

## **ABSTRACT**

### **Integrated Land Management Bureau Solutions to Data Discovery**

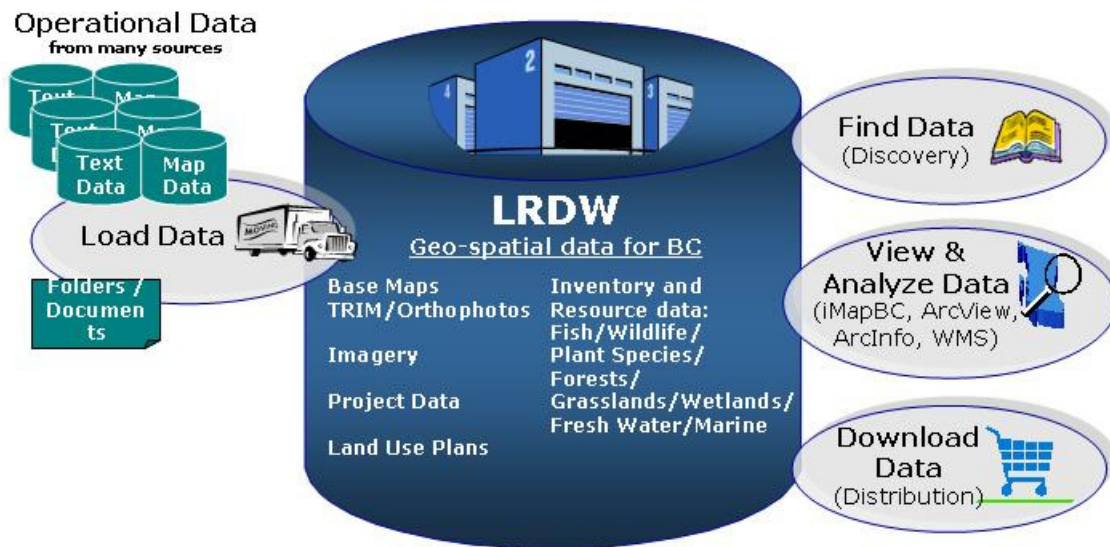
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To improve access to the Provinces data assets the Integrated Land Management Bureau (ILMB), (formerly MSRM - Land Information BC (LIBC)) initiated in 2002, partnerships with Selkirk College, several provincial Ministries, the Canadian Federal Government's GeoConnections program, along with other federal government agencies for the delivery of a corporate metadata service. This project included strategy, requirements, COTS tool evaluation, customization and implementation phases. It has enabled one-stop shopping of land and resource descriptive information. The project analyzed multiple divergent applications and standards from many natural resource Ministries, before deciding upon the development of a single, ISO standard based corporate metadata service.

Complimentary discovery and corporate metadata capture services were launched in 2004. Significant effort has also been expended on the consolidation of metadata records for geospatial datasets from multiple applications with various standards. The effort to date, has consolidated over 13,000 metadata records from the Ministries of the Environment, Forests and Range, Energy and Mines, the former Land Information BC and the federal Department of Fisheries and Oceans. Data managers and GIS analysts are now being trained to capture metadata describing geospatial data using the metadata management and discovery tools that have been developed for them. The continued conversion, loading, and capture of geospatial data and associated metadata from a number of sources shall provide for a richer collection of spatial data discoverable and accessible through both the ILMB Discovery Service and Natural Resources Canada's Geospatial Data Infrastructure (CGDI) Discovery Portal. The corporate metadata project has enabled the Ministry to adopt ISO standards for metadata and has provided the CGDI community with valuable "lessons learned" feedback that can be applied to future metadata based activities.

## **1.0 INTRODUCTION**

The Integrated Land Management Bureau (ILMB) was created in July, 2005 and is committed to providing client-focused, high quality, integrated crown land and resource management and information services to British Columbians. The Bureau has over 347 staff and a budget of \$ 58 million, of which 128 staff and \$ 27 million are dedicated to resource information management. The core holding, where the resource information resides, is the Land and Resource Data Warehouse (LRDW). The LRDW is a central, consolidated repository of land and resource information from across the province, offering a powerful suite of services for clients in government ministries and other agencies, business partners, and the public. The LRDW related services (Figure 1) allows users to browse, search, query, view, access, analyze, order, pay for, and download data sets from the warehouse.



