



Land Surveying Division
Sr Paul Tsui LSD Council Chairman

Land Surveyors and BIM (Part I)

In this and the next issue, I will discuss BIM, which is a newly-added area of specialisation in this revision. While I believe that BIM is still a relatively new technology to most HKIS members, the Institute is still exploring how it can further increase cost and time efficiencies in each surveying specialty. An LSD member may ask, "What is the role of land surveyors in BIM adoption throughout the project life cycle of a construction project?" To answer this question, I have invited two Fellow members, Sr Michael Wong and Sr Ricky Lai, to share their experiences in dealing with BIM in their work lives and their views on the role of land surveyors in BIM adoption from a contractor and client's points of view, respectively. In this issue, Michael will share his knowledge with members.

Land surveying is important in a construction project because it provides accurate and reliable spatial information. Traditionally, this involved setting-out works, detail surveys, as-built surveys, etc, according to the contract. These tasks are important for a quality assessment of the construction objects regarding positioning, verticality, or flatness. In recent years, with the implementation of BIM technology and improvements in surveying technology, land surveying's contribution to a construction project has significantly increased. The implementation of BIM technology benefits the entire construction cycle at different stages. This requires the improvement of spatial information, in terms of the level of detail or texture, for better decision-making and communication.

During the concept and design stage, a land surveyor performs topographical and detail surveys on existing objects adjacent to the construction site. The information from these

surveys facilitates discrepancies analysis and clash detection. Figure 1 shows that several new pipes are required to pass through an existing building. The surrounding structure and the MEP items on its ceiling have been surveyed. A land surveyor proposes the best routing for them, which, along with the spatial data, reduce the risk of clashing with the existing features during the installation works.



Figure 1

During the fabrication stage, a land surveyor conducts a pre-cast check to ensure that the fabrication units meet the fabrication accuracy stated on the contract. Figure 2 shows the steel structure being fabricated in the factory. Laser scanning is usually adopted to survey a complicated construction object like this structure. For parts that cannot be surveyed by laser due to access, aerial photogrammetry provides not only the missing spatial information, but also the reality model with a clear texture.



Figure 2

Studying working drawings is essential in engineering surveying. During the construction stage, a land surveyor must integrate layout

plans, section drawings, elevation drawings, detail drawings, and shop drawings to determine the setting-out data. Using BIM technology, one can check the BIM design model against the latest working drawing. Communication between the land surveyor, engineer, and designer is important for ensuring the setting-out information is correct before the survey work proceeds. If the construction object requires formwork erection, the land surveyor will conduct a formwork check to ensure that the formwork fulfills the specification requirements.

Existing site progress surveys are part of the work of a land surveyor. During the construction process, site boundaries and access features, such as haul roads, may be modified based on construction plans. Land surveyors use drones to take aerial photos and orthophotos, as well as to provide reality models. A photogrammetry product can be integrated with the working drawings or BIM model for site management and planning. During the ELS stage, a land surveyor must provide an interim record survey to record the excavation process, as excavation volume computation is among their basic tasks at this stage. ELS items such as steel piles and temporary struts can be captured by laser scanning or photogrammetry, as shown in Figure 3.

establishes a system to monitor the adjacent structures, ground surfaces, underground water sources, etc. The record produced by the land surveyor is compared to the alert value stated in the specifications or working drawings. If the land surveyor's results exceed those of the alert value, construction will stop and remedial work must proceed.

During the as-built and handover stages, the land surveyor captures the spatial data and integrates them with BIM technology. Today, a laser scanner is commonly used to gather as-built data due to its accuracy and efficiency. A surveyed point cloud can be compared to the design model to identify their discrepancies. An as-built BIM model is also established based on the survey records for asset management and maintenance. The land surveyor also adopts photogrammetry and integrates it with laser scanning, as shown in Figure 4. It is an important process for capturing constructed buildings and surrounding access roads during the handover stage. As the reduced level is accurately surveyed, this is important evidence for either settlement occur in the future.



