14th International Surveyors' Congress & 2012 CASLE Regional Conference

The role of civil engineering surveyors in the development of

Malaysia's infrastructure

Presentation by

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21 June 2012

INTRODUCTION

First and foremost, I am extremely honoured to have been invited to the 14th International Surveyors' Congress & 2012 CASLE Regional Conference and in particular, to be given the opportunity to raise awareness of the role of Civil Engineering Surveyors and how this could impact in the development of Malaysia's infrastructure.

Civil engineering construction makes a vital contribution to the world' economy, employing millions of people across the globe. It is responsible for developing, creating and maintaining the infrastructure of countries of all levels of development and wealth. Without a civil engineering industry there would be no clean water, no transport system, no sewage and waste disposal, no heat, no light and no power. The world's infrastructure and its people would be at the mercy of the elements and the natural forces within our changing environment.

Civil engineering surveyors play a key role in all stages of the Infrastructure asset life cycle. From concept to design and development, from procurement to management, construction and hand-over, finalisation and resolution of

disputes, from maintenance to monitoring – every step is influenced and enhanced by the involvement of a civil engineering surveyor.

By their skill and competence, civil engineering surveyors reduce the risk of failure at many stages of an asset's life and not only make an important contribution to the bottom line of the construction companies, operators and clients they represent, but help to underpin the sustainability of the industry by minimising and even eradicating the unnecessary wastes of time, resources and money.

Turning now to Malaysia's Infrastructure development, projects include:

- The comprehensive development plan for Iskandar Malaysia
- 1Malaysia Development Berhad (1MDB)
- KL International Financial District
- LRT Extensions –Ampang & KelanaJaya lines
- Sungai Buloh–KajangMRT
- Electrified Double Track Project, Ipoh –Padang Besar

It is clear that over the next few years these "mega" projects will cost RM100's billion.

As with the UK Government's £250 billion Infrastructure Plan, a significant part of the delivery of this work will rely upon the skills and expertise of the civil engineering surveyor.

In the UK, the government's chief construction adviser Paul Morell has indicated that Building Information Modelling (BIM) will become a key part of the procurement of public buildings and infrastructure in the very near future. The UK Government account for 40% of all expenditure on building and infrastructure projects and has mandated that by 2016 all projects over £5 million will have a BIM capability.

SO WHAT IS BIM?

BIM is a managed approach to the collection and exploitation of information across the life cycle of a built environment asset. At its heart are computer-generated models connecting all graphical and tabular information about the design, construction and operation of the asset and associated documents. BIM allows design options to be explored digitally. Design changes are quicker and cheaper to enact when compared to traditional design tools. It is the technological and process successor to computer aided drawings (CAD) and 2/3D drawings and creates data files or 'objects' of physical components and spaces to produce sophisticated 3D models which contain both graphical representation of the asset, but more importantly, details of all its associated information that can be reused.

The term Building often gives rise to confusion limiting the application of BIM to Architecture and physical buildings however in the context of the UK Architecture, Engineering and Construction (AEC) industry, Building should be taken as the verb to build rather the noun a building.

It is important to note also that BIM itself is not a single software application but is the use of software tools embedded in a process to manage data throughout the life cycle of an asset from procurement through operational management and changes. For this reason there is often controversy over what the 'M' in BIM means – we recognise that it covers two interchangeable aspects - Modelling and Management **-** of the key component Information.

BIM INFRASTRUCTURE EXAMPLE CROSSRAIL UK

For example, the £15 billion Crossrail project - Europe's largest current infrastructure project - has adopted BIM and is operating one of the most sophisticated models as part of an Asset Whole Lifecycle approach. The BIM model approach has been designed to be flexible and capable of increasing levels of detail as the design progresses through construction and on to the operation of the assets. At the concept stage, objects have been assigned attributes and requirements which have informed the specifications for later design. Objects can be interrogated for details of their purpose, performance

specification, manufacturer information, operating requirements, and systems of which they are a part. Once the railway is operational, the model can provide the 'single source of the truth' at handover for a variety of purposes, such as maintenance or replacement of components, all managed through strict configuration control and asset life cycle management.

In a more concise form, BIM might be defined as follows;

"Building Information Modelling is digital representation of physical and functional characteristics of a facility creating a shared knowledge resource for information about it forming a reliable basis for decisions during its life cycle, from earliest conception to demolition."

How does BIM relate to Infrastructure?

The effective management and use of information throughout the life cycle of an asset is what BIM is all about. Many people incorrectly associate BIM solely with the production of a 3D CAD model. Whilst a 3D model of the asset provides very important and useful information, we also need to understand and relate to the topological and spatial connectivity of different elements, the scheduling and cost elements, contextual data about the project and/or asset itself, and unstructured data dealing with contracts or operations – to name but a few of the different data BIM needs to address.