**Figure 1.** LRDW Warehouse Related Services and Data

The LRDW contains cadastral information (tenures, ownership, boundaries); resource information (vegetation, fisheries, wildlife), provincial atlas (rivers, roads, buildings, topography, surveys), and planning and analysis information (Land and Resource Management Plans, Sustainable Resource Management Plans), that is available in attribute and spatial data formats. The LRDW’s currency and value is maintained by on-going updates from various government ministries (such as Agriculture and Lands, Environment, Forests and Range, Energy and Mines) and business partners (forest companies, consultants, and federal government) who provide data for loading (publishing) into the Warehouse. To facilitate access to the LRDW and its holdings three services were developed, iMapBC for viewing data only, the Distribution Service for downloading datasets, and the Discovery Service. The Corporate Metadata Service, which includes the Discovery Service is a metadata repository for the LRDW and non-Warehouse land information data holdings managed by the Province.

Section 2.0 of this paper describes the Corporate Metadata Strategy used to create the Service. Section 3.0 describes the Service. Section 4.0 describes the Bureau’s metadata challenges and related solutions. Section 5.0, is the conclusion, and summarizes sections 2.0 through 4.0.

## 2.0 CORPORATE METADATA STRATEGY

In 2002, the Bureaus predecessor, the Ministry of Sustainable Resource Management (Ministry), initiated the Corporate Metadata Strategy. The strategies vision was to create a central source of accurate, relevant, cost effective and timely land and resource metadata that could be accessed by users both within and outside of government by rationalizing, consolidating and integrating systems and information sources to establish one comprehensive metadata repository thus supporting the Province's goal of – *“effective delivery of integrated science based land, resource and geographic information”* (MSRM, 2004). It was anticipated this service would provide the Province, with the following benefits:

- One central repository for all land and natural resource data,
- Retirement of legacy metadata services such as the Ministry of Forests – Integrated Spatial Data Dictionary and the Ministry of the Environment - Data Registry;
- Discovery support to internet based mapping applications;
- Greater degree of data sharing and access to industry clients and the public;
- Retention of organizational knowledge and expertise;
- Reduced administration costs for staff providing/communicating metadata to clients;
- Public empowerment and benefit, through public exposure of organizational knowledge;
- Inter-connectivity with other metadata repositories through the adoption of the Z39.50 Standard;
- Improved metadata management through the adoption of the ISO 19920 metadata standard;
- Established partnerships with organizations having an interest in land and natural resource metadata.

To develop and implement the metadata strategy vision, a multi-year four phase corporate metadata project was proposed and approved. Figure 2, describes the phases.