Figure 3

Monitoring is an important task during construction because it requires a high degree of accuracy and the results of which can affect the project's progress. Each construction site

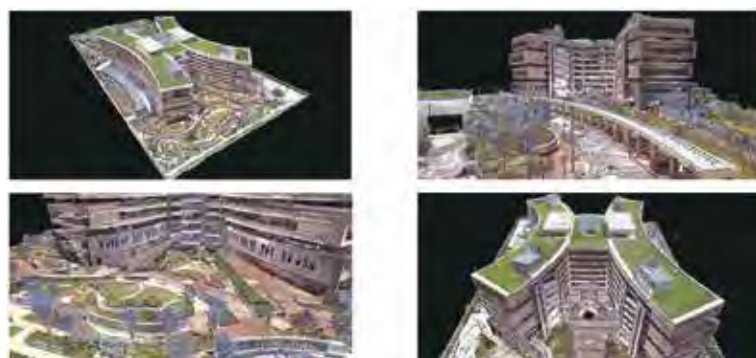


Figure 4

Another example, the point cloud record of an MTR station, is shown in Figure 5. The station's platform, concourse, and entrance were surveyed after its construction was completed. The record's accurate and high level of detail will benefit the maintenance work on and future plans for it.

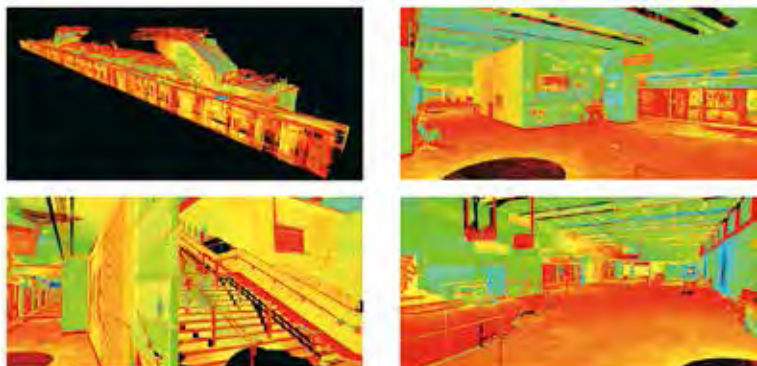


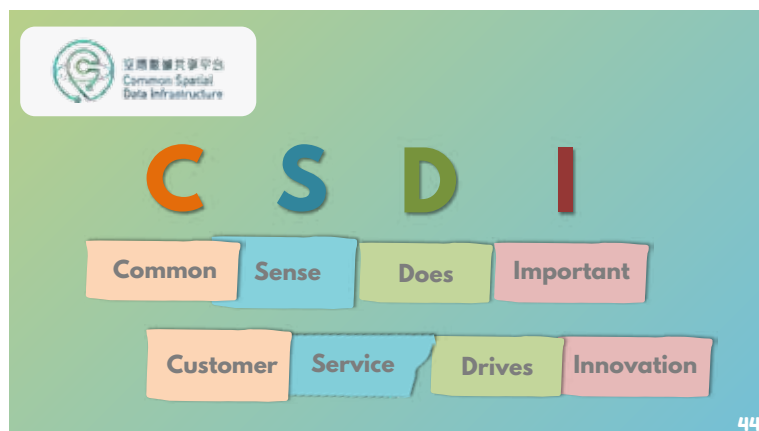
Figure 5

CPD Highlights

“Coordinates, Bearing, and Distance to Map Our Future”

Sr YC Chan, Head of the Development Bureau's Spatial Data, delivered a CPD to over 500 HKIS colleagues. He shared his observations of the land surveying profession's evolution and exchanged views with the audience on its future. He reiterated the need for common spatial data infrastructure (CSDI) and updated everyone on the current stages of the CSDI initiatives under smart city blueprints.

