

A Collaborative Approach to Building National SDI in Federated State Systems: Case Study of Australia

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SUMMARY

Spatial information is now recognised by governments as essential in supporting the economic, social and environmental interests of a nation. The demand for high-quality spatially related information that is complete, up-to-date, interoperable, and readily available is increasing with impetus for managing widespread, long- and short-term disaster events, domestic security, environmental degradation and the need for improved community preparedness. There are many and varied organisations and stakeholders that use, provide and distribute spatial data.

National SDI is being progressed throughout the world with the majority of countries reporting SDI activity. However, a nation's need for SDI is not well understood and further what constitutes National SDI and how to build one is the source of much debate. This research reveals organisation-based collaboration and effective coordination of spatial information and activities is required across and within jurisdictions to progress National SDI in a federated system. The role of the State has never been so important to achieving this national imperative.

Whilst much literature exists on SDI initiatives, advances in components of SDI, data sharing and how to structure and manage GIS-based projects, little contribution has been made to the nature of the interactions between the various organisations and stakeholders. Results from a comprehensive investigation of SDI at the State and National level in Australia will illustrate these issues.

This paper highlights new research by the Centre for Spatial Data Infrastructures and Land Administration at the University of Melbourne and the development of the National SDI Collaboration Model to facilitate National SDI development, particularly in federated countries and with relevance to all nations. Strategies were developed as part of the Model for improving collaboration and coordination in countries negotiating federal structures, independent states, private industry and the needs of the community.

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1. INTRODUCTION

Australia is recognised internationally as a leader in SDI development. However, management of Australia's spatial information resources and activities can be improved. Duplication of effort and expense is occurring throughout jurisdictions at all levels of administration. Increased recognition for nationally important spatial information to be managed in the interests of the community has fuelled National SDI development and an ethos of sharing spatial information in Australia and other nations. Countries with established National SDI are better positioned to respond to national disasters of the scale of the Indian Ocean Tsunami that followed the massive earthquake off the Indonesian north-western coast in December 2004.

This paper highlights new research by the Centre for Spatial Data Infrastructures and Land Administration at the University of Melbourne and the development of the National SDI Collaboration Model to facilitate National SDI development, particularly in federated countries and with relevance to all nations.

2. SUSTAINABLE DEVELOPMENT AND GOOD GOVERNANCE

The challenge of balancing these competing tensions in decision-making requires access to accurate and relevant information in a readily interactive form. SDI plays a critically important role in delivering this objective. The Bathurst Declaration was the result of a workshop organised by the United Nations (UN) and the International Federation of Surveyors (FIG) in October 1999 and later presented at an international conference on land tenure and cadastral infrastructures in Melbourne, Australia (UN-FIG 1999). The declaration identified the need for reliable information infrastructures to record environmental, social and economic rights, restrictions and responsibilities and to also provide spatial data to facilitate appropriate decision-making and support conflict resolution (Feeney, Rajabifard & Williamson 2001) (Refer to Figure 1).

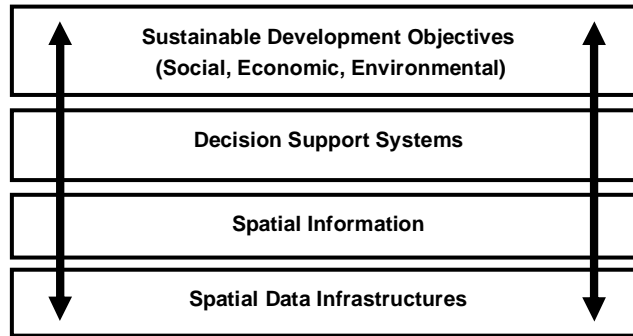


Figure 1: Sustainable Development Objectives Dependence on SDI to Support Decision-Making (Feeney, Rajabifard & Williamson 2001) (adapted).

SDI is a crucial component in providing the best available information for good governance of the community. In most societies, citizens' view government at all levels with suspicion. It is the responsibility of government to change that perception and that can only be achieved by performance coupled with good governance and transparency (Grant 1999). Ting & Williamson (2001) concede that unfortunately, modern societies still have some way to go before they will have the combination of legal, institutional, information technology and business system infrastructures required to support sustainable development objectives for the community.