# CORPORATE METADATA STRATEGY

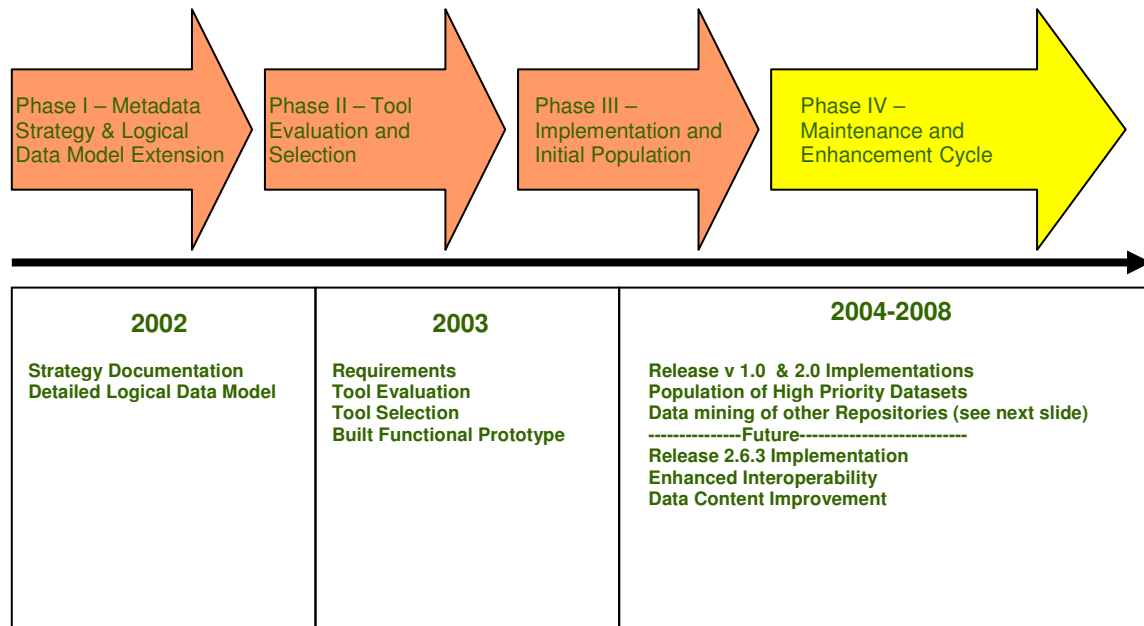


Figure 2. Project Phases and Milestones related to the Corporate Metadata Service.

Phase I of the project laid the groundwork for subsequent phases. An analysis of business requirements and the existing metadata tools and inventories were the key inputs into this strategy. The outcome of phase I was the decision to develop a core common metadata holding that adhered to international and industry standards including the ISO 19115 metadata standard for geographic information. In Phase II, the Ministry undertook a review of commercially off the shelf (COTS) metadata products, and selected the product Metastar, developed by Blue Angel Technologies. Phase III, included functional piloting of a Corporate Metadata Service (Service), including tool installation, requirements validation and testing of the metadata capture, data discovery interfaces, Z39.50 standard and mining of metadata from several provincial government sources. In phase IV, the current phase, key activities included the implementation of versions 1.0 and 2.0 of the Service, the on-going metadata population of the high-priority datasets, linkage to other services (Distribution and IMap) and more recently, the implementation of version 2.6.3 of the Service.

## Partnerships Part of the Strategy

In support of this project partnerships were established with several external organizations. Through Geoconnections, the federal government has contributed funding and expertise towards the completion of the Service. In return the Province through the Z39.50 standard provides on-going access to comprehensive metadata for land and resource data to Natural Resources Canada's - Geospatial Data Infrastructure (CGDI)

Discovery Portal - <http://geodiscover.cgdi.ca/>. An agreement with the Cooperative Ocean Information Network (COIN Pacific) which is the hub of the west coast ocean technology cluster (OT Cluster) provides COIN Pacific with access to the Service and its metadata records. A third partnership agreement with the BC Selkirk Community College, required the college to purchase the Blue Angel license, that would be placed on a Ministry server. In return the Bureau provides the College with access to the server and its related database for their own use. A fourth partnership was established with FORREX for a fixed number of hours of metadata technical expertise and in particular metadata mining. In return ILMB has provided office space, to a FORREX consultant, in its downtown Victoria office.

### **3.0 CORPORATE METADATA SERVICE**

The ILMB Corporate Metadata Service includes a discovery component for searching, a metadata capture tool, and a repository management application. Sections 4.1 – 4.3, describe the functionality and interoperability of the current version. Section 4.4 describes the enhancements made with the new version 2.6.3 due for release on October 3<sup>rd</sup>, 2006. Figure 3, illustrates how the three components of the corporate metadata service operate together.

#### **3.1 DISCOVERY SERVICE**

The discovery component is a public facing corporate metadata repository supporting the Bureau and the metadata holdings of other natural resource sector clients and business partners. This component helps users find out detailed information about the data that is included in the LRDW, and other sources such as: frequency of update, quality of the data, format, limitations, contacts and more. It provides several ways to search the data: by category, by selecting an area on a map, by standard text search. The discovery component is also linked to the Bureau Distribution Service, so that clients can initiate the ordering process for their selected dataset.

