

A HISTORY OF INFORMATION TECHNOLOGY IN THE BC GOVERNMENT:

*HOW INFORMATION TECHNOLOGY HAS BEEN USED
TO IMPROVE INFORMATION MANAGEMENT AND SERVICE DELIVERY*

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**THE HISTORY OF COMPUTERS IN THE BC GOVERNMENT:
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INTRODUCTION

From first using mainframe computers over 30 years ago to today's delivery of services electronically, the BC Government has continually embraced computer technology to improve program operations and service delivery. Throughout this time, there have been notable achievements both in information technology (IT) and information management (IM). This paper reviews some of the business applications, IM/IT innovations and governance models, and highlights some of the major successes. The paper has been organized into four IT eras defined as such by the major IT innovations introduced: mainframe computers, microcomputers (minis and personal computers), client/servers and, finally, the Internet. All these technologies continue to be used today.

Regardless of the organization, there have been general IT trends. Computers have become increasingly smaller, cheaper, and faster with more capacity. Their primary uses were processing data, then managing information to more efficiently support government ministries and, more recently, delivering service directly to the customer. IT expertise, initially the domain of IT professionals, gradually devolved to IT users, as computer literacy became more and more widespread. As the technology advanced and enabled more networking, government management, and indeed citizen and business expectations, have risen.

Changes in IT innovation were not, however, done in isolation of other government trends taking place at the same time. IT advances need to be placed in the context of the existing fiscal situations and pressures, the continuously increasing customer expectations (both internally and externally), and the shifting organizational culture. All these factors influenced the progression and direction IM/IT took in British Columbia.

MAINFRAMES – BATCH COMPUTING

The Environment

This era was characterized by centralized computing and the automation of manual processes. Typically, these were transaction-intensive, administrative functions. In the late 1960's and for most of the 1970's, the government had three mainframes located in the ministries of Finance, Health, and Transportation and Communications (T&C). While the first two were dedicated to ministry-specific operations, T&C brokered computing capability to remaining ministries. Mainframes were large and very expensive. They were used to automate high volume paper processes for large-scale line of business operations such as payroll, drivers' license registration and medical plan processing. Initially, two of the mainframes were IBM and one was a Honeywell product. During the early

1980s, the government settled on IBM technical architecture, as well as the Synchronous Network Architecture (SNA) protocol. SNA enabled regional remote job entry (RJE) terminals to be connected to the mainframe. These connections became the basis for a province-wide network owned by the government. The RJE terminals, however, had no functionality and could be used only to input data, usually on a batch basis, or query very basic information.

An early example of a leading edge application of IT was the Environmental Quality Information System (EQIUS) in the Pollution Control Branch. This system created a data file of environmental monitoring and discharge data. Reports could be run to aggregate test results, do research and trend analysis. One such report, produced weekly, compared discharge data to permitted or allowable pollution levels. The system was noted as one of the few government examples of a true management information system.

Governance

As business requirements for computing increased, additional computing capability was required. Computer acquisitions, however, were treated as “current account” expenditures rather than amortized. Ministries did not have the budgets to support these expensive purchases in a single fiscal year. Because of the fiscal pressures in the late 1970’s, a freeze was placed on additional computer acquisitions. It was becoming apparent that investments in data processing equipment needed to be rationalized and these factors contributed to the requirement for a new funding model.

In this period the government introduced the concept of moving large assets to Crown Corporations, so that they could become debt-financing vehicles. Building assets were transferred to the BC Buildings Corporation and, in 1978, government’s computer assets were moved to the newly created BC Systems Corporation (BCSC). In addition to supporting computer acquisitions, the BCSC model enabled the rationalization of data processing assets and expenditures as well as the transfer of a significant number of staff from core government. BCSC introduced the concept of a corporate data centre and realized economies of scale for both hardware and staff expertise.

Significant Achievements

- The governance (Crown corporation) model was an innovative solution to the computer funding issue. Over time, BCSC became recognized as an employer of choice for IT professionals and continued as a recognized leader in technology innovation during the 1980s.
- With the transfer of regionalized welfare programs to the province in the late 1970s, a system was needed to ensure benefits were administered equitably throughout the province. The GAIN (Guaranteed Available Income for Need) application was one of the first systems to incorporate business rules into an automated system. This meant that the computer rather than social workers

determined benefits eligibility. This ensured province-wide objectivity in the application of the rules.

- The beginning of rudimentary e-mail was established with the development of PROFS, the IBM-based e-mail system that enabled text messages to be exchanged among a limited number of users over the SNA network.
- The installation of the first Intergraph Mapping system in the Ministry of Forest Inventory Branch was a very early example of a geographic information system (GIS).

