What are you prepared to do?

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Barry Gleeson and Martin Penney outline 5 major challenges in geo-enabling BIM

Over the next 5 years, building information modelling (BIM) will drive not just transformation of the built environment but of the geospatial industry as well. Its successful implementation will depend on collaboration between all participants. The surveying profession therefore needs to be at the forefront of geo-enabling BIM. What are we prepared to do about it?

The vision for the government?s Digital Built Britain strategic plan is aligned with the rise of the Internet of Things, big data and a desire for smart cities, all underpinned by spatial context and geo-location. The geo-enabling of the internet ? for example, with Google Maps or Bing Maps ? and smart devices has taken place over the last 5 years.

Meanwhile, entrepreneurs and commercial ventures such as Uber are exploiting the maturity of the digital revolution in communications and commerce ? mobile devices, user reviews and ratings, payment systems ? by simply geo-enabling. Five years ago Uber was worth nothing; today, it is worth more than ?50bn.

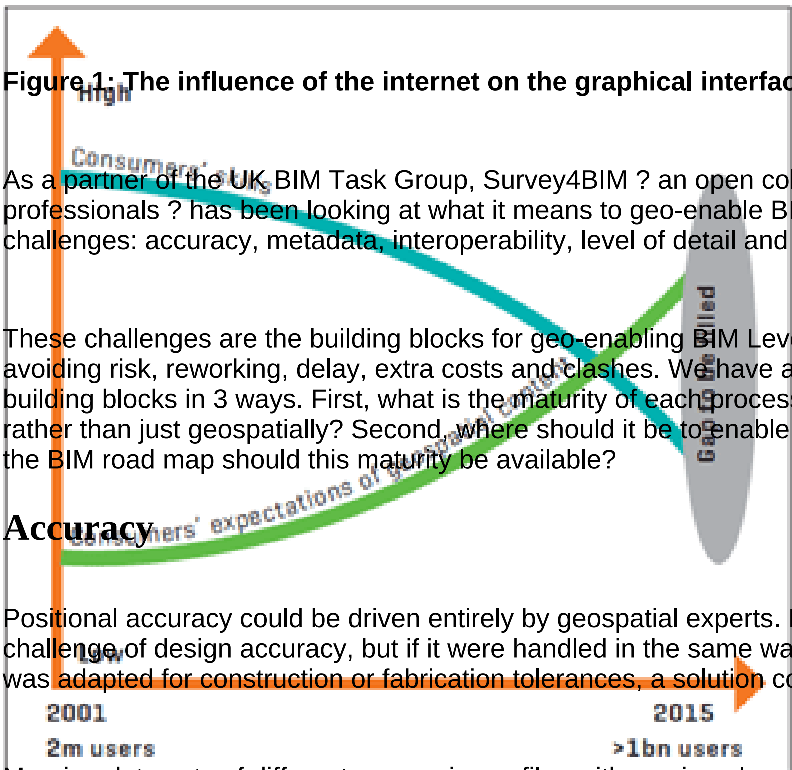

Figure 1: The influence of the internet on the graphical interface for users

As a partner of the UK BIM Task Group, Survey4BIM ? an open collective of geospatial professionals ? has been looking at what it means to geo-enable BIM. It has identified 5 challenges: accuracy, metadata, interoperability, level of detail and generalisation.

These challenges are the building blocks for geo-enabling BIM Level 2. The benefits are clear: avoiding risk, reworking, delay, extra costs and clashes. We have assessed each of these building blocks in 3 ways. First, what is the maturity of each process in the context of UK BIM, rather than just geospatially? Second, where should it be to enable Level 2? Third, where on the BIM road map should this maturity be available?

Accuracy

Positional accuracy could be driven entirely by geospatial experts. BIM presents the broader challenge of design accuracy, but if it were handled in the same way as built accuracies and was adapted for construction or fabrication tolerances, a solution could be found.

Merging data sets of different accuracies or files with varying elements of differing accuracy is something that the surveying profession has managed for centuries in the printed world.

However, a digital workflow can accommodate the maths and the complications of combining various accuracies and tolerances, allowing them to be interpreted consistently and dynamically as data is combined. For measurement science, there is no single source of truth ? only our best estimate, resulting from a controlled combination of multiple sources of spatial information.

Interoperability

Regardless of the differing software formats, 2 fundamental issues arise:

1. handling of grids and spatial reference
2. interchange between formats.

These issues continue to undermine geospatial geometry, accuracy, level of detail and even information content.

Surveyors are well versed in these already. For example, when setting out infrastructure works, designs can have been developed in multiple specialised software types and on many different grids depending on the extent and how spatial coordination was managed.

This example is made more critical as, increasingly, the information with which they are presented is digital but not readily consumable in survey instruments. Yet digital design information is automatically perceived as being correct and interpretable, which highlights the difference between the perception and validity of design data in the real world and as-constructed geospatial context.

Resolving this discrepancy could lead to significant effciencies. How many BIM projects have stalled because 2 data sets have coordinate systems that do not sit readily together, and the new owners lack the tools to resolve the issue? Of greater concern is how many times these differences might have been handled inappropriately and gone unqualified.

Another example of this type of risk is the matching of postcodes to point locations. In the UK, some postcodes can represent 80 sq. km in area, which may be perfectly suitable for certain purposes but may be interpreted as a single-point location solution in a satnav or a mobile phone; although assumed postcode locations are not necessarily interoperable with point location. If location were required for an emergency call-out, the consequences could be costly in terms of time or even human life.