YC summarised his talk by opening a very encouraging time capsule, which contained his predictions of sustainable development in land surveying made in 1999. He encouraged younger surveyors to help facilitate future developments in the land surveying profession. The seminar successfully concluded after a fruitful discussion chaired by Sr Eddie Wong.



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Time Capsule - 1999

Preliminary ideas collected on Sustainable Development of Land Surveying Profession

Following the brainstorming with fellows in academic institute, private practice and public service, several potential areas for sustaining the development of LS profession were identified for further discussion:

1. LIS Application

- On top of the provision of spatial data infrastructure, every attempt should be made to explore the development of customized LIS applications for others. For instance, fleet management, logistic management... Surveyors should have privilege in consolidating systems containing interactive location data (ID) and are willing to provide total solution (at least take a leading role in such projects).
- Internet applications on spatial data should be explored. LIS should not only rested on a sophisticated and expensive platform, for many users, a simple query on location based information using internet may be very helpful.

2. Legislation (e.g. Extension of Land Survey Ordinance, Land Title Bill...)

- To uphold the professional status and sustain the development, we will be happy to see that if we have statutory authority/responsibility to conduct or oversee different surveys. Not only our supporting role in legislation should be strengthened, we also need support from the legislation. We are not trying to create monopoly by stopping others to do our work but to maintain quality professional service to benefit the community. There are many areas of which survey require our input. For example, land matters, land-use and related environmental protection, public works...

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Time Capsule - 1999

3. Engineering Survey

- Until recently, professional surveyors' involvement in civil engineering structural works is limited. There should be several areas for us to explore such as hydrographic surveying, independent checking services, quantity computation, monitoring, environmental protection.

4. Navigation

- Surveyors with pre-requisites in survey & mapping, positioning & directional instruments and LIS should have benefits in setting up monitoring navigation systems. Such navigation systems not only provide real time positions of the vehicles, they can serve as fleet management tool as well as security systems.

What can we do?

HKIS

- To promote land surveyors' status to the general public extensively.
- To promote our role to secondary schools such that more "cream" of the students will be attracted to join the profession.
- To seize every opportunity to lobby business accepting professional service as a mandatory clause in some tenders / contract documents.
- To arrange CPD courses can be joint events with other professional bodies or academic institutes.

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Time Capsule - 1999

Fellow Surveyors

- To be technology sensitive.
- To be customer focused - providing total solution for customers.
- To be well equipped by strengthening knowledge in IT, electronics, legal framework and management.
- To increase exposure.

The sustainable development of LS profession relies very much on the members' participation, grateful if members can extend the above list by forwarding their ideas to us.

Prepared by: Y.C. Chan

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CPD event - "Coordinates, Bearing, and Distance to Map Our Future"

HKIS Social Event - Flower Basket Workshop 花籃工作坊

(Organised by the HKIS Members' Welfare Committee)



The HKIS Members' Welfare Committee is organising its first social event in 2022, two flower basket workshops, for all HKIS members. Participants can create their own flower basket with fresh flower in three hours and take home their creation. Tutors will introduce different types of equipment and floral materials for flower arrangement and how to handle soil and floral materials. Flower arrangement will be demonstrated.

Class A: 20 August 2022 (10:30am - 1:30pm) (Code : HKIS/S/202203A)

Class B: 20 August 2022 (2:30pm - 5:30pm) (Code : HKIS/S/202203B)

Venue: Board Room, Room 1207, 12/F, Wing On Centre,
111 Connaught Road Central, Sheung Wan, Hong Kong

Fee: HK\$300 for HKIS members (including equipment and floral materials)

Quota: 15 for each class

Tutor: Hanaichi Flower (Instagram: hanaichi.flower.hk)

Remarks:

- 1) This event is not eligible for CPD hours.
- 2) The workshops welcome beginners with no floral arrangement experience.
- 3) Images are for references of general style and mood only. Floral materials might not be the same as in the photos.

Application:

Please visit the HKIS Website – CPD for online application. For enquiries, please contact Ms Kitty Lai at 2526 3679 or kittylai@hkis.org.hk.