MICROCOMPUTERS – NETWORKED COMPUTING

The Environment

With the advent of cheaper IT technologies and more user-friendly software, ministries gained control of an ever-increasing portion of information. These microcomputers, at first minis and subsequently personal computers (PCs), did not replace mainframes; they added additional, more flexible computing capability.

If the mainframe era was characterized by centralized data processing, then the microcomputer era was typified by computing within a ministry, division or work-group and, with the advent of PCs, a direct shift to the individual.

While high volume or corporate applications continued to run on mainframes, the availability of smaller, more affordable hardware brought minicomputers from Digital Equipment Corporation (DEC), WANG, Data General, and Hewlett Packard plus IBM's 8100 into government. Ministries were able to acquire their own hardware to develop and run applications to meet specific ministry- or program-level requirements. Examples of applications were forest inventory, liquor licensing and control, computerized mapping and highways engineering.

With the increased use of PCs, “dumb” terminals were gradually replaced because PCs had computing capability different from the existing functionality offered by minis; e.g. desktop database applications. They enabled even more local processing capability assisted by a proliferation of new desktop application software products such as spreadsheets and graphics. As the need to share PC information with other colleagues grew, so too did the demand for greater network capability.

Microcomputers also supported office functions such as word processing and e-mail. These were becoming government's largest IT applications. As e-mail became more affordable, a large number of e-mail products came into use.¹ This situation created two requirements: first, the need for a “converter” or gateway so that messages could be exchanged among the various email systems and, secondly, the need for a network to connect these minis. At this point, the

¹ At one point, 16 e-mail systems were in use in the BC Government.

government made two significant decisions. In 1986, DNet, DEC's distributed network protocol, was introduced. It was compatible with other vendors' platforms and could connect the various ministry mini-computers. DNet became the basis for government's second network, along with the existing IBM-related SNA. Secondly, GEMS (Government Electronic Mail System Directory) was developed by BCSC to enable the different e-mail systems to "communicate with each other. At a time when people in most organizations could not exchange e-mail on different computer platforms, the GEMS gateway allowed the BC Government to provide thousands of users the capability to communicate electronically.

PCs in a particular work group or branch needed to be connected to share peripherals and information. To enable this functionality, local area network capability (LAN) was adopted in early 1990's. The increase in sophisticated applications also required greater bandwidth and speed on the networks; fibre-optic cable started to replace copper. In 1990, the government began connecting all ministries in Victoria via a high-speed network called the Metropolitan Area Network (MAN). At the time, the MAN was one of the largest such networks in North America.

The microcomputer era did, however, also result in a proliferation of different hardware and software products throughout government. The need for standardization on both hardware and software, to ensure interoperability as well to control costs was becoming apparent.

Governance

While most IT functions remained centralized within BCSC, the decreasing cost and increased sophistication and choice of microcomputers allowed ministries to acquire and operate some of their own program-specific IT applications. Ministries established data centres and acquired technical expertise. When BCSC was created, a number of informal IM/IT committees were formed to promote discussion on common solutions and to share expertise among the ministries. In 1992, these committees were officially organized into the Advisory Committee on Information Management (ACIM). ACIM, which continues today, is a forum where the IT directors in government establish IM/IT directions, standards and other related issues that they hold in common.

As indicated, the proliferation of different computer platforms created interoperability problems and the need for better management of IT resources. In 1989, government created the Office of Information Technology (OIT) to provide corporate IT strategic planning, develop IT and security policies and technical standards, and review Treasury Board submissions related to IT acquisitions. Although OIT was disbanded in 1992 (and its responsibilities returned to Treasury Board Staff) its function was a precursor to the Chief Information Officer (CIO) role that would emerge in subsequent years.

Significant Achievements

- In the early 1980's, the Companies Branch implemented a system that placed the records of 200,000 companies online so that employees could quickly respond to public inquiries about these companies.
- A new corporate payroll system was introduced (1983) to produce cheques and maintain personnel information for the entire public service.
- The installation of an IBM VM system in the Ministry of Lands, Parks and Housing (in 1983) was the first adoption of a scalable relational database system for the management of Crown land resources.
- In 1987/88, a high-speed digital optical fibre link was established between BCSC and the Ministry of Environment Office in Victoria. This was the first use of optical fibre technology within the BCSC network and, at the time, represented leading edge application of technology.
- GEMS was a significant innovation and, at the time it was introduced in the late 1980's, GEMS was the largest e-mail network in Canada.
- BC Online was introduced in 1989 and, by early 1990, had about 3500 private sector users. In 1990/91, Personal Property Registry was added to BC Online. Members of the public, for a fee, could access property information in some government databases. BC was the first jurisdiction in North America to offer this service.

Clients/Servers – Distributed Computing

The Environment

“While the strategic benefits of IT were clearly evident, the cost of IT had skyrocketed during the mid to late 1980s. The need to share information locked within decentralized IT systems had similarly increased rapidly, and pressures such as gaining access to local information and controlling locally managed IT resource spending coincided with (and spurred the continued development of) improved network capacity, performance and management systems.