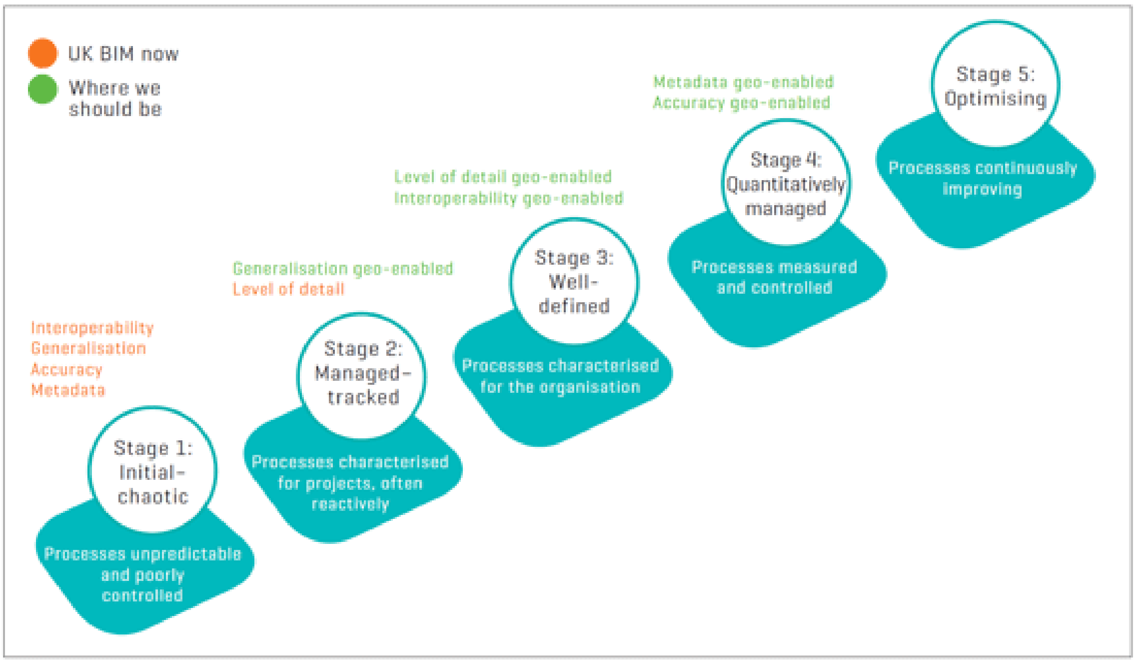

Figure 2: Maturity levels of the big 5 based on the standard maturity model

Metadata

In a geospatial context, legends, standards and attributes are all commonplace. But digital metadata standards are less well known and understood. Here, geographical information systems (GIS) take a lead, but in BIM and computer-aided design (CAD), element metadata is still underdeveloped. Metadata can help resolve challenges relating to accuracy, interoperability and level of detail, but in a data-driven world it also requires its own dedicated support for geospatial definition.

Many groups, such as the Open Geospatial Consortium, are working to upgrade metadata standards such as GEMINI 2.3. The UK geospatial sector needs to be more involved and broaden the discussion to support BIM and element metadata. CAD, GIS and computer-generated imagery professionals need to cooperate on an holistic solution.

Level of detail

Level of detail seems highly developed in many countries, and in BIM terms, yet it continues to fall down on an as-built basis. You can define all the levels of detail you want in a design concept, but if a need arises to map underground utilities, for instance, without the freedom to expose and analyse them fully, then an approach different to level of detail is required. PAS 128 is one valiant effort in the utilities field to provide guidance and solutions, but is not entirely BIM-ready when it comes to level of detail.

The acronym 'LoD' continues to evolve, being used with different meanings and therefore outcomes. LoD is starting to be expanded as 'level of definition' ? a combination of the level of graphic representation and the level of information. This can become very confusing, however, particularly where one aspect develops out of sync with the other.

There is also the challenge of comprehensive approaches developing independently in different countries, for example by the American Institute of Architects. We cannot afford to ignore these differences in the UK or hope they will go away. One of the key goals of BIM UK is to become an exporter of these services, to keep our knowledge and expertise aligned and current in an international context.

Generalisation

The generalisation issue presents one of the most diffcult challenges and yet one of the most exciting. The London Underground rent map produced by the Thrillist website is a practical example of what geo-enabled BIM can do.

This map helps the viewer decide where they can afford to live in the capital by applying rental values to the tube network, with each route open to individual interrogation to produce a long section comparing location and cost.

What?s next?

By mapping out the maturity levels of the applications of geo-enabled data in stages and relating them to the BIM road map, we can clearly identify where the opportunities for development lie and, in so doing, focus on what actions we need to take as a professional community.

It must be remembered these challenges are viewed in the context of applying BIM in the UK as a whole, as opposed to the UK geospatial sector alone. Applying this staged process of adoption to a BIM road map helps to clarify the gaps, and the steps necessary to achieve BIM Level 2.

The next step is to see on which actions the geospatial industry can focus, and which to prioritise. We have a chance to geo-enable BIM over the next 5 years. We hope you will be part of this.

Barry Gleeson and Martin Penney are Vice-Chair and Secretary at Survey4BIM respectively

Further information

- An earlier version of this article was published in the AGI Foresight Report 2020 and presented at the joint ICES South East and RICS seminar on 12 November 2015.
- Related competencies include Building information modelling (BIM) management , Measurement of land and property
- This feature is taken from the RICS *Land journal* (October/November 2016)