#### **3.2 METADATA CAPTURE APPLICATION**

The metadata capture provides an intuitive web interface for adding, editing, deleting metadata records. The capture application has secured access and is available to BC Government staff and selected business partners. A single XML metadata import stream is also used to import metadata mined from other metadata repositories.

#### **3.3 METADATA/REPOSITORY MANAGEMENT APPLICATION**

MetaStar's Repository product, by Blue Angel Technologies, is used to manage the metadata application. It is used for editing the metadata profile and dropdown lists (dictionaries), manage users, groups, and permissions, and to import xml metadata files.

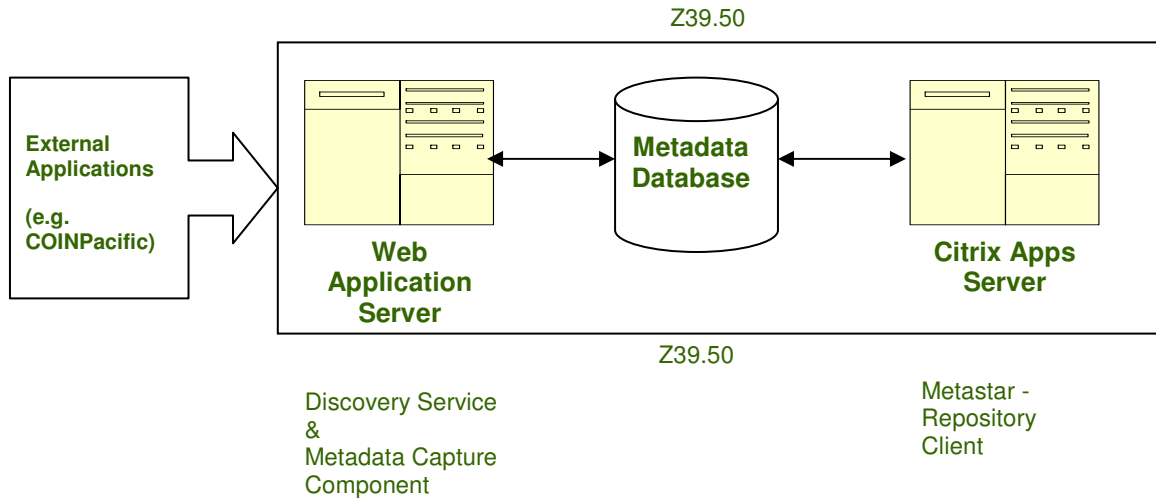


Figure 3. Technical Overview of the Corporate Metadata Service

### 3.4 NEW RELEASE OF THE DISCOVERY SERVICE

On October 3<sup>rd</sup>, 2006, version 2.6.3 of the Discovery Service was released (Figure 4). In addition to existing functionality, the new release includes the following additions:

#### General Improvements

- The migration to a new server to provide improved stability and performance;
- Improved interoperability via adoption of the common login screen;
- A link to “What’s New” web page from the Discovery Service Home page.

#### More Effective Searching

- Search results are now sorted by relevance;
- There is additional customization and sort options for search results;
- Power searching: search text will be found in the title, alternate title or description;
- Keyword searching - search words are matched against metadata key words;
- Theme view search: no longer the default search;
- A digital data only checkbox to exclude searching of hard copy metadata.