Major advances in information and communications technologies (ICT) in the last decade combined with the rapid growth of global information networks such as the Internet, have transformed businesses and markets. These trends have revolutionized learning and knowledge-sharing, generated global information flows, empowered citizens and communities in new ways that have redefined governance and created significant wealth and economic growth in many countries (DOT Force 2001). E-Government has become widely known as the online delivery of information and services by government via the Internet (Ting 2003). E-Governance is about the utilisation of E-Government combined with processes for broader consultation within and between government, private sector and the community. SDI plays a crucial role in E-Government as the enabling mechanism and technological framework that supports the information flow between government, citizens and the private sector.

3. CONCEPT OF SPATIAL DATA INFRASTRUCTURE

The recognised components and attributes of SDI are strongly related and often overlap. These are not the only factors influencing SDI, nor do these components form a fully structured model. Rather, the complex integrated components are identified and segmented as a basis to facilitate further discussion and as a means to isolate the institutionally related issues that affect SDI partnerships. The following Figure 2 summarises these components.

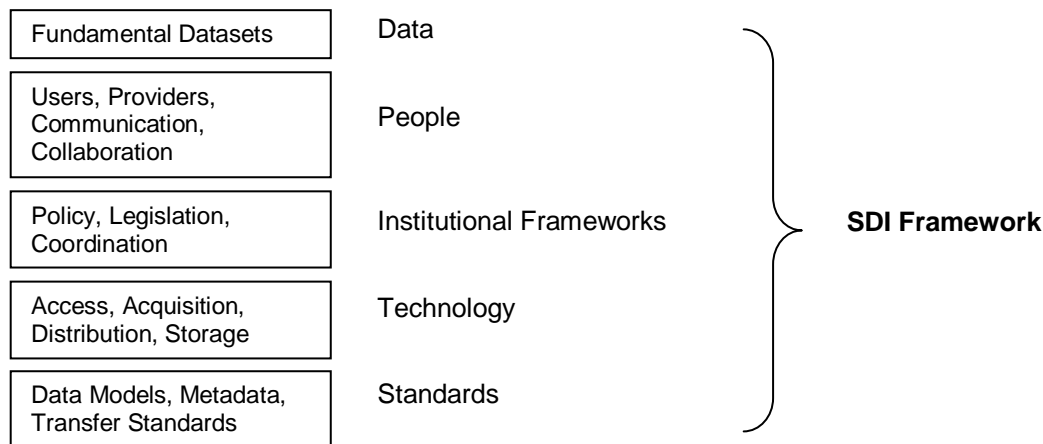


Figure 2: Core Components of an SDI Framework.

The fundamental interaction between people and data is governed by the technological components of SDI being the access network, policy and standards. Rajabifard’s diagram (refer Figure 3) demonstrates the dynamic inter-relationships between the people and spatial data within an SDI.

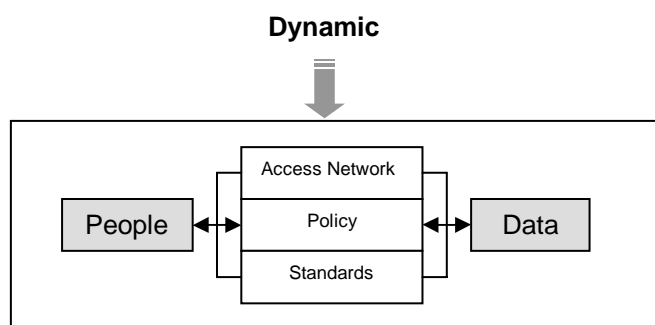


Figure 3: Nature of Relationships Between Components of SDI (Rajabifard & Williamson 2001).

The dynamic nature of the SDI environment is attributed to the rate of technological advancement and changing user needs. This suggests an integrated SDI cannot consist of the spatial data, value-added services and end-users alone. Other important factors regarding interoperability, policies and networks also influence the system (Rajabifard & Williamson 2001).

4. NATIONAL SPATIAL DATA INFRASTRUCTURE

National SDI is an enabling concept, with the ability to bring together many sectors, disciplines and communities of practice to co-manage and respond to the array of economic, social and environmental activities and interests of a nation. National SDI is attributed to improving access to spatial information for emergency management, with direct benefits of improved safety and preparedness, security of infrastructure and economies, and environmental protection. Many other sectors benefit from National SDI including

agriculture, health, defence, mineral resources, and transport which all produce or depend on spatial information.

