalist - Innovation

Best Collaboration Partner

THE INSTITUTION OF ENGINEERS, SINGAPORE

Award Title : Best Collaboration Partner

Award Criteria : Recognises the partner(s) who has demonstrated the highest level of commitment to deliver smart solution(s) that contributes towards land transport.

Organisation : The Institution of Engineers, Singapore

As the national society of engineers in Singapore, The Institution of Engineers, Singapore (IES) has made significant contributions to advance and promote engineering in supporting the development of Singapore's land transport system.

IES takes the lead in according professional recognition to engineers, engineering technologists and technicians in railway and transportation to raise engineering standards of these sectors in Singapore. The Singapore's Chartered Engineer programme was extended to railway professionals in 2015 with a Memorandum of Understanding signed by the IES, the LTA, the Singapore Workforce Development Agency, SBS Transit Ltd and SMRT Corporation Ltd. Since then, the IES has accredited more than 200 Chartered Engineers in Railway and Transportation as well as more than 100 Chartered Engineering Technologists and Technicians. It has built a sustainable pool of highly skilled and proficient railway engineering professionals to support the future growth of Singapore's land transport system.

Another notable achievement by the IES is the setting up of the Railway and Transportation Technical committee (RTTC) in 2016 to support the development of Singapore's land transport community. Since then, in partnership with the LTA, the RTTC has significantly promoted, enhanced and developed the capability, competency and networks in the Railway and Transportation sector through organising conferences, workshops, seminars, technical visits and closed-door forums.

The IES has also been working with LTA on the LTA-IES Certification for Technical Specialist (Bus) (CTS) programme since 2018 to benchmark the competencies of bus technical professionals. IES has also been partnering LTA in the certification of bus professionals in maintenance, with close to 100 certifications given out to date.

The Singapore Rail Standards Initiative was launched at the IES 53rd Annual Dinner in 2019 to enhance support for Singapore's railway development. Since then, the IES has played a key role in advancing the initiative that is supported by LTA, SMRT, SBS Transit and Enterprise Singapore (ESG). It is spearheaded by the Technical Committee on Railway Systems (TCRS) set up under the Singapore Standards Council, overseen by ESG. The Technical Committee (TC) will develop standards for the operation and maintenance of railway systems to enhance the safety, reliability and productivity of railway systems in Singapore.

Moving beyond railway standards, IES also partnered with LTA and various stakeholders to launch the Transportation Standards Committee (TPSC) at the World Engineers Summit (WES) 2021. The TPSC seeks to address emerging challenges in the rapidly evolving transport sector by providing strategic leadership to existing Technical Committees (TCs) on Automotive and Railway Systems and an upcoming TC on Intelligent Transport Systems in order to enhance synergy, interconnectivity, inclusiveness and intelligence in the sector through the development of common national and international standards.



Award Finalist - Innovation

Best Collaboration Partner

ST ENGINEERING

Award Title : Best Collaboration Partner

Award Criteria : Recognises the partner(s) who has demonstrated the highest level of commitment to deliver smart solution(s) that contributes towards land transport.

Organisation : ST Engineering

ST Engineering has built a distinctive reputation for deep engineering expertise over the last 54 years. From its early days, ST Engineering has evolved to become a global technology, defense and engineering group with a diverse portfolio of businesses across the aerospace, smart city, defence and public security segments. As part of its Smart City portfolio, it offers an extensive suite of Smart Mobility solutions including rail electronics solutions, intelligent traffic management systems, fleet management systems for buses and taxis, clean energy fleet solutions, autonomous capabilities, data analytics, cybersecurity, and advanced transportation operations centres.

Deeply committed to improve connectivity and the commuting experience for public transport in Singapore, ST Engineering actively and regularly engages LTA through multiple platforms such as the 26th Intelligent Transport Systems (ITS) World Congress 2019 held in Singapore and the LTA-UITP Singapore International Transport Congress & Exhibition (SITCE).

With a deep understanding of Singapore's current and future land transport challenges as well as LTA's needs, ST Engineering proactively pursues strategic partnerships and projects to share capabilities and provide innovative solutions. On top of participating in several LTA tenders in bus, rail and road services and successfully completing these projects, ST Engineering also works very closely with LTA to develop new proof of concept (PoC) projects that help to enhance commuting experience in the areas of safety, reliability and efficiency.

ST Engineering also extends its support to local transport ecosystem partners such as SBS Transit and SMRT Corporation, helping the local public transport industry to thrive. This include working with these partners to upskill drivers to stay relevant with future autonomous vehicle operations, and working with overseas original equipment manufacturers to build local competencies.

With LTA's leadership and partnership with the local transport ecosystem, together with ST Engineering's deep engineering expertise and strong collaborative spirit, ST Engineering is confident to build a robust, resilient and people-centric land transport network that enhances the quality of life for people in Singapore.

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