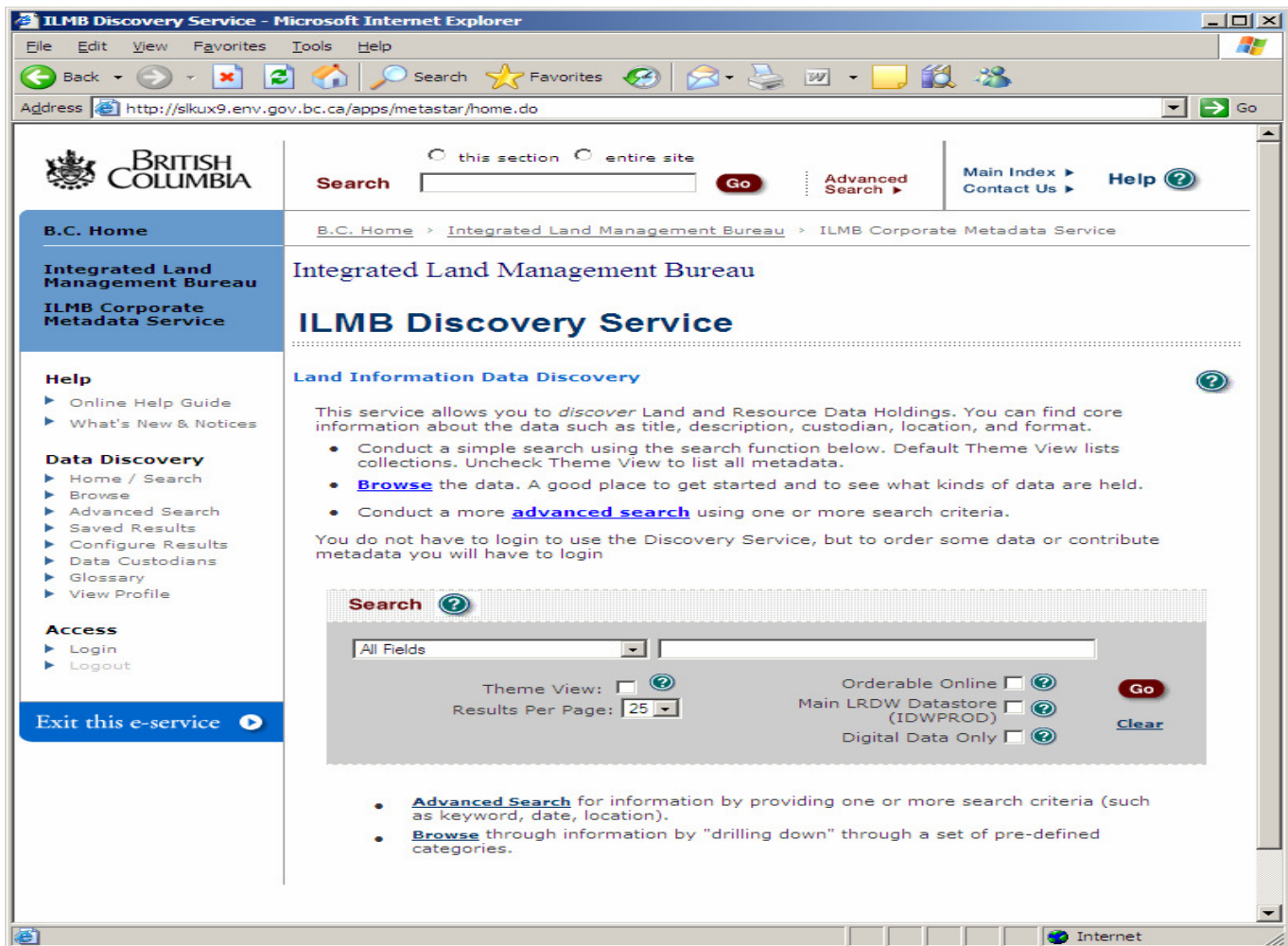
#### Better Help Information

- A help guide table of contents to navigate to topics;
- Comprehensive help and technical information, detailing search options and the editing of existing and capture of new metadata records;
- Hover text over field labels displays improved explanations.

## Improvements for Data Managers

- Question mark icon provides detailed explanation for important fields;
- E-mail generated for metadata records waiting for certain actions;
- Pending records show metadata waiting for publish approval;
- Better error messages when submitting metadata with missing mandatory elements;
- Published approval checklist at [http://lrdw.bcgov/whats\\_new/docs/approval\\_checklist.pdf](http://lrdw.bcgov/whats_new/docs/approval_checklist.pdf)

(Greg, Gale 2006).