National SDI is required to integrate and provide spatial information about critical infrastructure. Disruption to one or more forms of a nation's critical infrastructure can have serious economic, social and potentially devastating environmental consequences. Collaboration between sectors and all levels of government is required to ensure spatial information is available to better understand hazards and vulnerabilities of critical infrastructure, community risk, mitigation and planning, and the interdependence of critical infrastructures.

National SDI coordination structures need to balance the interests and mandates of agencies at different levels of government and across many jurisdictions. Stakeholders at all levels of government and the community need to be engaged. A collaborative National SDI (that is both bottom up and top down) requires coordination arrangements to progress national consistency and local implementation. A legislative approach may be required where public-good issues necessitate compliance. It is evident that a country's system of governance will impact the nature of National SDI and how it is administered. In federated countries where governance is distributed across central and regional jurisdictions, federalism brings a greater dimension to the complexity of how to administer issues that are in the national interest.

5. FEDERAL AND STATE CASE STUDY: AUSTRALIA

A case study of Australia examined SDI activities at the federal level and the national coordination arrangements. ANZLIC, the peak body for spatial information for Australia and New Zealand, has enjoyed notable success in advancing the management of spatial information across Australia together with the Intergovernmental Committee for Surveying and Mapping (ICSM) and the integration and distribution of nationally consistent spatial datasets on behalf of the states and territories by the government owned business Public Sector Mapping Agency Australia Ltd. (PSMA). The development of SDI in Australia has received international acclaim and has contributed to development and understanding of SDI worldwide.

However, the case study investigated a cross section of jurisdictional SDI activities and coordination arrangements in Australia to assess SDI development, coordination, and nature of collaboration at the state level. The investigation revealed Australia's development of SDI extends far beyond the national effort.

A robust example of communication and spatial information coordination was observed in the State of Western Australia. Broad membership and success of the Western Australia Land Information Strategy (WALIS, refer to <http://www.walis.wa.gov.au>) demonstrates a good operational framework for SDI development. Notably, WALIS recognises a breadth of fundamental spatial information managed by various agencies. Under WALIS access and pricing arrangements, WALIS members appear to be getting appropriate access to the spatial

information they require. Pricing policy does not appear to be a barrier. Thus, discussion amongst WALIS member agencies concerned more the quality of spatial data, format, completeness, and how up-to-date the data is. The added benefit of the open communication is peripheral awareness of each other's business and business needs for spatial information.

Sectors of excellence in Western Australia include the mineral resources and agricultural activities in the State. Geological Survey of Western Australia with its ethos of free and open access, distributes a vast amount of spatial information about the State's geology and mineral and petroleum assets, fostering new investment in an industry producing nearly 30 Billion AUD annually.

The State of Victoria is a world leader in the development of land and property information systems and management of spatial information. The Land Exchange together with the Victorian Online Titles System (VOTS) is allowing Victorian's online access to the states nearly 5 Million property titles and related records, enabling land dealings and property enquiries to be conducted 24 hours a day, 7 day a week. The Land Exchange suite will also streamline the planning and development processes in the State, allowing online interaction between builders, developers, councils and referral authorities and to lodge and approve plans (refer to <http://www.land.vic.gov.au>).

Progress in Victoria is underpinned by a strong vision for GIS development in the State and an early awareness of the current State of play in the 1990s. While management of Victoria's land and property activities were consolidated, the management of broader themes of spatial information and activities still remain silo-based and ad hoc. Spatial Information Infrastructure (SII) has been very successful in bringing together the State's eight key fundamental datasets that form the Vicmap suite of spatial information products.

Despite these successes in both Western Australia and Victoria, there still remains a need for high-level government and cross-agency coordination of State spatial information and activities. Spatial information management currently maintains a strong land and property information focus, somewhat removed from the management of natural resources and environmental information, mineral resources and petroleum, scientific information, and regional planning information. Victoria is building on its strong GIS expertise, with improved high-level coordination of spatial information with the establishment of a Spatial Information Coordination Council. Linkage then to Victoria's broader ICT and E-Government strategy will place the State at the forefront of SDI development internationally. The investigation confirmed Australia's development of SDI extends far beyond the national effort. Further, the investigation revealed that the National SDI is a collective of the sum of efforts at the state and federal levels.

