The AGI Foresight Study - The UK Geospatial Industry in 2015

An Expert Paper

Cartography and Visualisation

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Summary

Technological innovation, improved spatial and temporal resolution of capture technologies, adoption and adaptation of mobile, location aware technology coupled with further database/modelling developments will continue to impact on the design, delivery, and interaction with, digital map products. In the next five years UK Geographic Information (GI) business will mushroom in response to new non-terrestrial data sources, more current and finer detailed data that is cheaper and multiply sourced. Update methodologies will support 'real time' maps. The role and core activities of National Mapping Agencies will remain the same, sheltered by government legislation, local government, Non Government Organisations and civil defence requirements. But there will be stronger emergence of 'digital DIY mapping' in which the path from capture to use will be very much shorter than currently happens.

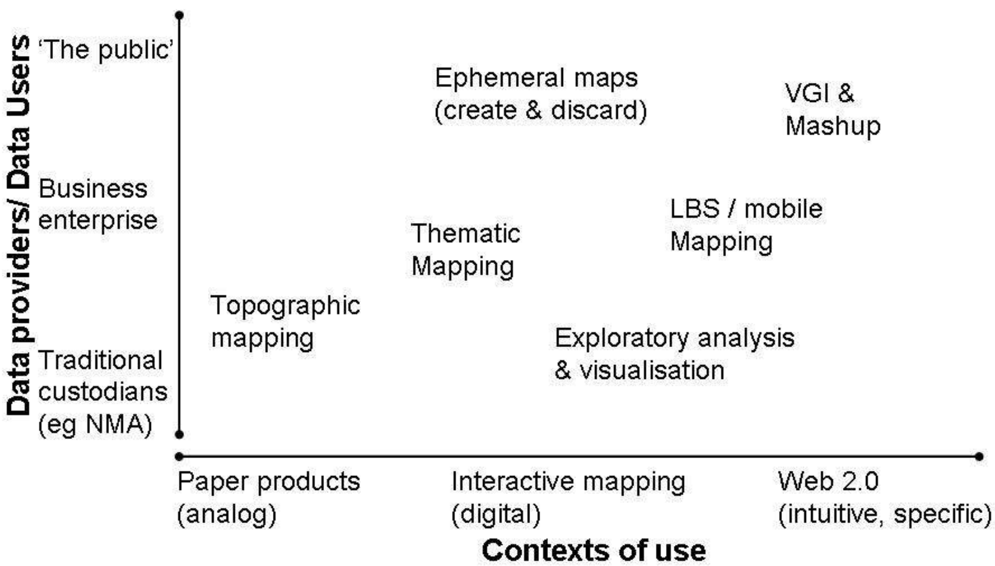

Figure 1: Shifting patterns of 1) providers, 2) users, and 3) uses.

Figure 1 attempts to illustrate a right shift beyond traditional mapping, to a predominance of 1) the instant, 'create and discard' approach to mapping; 2) growth in volunteered geographic information (get-your-own data), and 3) intuitive tools to support integration of multi sourced data, 4) greater degree of interaction and analysis with map data.

Factors Governing Change in the Use of Maps

1. better capture technology and greater diversification of data sources. Growth in provision of validated data sourced as volunteered GI (VGI) – the 'democratisation' of data capture? Continued growth in non-terrestrial data capture, at finer resolution, greater frequency, and in 3D. Supporting new cross-application domains such as linking architectural modelling with urban planning.

   [Editorial note: Volunteered Geographic Information (VGI) is alternatively referred to elsewhere in the study as crowd sourcing.]

2. diversity in delivery mechanism. Growth in use of maps 'packaged' within/alongside mixed multi media (video, text, sound, gesture), often via mobile devices (embedding of multi media within the map, and the embedding of the map within augmented/virtual environments).

3. much better data integration. Spatial Data Infrastructures (beyond Inspire) that facilitate third party integration – an idea linked to semantic web, extreme tagging and data clouds. Greater use and sophistication of information retrieval techniques for automatic enrichment of databases supporting multi scale mapping.

4. better map interaction and analysis. Low end GIS functionality standard across office applications and small devices, i.e. cartography continuing to be further subsumed by visualisation methodologies that encompass ideas of immersion and interaction.

