HKIS Annual Conference 2020
Beyond 2020: The Trend of Surveying
Keynote Speech by Ir Eric PANG JP, Director of Electrical & Mechanical Services
"ABC" trend in Property and Facility Management (PFM)

Secretary WONG (SDEV), Surveyor SHIU (President of HKIS), Honorable guests, ladies and gentlemen. It's my great honour to be invited to the HKIS Annual Conference 2020 and share with you the new trend in property and facility management which improves the quality of living for the community.

In recent years, we have been facing serious aging problem in the construction and building industry. Not just for the labour and our population, but also the facilities that we operate and use. The shortage and aging in manpower, together with the performance deterioration of aging engineering assets, are heavily affecting the cost, efficiency and environment of our city. We have to seek new ways to tackle the issue.

Innovation is a key element in our Construction 2.0 strategy. We need innovation and the introduction of new technologies to enhance efficiency and professionalism so as to sustain our growth and meets the development of HK. Accordingly, Modular Integrated Construction, MiC, has been strongly advocated by the construction industry. The adoption of MiC is a very good example to demonstrate how new and advanced technologies can change the ecosystem of the industry.

In the past, buildings were constructed on-site bit by bit with raw materials. In the 1990s, the concept of prefabrication emerged, noticeably by the Housing Authority, which enhanced the quality and shortened the construction time and labour. Component manufacture is automated in the factory and assembled together piece by piece on-site to become completed flats, and then the whole building.

Well, modularization did not stop there. Over the past decade, it has evolved to become the MiC. Not just stopped at the prefabrication of a single component, the entire room or flat can be modularised and prefabricated. Efficiency, productivity and quality of the construction industry is therefore enhanced tremendously.

Advanced technologies transform the industry. Building constructors are working hard as ever, but no longer like an ant, but a honey bee. While both are exceptionally hard-working and diligent, the bees do it smarter! When honey bees are forming their nests, each of them builds their own hexagonal prismatic cells efficiently. All bees work in synchronism and to complete their modular nest.

Apart from MiC, adoption of drone in the surveying profession is another innovative breakthrough. Let's take a look at this video.

https://www.youtube.com/watch?v=OoC2MZt813o

We human beings never cease to innovate. I believe that innovation is the key to enhance our productivity, quality of services and competitiveness, and is in fact the underlying drive to the advance of mankind. We can also utilize innovation and smart technologies to tackle the inevitable social phenomena such as manpower shortage, and population and facility ageing. Currently we in EMSD are also facing the aging of engineering assets in over 8,000 government buildings. And there is never sufficient manpower to handle the engineering services of these E&M assets.

So we are in dire need for a breakthrough in property and facility management.

The visionary breakthrough is the **S**mart **F**acility **M**anagement. It is the integration of data in **A**sset management, **B**uilding management to **C**ity management. It can be simply summarized as "ABC", by the integration equation :-

$$\text{Smart FM} = \int_{B}^{C} A(x) \ dx$$

Well, for those of us good at mathematics, it looks so simple and neat. Right? So let us elaborate what they are.

Let's start with smartphones to introduce our first letter "**A**", that is Asset Information Modelling. A smartphone, undeniably, is an asset to us. Though it seems to be small, neat and simple to use, it is an inseparable part of our daily lives. I believe everyone of you has a phone. Right?

In the old days, you could only do calls and simple texting with it. Now you can use your phone to locate yourself in the globe, schedule a meeting with participants staying somewhere in the globe, order a meal from far away and monitoring its delivery progress to your house, and even talk to Siri ("hey Siri") with various apps. Smartphones are, in fact, a good example of a kind of advanced asset.

Similar to smartphones, the trend of Asset Information Modelling is to keep operation and maintenance parties notified of the operational status and availability of assets, and enable them to control the assets remotely. We could make our asset notify us when their service date is near, power generated is lower than expected, or when there is any impending failure in the equipment.

To achieve such spontaneous feedback from an asset, we have to first make it smart by equipping the asset with the required intelligence, for example, equipping it with IoT and building a platform that enables it to communicate with us.

EMSD has been developing the Government-Wide IoT Network, GWIN, to enable silent assets speak, and to make them go "online". For instance, updating us on facility occupancy and utilization, environmental changes, and their own performances. GWIN makes use of LoRa technology, which is a Low-powered Wide Area Network. Its low power characteristic allows sensors to be operated with a battery for a very long time, typically around 5 years or even longer. Moreover it has an outdoor range of about 5 to 10 km, and an indoor range of over three halls by using just one gateway equipment.