The case study of Australia contributed to the development of the National SDI Collaboration Model and the accompanying set of strategies for collaboration and coordination in countries that are a federation of states.

6. FEDERAL AND STATE CASE STUDY: CANADA

In order to test the National SDI Collaboration Model a comparative case study of Canada was undertaken. Canada was found to be making very positive progress in the development of National SDI. While there were many similarities to the developments in Australia, there were also some unique strengths and weaknesses in the spatial information activities observed in Canada. Canada was characterised by a strong industry focus, recognition of fundamental spatial information and the relationship of spatial information and E-Government.

Collaboration and strategic partnerships were central to Canada's approach to developing National SDI. The progress of the Canadian Geospatial Data Infrastructure (CGDI) appeared to be driven by economic and social imperatives, more so than supporting environmental management and decision-making. Business and industry were seen as the key users and beneficiaries of spatial information. However, the CGDI is contributing to Canada's management of economic, social and environmental issues through the work of the Sustainable Development and Resource Management Advisory Network Node of GeoConnections (refer to <http://www.geoconnections.org>).

The Inter-Agency for Geomatics in Canada (IAGC) provides a high-level government linkage by connecting to the Federal Government's information and knowledge management strategy. The recognition of the synergy between spatial-information management and broader information and knowledge management across government is particularly strong within the federal GeoConnections program and in the Province's of Ontario and New Brunswick. This is demonstrated by New Brunswick's E-Government service delivery program Service New Brunswick (SNB refer to <http://www.snb.ca>). SNB is a realisation of the potential for spatial information to support and compliment a wide range of government information services. Coordination of spatial information and activities in Canada is a function of top-down development of the CGDI and regionally diverse provinces that maintain greater power than the federal level. While Canada largely recognises the role of ICT and importance of connecting to high-level government, the role of the provincial level is less recognised in the national initiative.

The National SDI Collaboration Model and associated set of strategies for SDI, coordination, and collaboration held true against the findings of the federal and state case study of Canada and selected provinces. The case study findings reinforced the guiding principles of each of the interrelated strategies. The three strategic components of the Collaboration Model were deemed transferable to aid the development of National SDI in other countries that are a federation of states. The Collaboration Model is also a useful framework for the evaluation of a federated country's National SDI effort.

7. NATIONAL SDI COLLABORATION MODEL

The National SDI Collaboration Model compliments existing SDI models to expand on the people and policy components that comprise the institutional framework, administrators, users and providers of SDI. Figure 4 provides an illustration of the National SDI Collaboration Model, highlighting the interrelated components and the guiding principles of each.