5. continued growth of 'non-visual' methodologies. Further shift of decision making from human to machine (cognitive ergonomics) will somewhat obviate the need for 'visual access' to maps i.e. 'follow me' devices that take you somewhere without you needing to navigate via a map. The map lies behind the technology, but is 'hidden' from the user.

6. improved capacity to model geographic spaces at multiple levels of detail. Data modelling at multiple scales to support 'intelligent zoom' – hugely facilitate map based tasks associated with small devices (with small screen real estate). This includes standard use of cityGML (multi resolution modelling) across the rural landscape not just urban.

Outcomes - Anticipated Changes to 2015

1. **Proliferation of 3D/4D maps.** Increasing use of 3D maps, contributing to virtual and augmented worlds – maps (as abstractions of reality) residing along a continuum from the real / immersed world to the highly abstract. Maps as a *compliment* to virtual and augmented reality (not an *alternative*).

2. **Ease of use in creation of tailored maps.** Third party data integration through spatial data infrastructure (SDI), coupled with greater automation of cartographic tools that will enable creation of bespoke, ephemeral maps (eroding the need for series mapping and topographic mapping).

3. **Improved quality of map information.** Capture frequency and VGI will significantly improve immediacy of map data, making them far more current.

4. **Greater map literacy among general public.** Pervasive use of maps, particularly via mobile devices; maps that are frequently combined as part of service oriented applications (information delivery), will lead to common place use of maps – further extending the idea of 'maps as interface' – the means by which information is searched/catalogued and displayed (the idea of the map as an organising metaphor).

5. **Greater use of spatial analysis tools.** Technology and applications that enable users to perform queries that go beyond the qualitative, and support more intuitive interaction with geographic information more generally.

6. **Wider choice of map data.** Improved interaction among a broader thematic range of data. For example, being able to overlay multiple thematic layers such as census, planning, local government services, and environmental agency data.

7. **Novel business models addressing privacy and ethics.** New business models that support internet / digital map data sharing, and that address issues of privacy and ethical issues, as well as ownership issues, such as clarity of ownership of derived products.

Outcomes – Impediments to Change

Vested interests and current business models will act to impede change. The efforts of those wishing to retain the status quo will slow or curtail the anticipated changes listed above:

1. **Impediment of Government legislation**
Innovation will be curtailed by government legislation that mandates use of GI supplied by NMA. It is acknowledged that the role of NMA will remain as provider of data as basis for resolving legal disputes, as basis for cadastre, military/ civil defence and government asset / resource management but this argument should not be used to curtain innovation.

2. **Inadequate Government Funding of SDI / Mandating of use of SDI**
Where SDI is inadequately funded, where there is inadequate consultation and if it is not strongly promoted and 'imposed' by Government upon agencies and utilities, then cost implications will snuff out the benefits of data integration and sharing.

3. **Business models of map use in digital contexts**
Existing models of map use reflect a paper-based approach and are anachronistic. They work counter to the ethos of digital environments. Continued use of such models is (and will continue to) stymie innovation. The high cost of remotely sensed imagery will also stymie innovation.

4. **Inadequate examination of societal implications of digital map data use** 'Use models' must also address issues of ethics, privacy, and liability – particularly in the context of integration of multi sourced data from which it is then possible to disaggregate the data and reveal information specific to an individual/ group of individuals.

Scenarios of Change within the Geospatial Industry

Depending on the strength of opposition, and the willingness of Government to proactively 'bang heads together' in the creation and adoption of an SDI, the potential scenarios of change are:

1. **Data Providers** Private sector provision of data, and volunteered data (the public) will interfere with and supersede traditional data supply chains. Availability of finer and multi dimensional datasets will lead to new services (particularly in mobile contexts), but also applications requiring integration of multiple sources of data.

2. **Service Providers** Growth in UK GI in response to regulatory relaxation of data use, coupled with increasing breadth of data suppliers (leading to competitive pricing in data supply).

3. **Knowledge transfer** Growth in multi partner collaborative research between Industry and academia in the trialling and delivery of services. For example bringing together informatics (ergonomics, semantic web, interface), geosciences (RS, GIS, analysis, geodesy), and various government agencies/ utilities.