Thus, by the 1990s, we entered the world of distributed information systems and client/server computing – a world in which users could access and communicate information through a wide variety of powerful workstations and portable technologies (clients) linked to shared information and communication services (servers) through high performance local and global networks.”²

With more and more information being stored and manipulated on minis or PCs and then shared with other users, the focus began to shift from technology to managing information. Issues of security and privacy as well as an emerging

² *Managing in an Information Age: IT Challenges and Opportunities* from *Business Fundamentals: Information Technology for Managers*, Harvard Business School Publishing, 1999

need for data standards to support interoperability required attention. Information was beginning to be seen as a true asset. If the need for hardware and software standards had become apparent during the microcomputer era, the need for information or data standards became critical during the client/server era.

By the mid-1990s, more and more applications were using the UNIX operating system, TCP/IP protocol, Oracle databases and the Microsoft Office suite. The client/server model of computing became the norm and users typically had a desktop computer. They could access files on any number of servers on their network and exchange information with users virtually anywhere. For example, doctors' offices were connected to the network enabling medical practitioners to submit their payment claims directly to the Ministry of Health (TelePlan).

During the client/server era, the province accurately anticipated that TCP/IP would eventually become the global Internet protocol and adapted its networks accordingly. This was a very significant decision as it positioned the government very well for the Internet era. Prior to the client/server era, IM and IT had been used primarily to improve processes within government. With the adoption of the Internet protocol and the ability for customers to access government computers, the application of IT was broadened to address the service delivery requirements and focus on customers, internal and external. The result was the focus on e-service delivery that is still in place today.

In 1993, DNet and SNA were transformed into the Shared Provincial Access Network for BC (SPAN/BC). This network is the government's communication "backbone" connecting all government offices in the province. As noted some years later by the Premier's Technology Council, "with SPAN/BC, British Columbia is Canada's only province with a single, secure government Internet protocol network."

The client/server environment enabled information to be processed and shared very efficiently over networks exchanged between offices, ministries or regional jurisdictions. For example, in 1993, with the automated mapping of geospatial information in its GIS, the Ministry of Environment was able to integrate massive amounts of environmental information (e.g. latitude/longitude, water license, topological, and habitat data) onto digital maps. In 1996, this distributed computing application was featured in *CIO Magazine*, particularly because of its data architecture approach. From the initial computer applications to today, the government has been leader in IT geospatial applications.

With the ever-increasing emphasis on information, and the awareness of its potential when databases were integrated, it became clear that information had to be shared not only within a ministry but also between ministries. The traditional information "silos" created by organizing government programs into ministries started to break down. For example, it was obvious that the geospatial information resident in the different resource ministries would be more powerful and useful if it was integrated and shared beyond a specific ministry. The ministries of Forests and Environment pioneered data sharing agreements and,

ultimately, the policy for sharing information within government was revised to promote exchanging information freely.

Governance

By 1995, the possibility of transforming service delivery by using the Internet was promoted through the governments' Electronic Highway Accord (EHA). The EHA had three key objectives:

- universal, affordable access to communication networks and information services for individuals, communities and institutions;
- increasing and enhancing BC's IT industry; and
- increased effectiveness and efficiency of public services using IT.

One of the outcomes of the Accord was the establishment of the first provincial Chief Information Officer (CIO) and the assignment of staff to support that role. One of the key organizational decisions occurred in 1996, when all IM-related functions were assigned to the CIO so that strategic planning as well as operational service delivery for both IM and IT were located within the same organization. BC was the first jurisdiction in Canada to recognize the importance of linking the IM and IT functions via a common reporting relationship.

One of the mandates of the CIO was to review the operations and mandate of BCSC. By 1998, the centralized computing operations of government were transferred back to the core public service and the IT Services Division was established. This division provided IT services to ministries and other agencies on a charge-back basis.

Significant Achievements

- Begun in 1990, LandData BC created an infrastructure permitting the controlled electronic exchange of land-related information regardless of location, technology and administrative organization.
- Since the mid-1990s, PharmaNet has been a secure computer network linking community pharmacies and hospitals throughout the province. It focuses on protecting BC citizens from potentially dangerous medication interaction and duplications as well as on limiting prescription fraud and drug abuse. PharmaNet streamlined the drug dispensing process and was recognized across Canada as an innovative solution.
- In 1996, the award-winning Corporate Human Resource Information and Payroll System (CHIPS) was introduced. CHIPS, a customized PeopleSoft application, maintains human resource information, tracks leave entitlements and transactions, and processes payroll for all government employees. CHIPS integrates HR, leave and payroll into one system.
- Begun in the early 1990s and fully implemented in 2001, BC's justice information system (JUSTIN) provides a single integrated system supporting almost every aspect of a criminal case including police reports to

Crown Counsel, police scheduling, Crown charge assessment, Crown victim and witness notification, court scheduling, results recording, document production and judicial trial scheduling. Administrators and officials in the justice system as well as judges, lawyers and the police can access the information in the system. A significant feature of JUSTIN is that it was one of the first applications to integrate program requirements both between different ministries and different levels of government. It was also one of the first that identified the need for common information nomenclature. For example, all components of the application needed to have the same definition of “case”.