Link to the Corporate Metadata

Service: → <http://aardvark.gov.bc.ca/apps/metastar/home.do>

Figure 4. Homepage of the Bureau's New Discovery Service.

## 4.0 CHALLENGES AND SOLUTIONS

The Bureau has encountered several challenges in all phases of the Corporate Metadata Project. The more recent challenges, which Phase IV of the project center more on the people and less on the technical side of the equation. The metadata challenges and related solutions include organizational knowledge, perception and value, service utilization, technical support, ease of use and metadata content management. Through the resolution of these issues, the Bureau is improving its metadata service offering and thereby enhancing, its metadata dividend.

### Organizational Knowledge

Organizational knowledge is the collection of assets, rules, routines, standard operating procedures and other organizational attributes that shape member behavior; and the dominant logics, mental models, culture, sense-making devices and other organizational attributes that shape cognition; that, when combined, allow an organization to perform collective actions (Holan, 2004). Organizational knowledge is dynamic and changing. When staff are hired, knowledge from existing staff is passed on and new staff develop their own unique expertise and skills thereby adding to the organizations collective knowledge. Alternatively, staff who are retiring, or leave the organization, reduce the organizations collective knowledge.

The Bureau, like much of the Public Service, is impacted, by the bulge of eligible amongst the baby boom generation, who had been first hired in the 1970's. The business knowledge, expertise and history of these long-term staff is highly valued. The retention of this knowledge is very important to the Bureau. This challenge is being addressed on many fronts. For example, retired staff are encouraged to returning to the Public Service, can collect their pension and apply for new positions, mentoring is encouraged, as a way to facilitate knowledge transfer, a human resources strategy has been developed and business knowledge is being captured in the Corporate Metadata Service. The Service, enables a data manager to record in detail the characteristics of the Bureaus, dataset assets. Data rules, routines, standard operating procedures, and other organizational attributes such as intended use, quality, history, data descriptors, contact information, as organizational knowledge can be retained for future generations to leverage. By retaining knowledge within the organization, the Service, is preserving its existing value and adding to the organizational metadata dividend, by exposing this knowledge to a wide audience.

### Perception and Value

Metadata is a term that is not understood by the general public. On the other hand the majority of knowledge workers have at best a general understanding of metadata, having heard the term in a course, or having read the term in an article. A small percentage of these knowledge workers appreciate the value of metadata and actively access and use metadata through either a data registry or discovery service. Data managers, who are responsible for maintaining metadata, have varied perceptions, perceptions that strongly



correlate with their organizations data management culture. Data managers, in an organization, with a mature data management culture, have strong data custodian values, and take a serious approach to the management of their, inclusive of metadata (MSRM, 2005). Data managers in this realm, recognize the value of metadata. In successful organizations, such as Intel, the value of metadata is proven and quantified. While some IT operations are still struggling to help top executives see the cost benefits of managing metadata, such an effort has paid off big for Intel Corp. After a false start six years ago, the chip maker now estimates that for every \$1 it spends on metadata management, it saves \$6 (Havenstein, 2005).

The Bureau is changing the perception of metadata, and adding value to the Service, concurrently, by integrating the Service, into internal and public web mapping applications, opening up the Service, through the Z39.50 standard to other organizations, improving the service offerings (e.g. improved search results), along with training and communication with the Service client base. These activities increase the Service's client exposure and should lead to increased use. Increased use, equates to increased value, a broader perception and significant metadata dividend..

### Service Utilization

Related to perception and value, is the rate of service utilization which is the rate, expressed as a percentage, of a service's use, in relation to its maximum potential use, at a point/period of time. There are two challenges with service utilization. The first challenge is to measure the rate of utilization, to establish a benchmark. The second challenge is to increase the rate. The application service utilization of the Service, can be measured by the number of applications to which it is integrated. A secondary method is by the number of user sessions that are open.

