

EMERGING TRENDS AND KEY STRATEGIC ISSUES

Multi-level Implementation of SDIs

The debate on Spatial Data Infrastructures (SDI) has reached a level of maturity that encourages reflection and facilitates evaluation of past experience. The author considers some emerging trends in the field of SDI with reference to recent implementation, and reformulates four key strategic issues for future SDI development identified in GIM International several years ago.

The largest change is the shift from the product model of the first-generation SDIs to a process-led model of second-generation SDI, essentially a shift in emphasis from the concerns of data producers to those of data users. Database creation was very much the key driver for first-generation SDI, and as a result most such initiatives tended to be data-producer led. The main driving force behind the process model is the desire to reuse data collected by a wide range of agencies for different purposes and at various times. Also associated with this change in emphasis is a shift from centralised structures to the decentralised and distributed networks that are a basic feature of the World Wide Web.

NSDI Patchwork

A shift in emphasis from SDI formulation to multi-level implementation has resulted in the necessity to think in terms of more inclusive models of governance. These developments will also require new kinds of organisational structure to facilitate effective implementation. Many national SDI documents seem to abide by the principle of 'one size fits all'; they suggest that the outcome of SDI implementation will lead to a relatively uniform product. However, there is both a top-down and a bottom-up dimension. National SDI strategies drive state-wide SDI strategies and state-wide SDI strategies drive local-level SDI strategies. As most detailed database maintenance and updating tasks are carried out at local level, the input of local government has a considerable impact on SDI implementation at state and national levels. From the standpoint of a national SDI such as that of the US, the outcome of such processes is likely to be that levels of commitment to SDI implementation will vary considerably from state to state and from local government to local government. Consequently, the NSDI will be a collage, or a patchwork quilt, of similar but often quite distinctive components reflecting the commitment and aspirations of the different sub-national governmental agencies. While the top-down vision emphasises the need for standardisation and uniformity, the bottom-up vision stresses the importance of diversity and heterogeneity. The challenge will be to find ways of ensuring some measure of standardisation and uniformity whilst recognising the diversity and the heterogeneity of the different stakeholders.

SDI Governance

Many countries are moving towards more inclusive models of SDI governance to meet the requirements of a multi-level multi-stakeholder SDI. To guide its own NSDI, the US FGDC is considering the recommendations of its Future Directions Project regarding the creation of a new governance model to include representatives of all stakeholder groups. Similar developments are already underway in Australia. The Australia New Zealand Land Information Council's proposals for an action plan involve a new governance model that takes account of the balance between public and private sectors, data sources and data users. These developments bring these countries into line with Canada, where the leading Canadian agency, GeoConnections, has always been an inclusive organisation bringing together all levels of government, the private sector and academia.

New Structures

These developments may also require the creation of new kinds of organisation in various forms.

The simplest case is the merger of various government departments with responsibilities for collecting Geographic Information (GI). The driving force behind this restructuring is the perceived administrative benefits of having an integrated database for the agency as a whole. Land Victoria in Australia is the product of a merger of various state government entities with responsibilities for various aspects of land administration; the objective was to establish an integrated land administration agency with shared GI resource. Alternatively, a special government agency might be set up outside the existing governmental structure, with a specific remit to maintain and disseminate core datasets. Service New Brunswick in Canada is a good example of such a strategy. As a Crown Corporation owned by the Province of New Brunswick it was originally set up to deal with matters relating to land transactions and topographic mapping. Later it became the gateway for the delivery of a wide range of basic government services, including SDI implementation.

Joint ventures between groups of stakeholders may be categorised:

- Data producer-driven initiative. An example is the Australian Public Sector Mapping Agencies consortium (PSMA) set up in 1993 to create an integrated national digital base map for the 1996 Census of Population. The initiative resulted from recognition that the

whole is worth more than the sum of the parts; there are clear benefits for the nation to be derived through the assembly of national datasets from data held by consortium members.