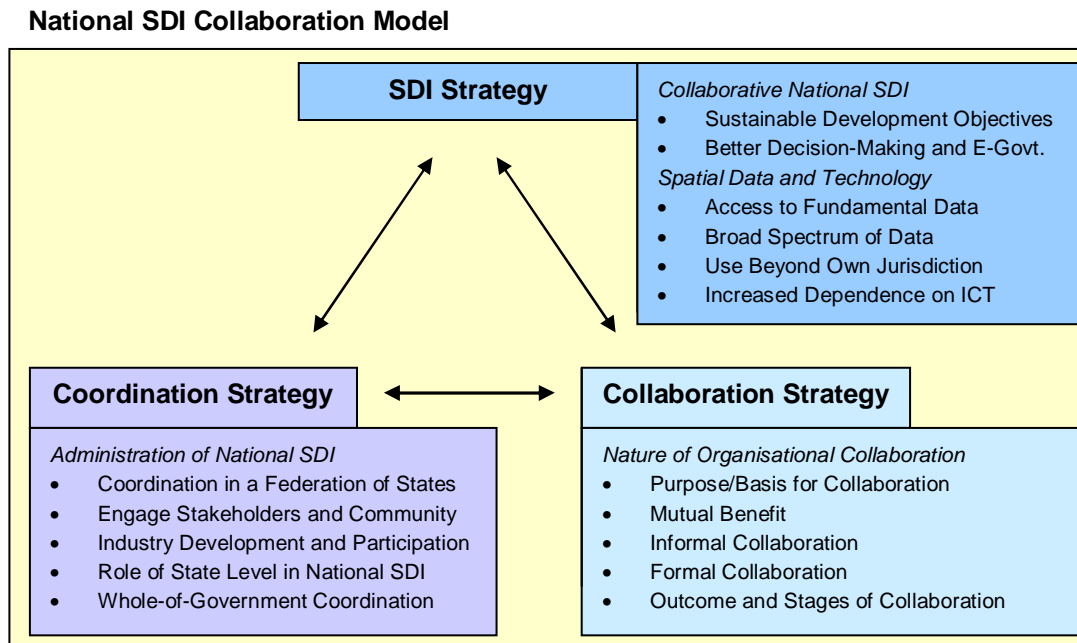


Figure 4: National SDI Collaboration Model (Warnest 2005).

The SDI Strategy provides the policy framework for National SDI to guide the use, provision and management of spatial information at the jurisdictional and organisational level. The Coordination Strategy provides a framework for SDI coordination bodies and administrators to set policy for inter-governmental relations, engaging stakeholders, community participation, and for fostering industry growth. The Coordination Strategy is pertinent to federated countries with guiding principles for cohesive state and national coordination of spatial information and activities. The Collaboration Strategy provides a guide to various organisations entering into spatial data partnerships. Collaboration principles enable organisations to consider their interactions with other organisations and to harmonise policies and collaboration strategies. The expanded set of strategies that accompany the National SDI Collaboration Model are detailed in Warnest (2005) and forthcoming publications.

8. CONCLUSION

This paper highlighted new research by the Centre for Spatial Data Infrastructures and Land Administration at the University of Melbourne and the development of the National SDI Collaboration Model to facilitate National SDI development. An accompanying set of strategies were developed as part of the Model for improving collaboration and coordination in countries negotiating federal structures, independent states, private industry and the needs of the community. The Model is particularly relevant for federated countries with lesson of interest to all nations.

The National SDI Collaboration Model was developed through a case study of Australia. The model was tested against a case study of Canada as a comparative federated country. The Model was determined to be transferable to other countries that are federations of states. The study substantially found that collaboration underpins the development of National SDI in countries that are a federation of states.

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BIOGRAPHICAL NOTES

Mathew Warnest submitted his PhD for examination in February 2005. He attained a combined Bachelor of Geomatics (Hons) and Bachelor of Science in 1999 from the University of Melbourne. In 1998/99, Mathew visited the Technical University of Berlin and undertook a research project on High Resolution Stereo Camera Imagery and 3D visualisation. In March 2000, Mathew commenced employment as a Research/Executive Officer with the Surveyor General of Victoria, Department of Sustainability and Environment. Mathew commenced his PhD at the University of Melbourne in July 2001. He is a Graduate Member of the Victorian division of the Institution of Surveyors (ISA) and has held the position of Honorary Secretary. He is currently an active member on committee. Mathew was awarded Young Spatial Scientist of the Year 2002 by the Spatial Sciences Institute, Victorian region. His research has involved SDI investigations throughout Australia, and visits to Canada and the United States. He is looking forward to pursuing a career in the spatial information sector in 2005.

Dr Abbas Rajabifard is Deputy Director of the Centre for Spatial Data Infrastructures and Land Administration, and a Senior Research Fellow in the Department of Geomatics at the University of Melbourne. He holds BSurv (Tehran), Postgrad-Dipl (ITC), MSc (ITC), and has PhD from the University of Melbourne. He has been an Executive Board member and National representative to Permanent Committee on GIS Infrastructure for Asia and the Pacific 1994-1999, and member of International Steering Committee for Global Mapping 1997-2001. His current research and interest are spatial data management, SDI development models and SDI capacity building.

Professor Ian Williamson AM, FTSE is Head, Department of Geomatics, University of Melbourne, Australia, where he is Professor in Surveying and Land Information, and Director of the Centre for Spatial Data Infrastructures and Land Administration. He is Chair, Working Group 3 (Cadastre) of the United Nations sponsored Permanent Committee for GIS

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