DATA HIERARCHY OF NEEDS/USER LEVELS

How we view this data is also important depending on the life cycle stage we are operating at. In some stages we are interested in a very project-centric view of the data and at others we require an asset-centric view. Sometimes we are operating at a national strategic level and at others a project or asset sub-atomic level. The data we require for these activities will differ in terms of type and detail.

So why is the role of the civil engineering surveyor so important?

BIM is fundamentally about the flow of information through the whole life cycle of an asset – from initial conception through design, construction,

operation, refurbishment and re-use through to decommissioning and eventual demolition.

No other profession is as intimately and extricably involved in the production, transformation, manipulation and maintenance of this information over the life cycle of an asset as the civil engineering surveyor.

This might involve;

- Topographic survey for a new building or infrastructure project
- The use of terrestrial laser scanning or photogrammetry of an existing building or asset
- Sub-surface utility engineering or utility mapping of buried services
- Manipulation, transformation or visualisation of existing or designed models
- Calculations of building and/or earthwork quantities, estimating and cost engineering
- Building, asset or infrastructure setting out during construction activities
- Planning and project management activities
- The writing of unambiguous collaborative contracts with clear definition of ownership, liabilities and information interoperability
- The survey and delivery of as constructed models and information
- Asset management, operation and maintenance information (asset condition or monitoring surveys for example)
- Survey, design, assessment and setting out of refurbishments
- Survey work with regard to decommissioning or demolition

The civil engineering surveyor therefore is in a position to play a unique role with regard to geospatial engineering and commercial management activities.

What are the benefits?

In the UK the hypothesis is that the Government, as a client, can derive significant improvements in cost, value and carbon performance through the use of open shareable asset information. Benefits of supply-chain integration in the construction sector are largely understood in terms of performance improvement, greater project ‘certainty’ and reduced risk and it is expected

that these will deliver a 20% saving on capital expenditure (CAPEX) costs during the design and construction phase alone.

One of the key factors in achieving successful integration is the accuracy, effective flow and intelligent use of information which BIM, by requiring interoperability of information, will encourage. It is anticipated therefore that a major value of BIM will be in the post-construction phase through the on-going management of assets for optimum value in space utilisation, running costs, whole life costs and energy/carbon reduction.

The role of the Chartered Institution of Civil Engineering Surveyors (ICES)

The ICES supports and facilitates the realisation of these benefits via its Royal Charter associated to the role of the civil engineering surveyor.

By way of background, Royal Charters are granted by the Sovereign on the advice of the Privy Council which today are normally reserved for bodies that work in the public interest (such as professional institutions and charities) and which demonstrate pre-eminence, stability and permanence in their particular field.

In September 2009, Her Majesty Queen Elizabeth II granted ICES a Royal Charter which together with Bye-laws form the documentation for our governance. The Royal Charter sets out the object and role of the Institution. The Charter also lists the membership grades, and authorises the use of post nominal letters by members. The Object is as follows:

ROYAL CHARTER

'The object for which the institution is established (hereinafter referred to as the “Object”) is to advance the science and art of civil engineering surveying in all aspects of the specialisations of geospatial engineering and commercial management within civil engineering for the benefit of the public, in particular but not exclusively by upholding and advancing the standards of education, competence, practice and conduct of members of the institution'.

As you will see, the Object is specific to the two specialisms of geospatial engineering and commercial management. In many ways, this is the strength of the Institution. It does not seek to go outside these boundaries but continually strives to be the leader in these specific fields of activity.

THE SPECIALISMS - GEOSPATIAL ENGINEERING

Geospatial engineering is an important part of civil engineering construction and infrastructure projects. Engineering surveyors are involved in all phases from cradle to grave, providing mapping at design stage, controlling setting out during construction and checking for movement by monitoring afterwards.

Key elements are:

- Locating the best positions for the construction of bridges, tunnels, roads, railways and

other infrastructure

- Producing up-to-date maps and plans at international, national and local scale
- Setting out a site so that structures are built to scale and in the right place
- Monitoring the construction process
- Providing control points so the future movement of structures, such as dams or bridges, can be monitored

Specialisms are:

- Land surveying (checking setting out and measuring building position to ensure that construction takes place to the dimensions and tolerances required)
- Engineering surveying (checking setting out and measuring building position to ensure that construction takes place to the dimensions and tolerances required)

- Hydrographic surveying (measuring and mapping all parts of the earth's surface that are covered by water)

- Photogrammetry and remote sensing (collecting data and information from photographs and aerial sensors without touching the objects being surveyed)

- Geographical information systems – GIS (the collection, analysis, visualisation and presentation of geographical information)

- Buried services surveying (the measurement, definition and portrayal, either digitally in the form of maps, plans or reports, of the characteristics of buried services.