The Corporate Metadata Service, currently connects to 10 of the 33 internet mapping applications listed at the Bureau's Natural Resource Information Center ([www.nric.ca](http://www.nric.ca)). The current application utilization rate of the Service is 10/33 or 30 %. The Bureau shall be able to increase this rate, through the retirement of the Data Registry application and switching the applications referencing the Registry over to the Service. This shall increase the application utilization rate to 50 %. Further increases, are possible, through the implementation of the new internet mapping application standard, which now requires linkage to the Corporate Metadata Service. When an internet mapping application, carries out a new release, it will now be required to use the Corporate Metadata Service. Over a 2 year span, it is anticipated that the application utilization of this Service, shall increase to over 80 %.

The new release of the Service (2.6.3) includes the implementation of a java bean for application monitoring. Upon implementation, it will be possible to monitor and report out on the use, reliability and performance of this Service. This information can then be used to track and assess different activities related to training and communication, which are intended to increase the use and access of this Service. In this manner the Bureau,

will be able to monitor the effectiveness of its activities for increasing the number of open user sessions and thereby increase the metadata dividend.

### Technical Support & Ease of Use

The user base of the Service includes several thousand users, who search the metadata records and approximately 100 data managers who capture and edit metadata records. The support challenge faced by the Bureau, is not unique, nor is the solution. The resources that can be dedicated to support are modest, and are not likely to increase, even though the rate of utilization and value of the Service is increasing.

To address the support challenge, the Bureau, assists clients in three ways. For users who have questions regarding the data, they are provided with the contact information in the metadata record. When users are having difficulty carrying out a search or getting the desired search result, they are directed to the Service's on-line help. If the help is not sufficient, users are directed to the Bureau helpdesk (MOE/MAL helpdesk). The Bureau, responds to simple helpdesk calls immediately and complex helpdesk calls within 24 – 48 hours. The Bureau will also be carrying out presentations, to demonstrate the new release (2.6.3) of the Service, and to show the most effective ways of using the Service. For data managers the Bureau is also developing an on-line training manual and course, for metadata capture and editing. User support facilitates the use of the Service, and thereby enhances the metadata dividend.

Ease of use is tied to technical support and business complexity. As an early adopter of the ISO 19920 standard for geographic data, the business complexity of this standard, has proven challenging to staff and client when compared to the metadata predecessor, the Data Registry. To address ease of use, release 2.6.3 includes hovertext to provide a definition for the different metadata fields, while the next release shall include a short-form for metadata viewing and capture. Paralleling technical support, ease of use is facilitated, by significant improvements to the Service's on-line help, user documentation, and upcoming presentations.

### Content Management

Content management are the activities that preserve or improve the value, integrity and quality of the metadata information provided by the Service. Content management is costly and time consuming, requiring investigation and correction on a record by record basis. The cost to correct a content issue is up to ten times the initial cost of data entry (English 1999).

The Bureaus most common content issues include incomplete records, missing records, incorrect information, and outdated information. The Bureau solution to content management is the Content Management Strategy combined with enhanced functionality in release 2.6.3 of the Service. Incomplete records are identified and corrected during the review process. Missing metadata records are identified through periodic reviews of the linkages with related services, such as Distribution and Imap. For existing data rigorous

approval controls limit the opportunity for the publication of new datasets without metadata. Communication and training with the data manager community is another way that the Bureau is improving content management over the long-term to enhance the organizational metadata dividend.

## **5.0 CONCLUSION**

The Bureau's metadata Service, is the Provinces, self-serve discovery portal for land and resource data. The Service provides internal and external clients with access to a variety of data. The Service has been an early adopter of the ISO 19920 metadata standard for geographic data.

Planning started in 2002 and culminated in 2005 with the exposure of the Service to the public. Since this exposure the Service has confronted several challenges. Unlike earlier challenges, the recent challenges have more to do with the client base, rather than the technology. The biggest challenge, has been the realization, that the landscape has changed, now that the application is mature and in a maintenance and enhancement cycle, rather than a development/implementation cycle, the focus must be on people, and getting value out of the Service as an application and the data the application serves. Value or the metadata dividend, is realized by keeping clients happy and increasing the use of the service. The more that the Service is used, the greater its organizational value.

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