The GWIN gateway and sensor installation is non-invasive, and so it is a quick and easy way to make a facility "smart". There are a wide range of sensors readily available for installation. For example, (1) environmental sensors for detecting temperature, humidity, light intensity, water leakage, etc; (2) occupancy sensors for detecting people flow and

space utilisation; (3) level sensors for checking usage and consumables, etc. These sensors would alert maintenance agents of any faulty equipment, orders of spare parts and consumables, as well as letting us derive the best maintenance strategy using data. Its power for Asset Information Modelling (AIM) can never be under-estimated.

While constructing the asset information model (AIM) is just the very first step, connecting the assets with real-time operational data at a building level becomes the next critical step. And that's where "**B**" -Building Information Modelling – Asset Management comes into play.

Building Management Systems (BMS) have been implemented in many buildings for instant monitoring of operational status of building E&M facilities. The advancement of IoT technology means that we could easily and rapidly deploy wireless sensors at locations without BMS. With them, we can monitor most of the E&M facilities in buildings.

Technologies not only make building operation and maintenance smarter than ever, but also help property and facility managers to enhance user experience, and enables them to optimize facility utilization to raise the financial return.

We have launched various trials at our EMSD headquarters for car park, meeting room and toilet management. Let me show you some examples.

With occupancy sensors installed at meeting rooms, we developed a new web-based system for room reservation and also checking the availability of the meeting rooms based on the real-time occupancy status. A meeting room will be released for use by others if a meeting is finished earlier than the duration the room is reserved for.

We also installed car park sensors to collect the occupancy data of individual parking space for further analytics to raise the utilisation of precious parking space.

Other than the IoT sensors in meeting rooms and carparks, we implemented smart toilet trials at EMSD HQs to feedback the occupancy, usage of the consumables (e.g. toilet paper and soap), and environmental parameters (e.g. odour, water leakage, temperature,

humidity, light intensity) for better toilet management and resources planning. Maintenance or cleaning staff would be timely notified of any problem inside the toilet for early rectification.

BIM-AM is the platform for integrating separate Assets at Building level using various technologies, such as BMS and IoT. It enables smarter facility management services and achieve better user experience within the buildings.

Once we have tackled the Smart FM at building level using BIM-AM, we can zoom out further for a bigger picture. Here comes the "**C**", the citywide level of Smart FM.

In order to connect the facilities of a city, we actively digitise our citywide E&M facilities. Integration platform such as the Geographical Information System (GIS) is adopted to monitor more than 1,900 traffic light junctions, 300 footbridges and 200 pedestrian subways across the territory on a real-time basis. E&M facilities including traffic lights, public lighting, power installation, lifts and escalators, and water pumps in subways, are being remotely monitored. The system allows us to keep track of the operation status or any faults encountered in any location in the city. It also interfaces with the BIM-AM systems of individual buildings to improve the availability and reliability of the E&M systems that keeps this city up and running, enhance operational energy efficiency, and improves the public safety and our quality of living.

Along this vision of a smart and green city management, to further enhance public service and Hong Kong's sustainability in citywide magnitude, we have established the first Regional Digital Control Centre, RDCC, at the EMSD Headquarters Building since 2019. In the RDCC, the E&M equipment status and alarms of various designated and widely dispersed sites are centrally visualised. Our staff can monitor assets at multiple sites remotely via centralised dashboards, which reduce the need for on-site visits.

Besides, big data and AI are applied on E&M operation management. An average of over 600,000 data are collected from a single building every day. The big data analytics performed aims to enhance E&M system operational efficiency and environmental performance in order to specifically address various client's and community needs. We

target at having over 100 buildings to be connected to the RDCC in coming years and we are now working closely with the big data experts from academia and IT industry for the development.

We also worked with the Drainage Services Department to install wireless water level sensors at storm surge and overtopping wave spots across the territory for flooding pre-alarms. It facilitates early implementation of citywide contingency measures in typhoon season for better protection of lives and properties. Let's take a look at this video!

As you can see, we integrate our data from **A**ssets to **B**uilding level, and from **B**uilding level to a **C**itywide level to achieve Smart Facility Management. Let's recall this integration formula, with full names for A, B, C and D:

$$\text{Smart FM} = \int_{Building}^{City} Asset(Data) \; d(Data)$$

In 2020, we are facing challenges after challenges brought about by the COVID-19. Much of our knowledge and experience acquired from the past doesn't work out. We need changes to take us forward. What I just share with you, the ABC of Smart Facility Management is a typical example where innovation and use of technology enable us to greatly reduce human contact in our daily work as we adapt to the new normal.

Whatever our background, profession, or position, we stand together. And together we make our city smart and great again. Thank you.