THE SPECIALISMS - COMMERCIAL MANAGEMENT

Commercial management covers a wide variety of construction commercial processes. Commercial managers are responsible for:

- Measuring and valuing the work carried out

- The increasingly complex financial arrangements for civil engineering projects

- Demonstrating an awareness of the construction process

- Planning and programming the work, ensuring that cash flows fit with the financial plan and are fully conversant with accounting practice in declaring the profitability of the project

- Ensuring that procurement is carried out within the complex rules that now prevail in public projects and being aware of legal implications

- Accurate preparation and administration of contract documents

- Developing and close monitoring of works programmes and budgets

- Ensuring the settlement of any disputes which might arise

Specialisms are:

- Quantity Surveying
- Estimating
- Planning
- Cost Engineering
- Procurement Engineering
- Project Management
- Construction Law

EXPECTATIONS OF PROFESSIONAL BODIES

- Greater responsibility
- Standards
- Professionalism
- Competence – Training & Continual Professional Development
- Lobbying
- National collaboration - networking
- International collaboration - networking

An example of how the Institution has fulfilled its Charter and the expectations as listed above is the on-going work it is undertaking with regard to the introduction of a new British Standard for Sub-Surface Utility Engineering and Utility Mapping.

Our concern is around ensuring communication and collaboration between all interested parties and specifically in providing input to data standards and exchange, generating best practise guidelines and competencies and training for those involved with the detection and surveying of buried services.

BURIED SERVICES SUB-SURFACE UTILITY ENGINEERING

We have been successful in lobbying government and stakeholders and have been influential in bringing them together with regard to the UK Traffic Management Act and the location, management and work carried out on buried services. We continue to provide support and encouragement to industry organisations such as utility groups, trade associations and research projects such as VISTA and Mapping the Underworld. Through our close collaboration and professional relationships with the Institution of Civil Engineers (ICE) we are sponsoring the development of a publically available specification (PAS) that will define standards, methods, procedures and expected accuracies for the specification and undertaking of sub-surface utility engineering and utility mapping. We are networking and collaborating with other countries that have implemented similar standards for the exchange of ideas and lessons learnt. On the back of this new British Standard we will work with the ICE to ensure companies are accredited to carry out such work and that survey practitioners have the appropriate skills, training and competencies.

Our work will enable the adoption of common standards and thereby improve the industry overall performance and sharing of information. It will enable “UK plc” and Government to address the issues of our ailing utility infrastructure in an efficient and sustainable manner. More importantly, it will bring together the knowledge, skills and experience of the industry as a whole to improve standards of work on buried assets, whether in the street or elsewhere making it safer and more effective.

All this for the betterment of our members, the industry and the public at large.

HOW IS ICES VIEWED BY THE INDUSTRY?

‘The Institution is now internationally recognised as the LEADING chartered professional body for civil engineering surveyors. It has introduced RELEVANT and MEANINGFUL competencies for geospatial engineers and commercial managers and SUPPORTS companies within the civil engineering industry in

developing and demonstrating their professional competence. It understands the civil engineering industry and is FLEXIBLE in its approach'.

HOW IS ICES VIEWED BY OTHER PROFESSIONAL BODIES?

ICES received many letters of support from a wide range of professional bodies including RICS, ICE, CIOB and the UK Engineering Council in relation to their application for a Royal Charter. Importantly, these organisations along with others recognised the unique sectoral knowledge and expertise of ICES within the civil engineering industry.

CONCLUSION

Since taking on the role of Chief Executive Officer of this professional body just over 3 years ago, it never ceases to amaze me with regard to the role undertaken by our member volunteers and their pride in being a member of this organisation. Their determination to uphold the expectations of the Royal Charter and professional standards within the civil engineering industry worldwide is to be admired.

Civil Engineering Surveying is clearly a global activity with surveyors seeking new opportunities and positions throughout the world including Malaysia.

Preparing for this visit, I took it upon myself to speak to as many people as I could about what to expect. This included speaking to one of your Past Presidents Mr See Lian Ong who you will no doubt be aware is the current Global President of RICS. Not only did he ask me to send his apologies for not being able to attend this Congress today but proudly pointed out that I would have the opportunity during my visit to meet some of the most friendly people in the world.

I listened carefully to what he had to say and was delighted that he shared the same views as myself as regards:

- the role and responsibilities of professional bodies throughout the world have never been so important as they are today
- the need to increase standards and professionalism within the industry

- the need for professional bodies to collaborate both nationally and internationally is paramount

It is therefore timely that the Royal Institution of Surveyors Malaysia and ICES have agreed to collaborate and today entered into a Memorandum of Co-operation in furtherance of building and maintaining a long term co-operative relationship to encourage:

- the exchange of professional knowledge, understanding and development
- collaboration in a number of different areas including CPD events
- RISM members to become members of ICES and vice versa

I am particularly indebted to our President Jason Smith and Vice President Ian Bush for their contribution in preparing this Paper.

Once again, thank you for allowing me this opportunity and I look forward to speaking to you during the Congress over the next 2 days.

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21 June 2012

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