- Data user-driven initiative. A more complex structure is Alberta's Spatial Data Warehouse, a not-for-profit joint venture between key data users, including the State itself, local government associations and utility groups, to facilitate the continuing maintenance and distribution of four primary provincial data-sets. From the outset the partners recognised that they did not have either the expertise or the resources to maintain and disseminate the existing databases. Consequently, in 1999 they negotiated a long-term Joint Venture Agreement with two private-sector companies to carry out these tasks. This covers the reengineering of the databases and is able to implement new pricing and licensing options.
- Data producers and data users initiative. An example is the MetroGIS collaborative in the US metropolitan region of Minneapolis St Paul. Such initiatives are both more ambitious and more open-ended in their potential for development than are the other joint ventures. The distinctive feature lies in its insistence on voluntary, open and flexible and adaptive collaborations which optimise interdependencies between citizens and organisations.

An earlier article published in GIM International identified four key issues needing special consideration by those involved in SDI development, in order of priority: the nature of the machinery for co-ordination, the need to develop metadata services, the importance of capacity-building initiatives, and the need to promote data integration. The findings of the analysis in the previous section suggest that these four strategic issues still play a vital role in the future success of SDIs, but their content needs to be substantively modified in the light of recent developments.

Governance Structures

It is necessary to go beyond establishing the machinery for SDI co-ordination and give top priority to the creation of appropriate SDI governance structures that are both understood and accepted. This is a daunting task given the number of organisations that are likely to be involved. For example, there are more than 100,000 organisations engaged in SDI-related activities in the US. Obviously, it will often not be possible to bring all stakeholders together for decision-making purposes, and structures must be devised for keeping all informed and giving them an opportunity to have their opinions heard. The simplest solution is to create hierarchical structures at national, state and local levels. This kind of structure is already operational to some extent in Australia and is implicit in the proposals for a fifty-state initiative in the US. Such governance structures should from the outset of any SDI initiative be as inclusive as possible, so that all those involved can develop a shared vision and feel a sense of common ownership. This may slow down things in the short term, but building up a basis for future collaboration is an essential prerequisite for long-term success.

Facilitating Access

One of the biggest problems faced by users is lack of metadata. Without appropriate metadata services it is unlikely that SDIs will achieve their overarching objective of promoting greater use of GI. One very practical reason for giving high priority to development of metadata services is that they can be developed relatively quickly and cheaply. Recently, the development of spatial portals, which may be seen as gateways to GI resources, has opened up new possibilities; they provide points of entry to SDIs, help users around the world to connect to these GI resources and allow GI users and providers to share content and create consensus.

Building Capacity

SDIs are likely to be successful when they maximise the use made of local, national and global GI assets in situations where the capacity exists to exploit their potential. The creation and maintenance of SDIs is also a process of organisational change management. Capacity building is important in less developed countries where the implementation of SDI initiatives is often dependent upon a limited number of staff with the necessary GI management skills. Further, there is still a great deal to be done to develop GIS capabilities in many more developed countries, particularly at local level.

Interoperability

It may come as a surprise to find that interoperability comes last in terms of priority. This is because much more than database creation is involved in SDI implementation. In countries where large-scale topographic datasets are incomplete the creation of a national digital topographic database can be an expensive, long-term task. In the meantime, those involved in SDI development must exploit alternative information sources such as remotely-sensed data, in addition to conventional survey technology. Products based on sources such as Google Earth challenge many of the assumptions underlying database development in existing SDIs.

Disruptive Technologies

"The new internet mapping products are disruptive because they force us to re-evaluate what should be private what is public, what constitutes giving away data, what is a product and what is infrastructure, whether we need our own data if we can rely on using someone else's infrastructure for free (albeit having to consume some advertising in the process). While these new technologies may appear not to be doing anything new, they are now making developments possible on a global scale at speeds, and effectively at no cost to end users, which change most of our conceptions of what the delivery of geographic information is all about. That is truly disruptive!"

Quote from Barr, R., 2005, Disruptive Technologies, Geoconnexion, October 2005

Further Reading

- Federal Geographic Data Committee (FGDC), 2005. Future directions - governance of the National Spatial Data Infrastructure: final draft report of the NSDI Future Directions Governance Action Team, Reston VA: Federal Geographic Data Committee.
- Masser, I., 2001. The Indian National Geospatial Data Infrastructure, GIM International, August, vol. 15, nr. 8, pp 37-39.
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- Tang, W. and J. Selwood, 2005. Spatial portals: gateways to geographic information, Redlands: ESRI Press.