- The *Freedom of Information and Protection of Privacy Act* was passed in 1993 to protect personal information captured and stored by government. The legislation was leading edge at the time and many jurisdictions used it as a model.
- The USE-IT (Uniform Services Environment for IT) was adopted in 1996 to promote the standardization of hardware and software; the consolidation of physical and staff IT resources where possible; the leveraging of government’s purchasing to reduce costs and to achieve other objectives; and, the optimization of systems development across government. USE-IT was the foundation for the sound IT infrastructure the government has in place today.

Internet – Universal Connectivity

The Environment

As the Internet came into common use, the “Information Age” arrived. The Internet made electronic communication possible anytime anywhere. With increased user sophistication and computer literacy came increased expectations for the availability of information, and for services to be delivered online 24/7. Further integration of information has been necessary to meet these expectations. Along with access, however, has been the necessity to protect and secure this information. Government has taken the role of information stewardship very seriously. As more and more government services are accessed electronically, policy and operational issues about privacy protection and user identification need to be addressed. Since e-services can be accessed from anywhere, the security of the network and the protection of information databases are vital.

The Internet has radically changed the service delivery model. Previously, government employees responded to the public and their inquiries or service delivery demands using technology to assist them in servicing those requests. Now, using the Internet, the public can obtain information or services directly with employees in the background managing the information and technology.

Many applications currently being explored or developed across government involve the further integration of information for the purpose of e-service delivery

to the public and business. These include the Enterprise Portal to provide the public with a single web-based point of access to government e-services. The ministries of Finance and Management Services have launched Corporate Online (COLIN) to enable BC businesses to quickly self-register, incorporate, amalgamate and fulfill obligations of the *Business Corporations Act* online. The Act requires all companies in BC, regardless of size, to electronically submit forms using COLIN.

Governance

- In 2001, the government increased the profile of the CIO Office by transferring the reporting relationship to the Office of the Premier. The IM/IT strategic planning and policy responsibilities were separated from IM/IT service delivery. In 2003, after it became apparent a closer link was needed between the governance and service components of IM and IT, the functions were reunited under the Ministry of Management Services. Other government service delivery channels (e.g. Government Agents, Enquiry BC) were also transferred to the ministry at that time. This gave a clear signal that service delivery, along with IT as its enabler, was critically important. The organizational structure ensured that the delivery of government services, regardless of the service delivery method, is coordinated in one organization. BC is the first province in Canada to place all service delivery channels and the IT infrastructure together under one authority.
- A worldwide trend toward a “shared services” business model prompted the government to consolidate, streamline and rationalize all common services across government and to place renewed emphasis on service to the public. In 2002, BC opted to include the IT infrastructure as a shared service and established a three-year goal for IT infrastructure consolidation, an aggressive schedule compared with other jurisdictions in North America. Included in the Common IT Services (CITS) mandate is providing services to public sector agencies as a means of lowering overall public service delivery costs.
- In 2001, the BC Government passed legislation to enable electronic transactions. The *Electronic Transactions Act* was based on a model developed by Uniform Law Conference of Canada.
- In 2003, the government passed the *Personal Information and Privacy Act* to strike a balance between the right of individuals to protect their information and the need of non-government organizations to collect, use and disclose personal information.

Significant Achievements

- BC Bid, recognized at the GTEC Awards in 1997, is a web-based application that provides businesses wishing to bid on government work the capability to access opportunities electronically.

- The One Stop Business Registration website provides businesses instant access to many public agencies to allow those businesses to do the most commonly required business registrations and transactions online. Examples include registering a business, receiving information on starting a new business and changing a business address with one entry. When a business address is changed other participating federal, provincial and municipal agencies are automatically notified.
- The BCeID is a service that enables businesses to use one login ID and a single password to sign in securely to any participating BCeID provincial government Web site.
- The Land Title Branch Electronic Filing System (EFS) enables authorized users to electronically submit Land Title documents for registration. EFS templates are used to generate an electronic land title form. The form templates are downloaded to a user's PC, the work to create the documents is done offline and, once the form is completed and a paper copy has been executed, the lawyer or notary applies a digital signatures to the electronic form. The completed form, with the digital signature can then be submitted electronically to the Land Title Office through BC OnLine. EFS processes the document and sends a notice to the user.
- In August, 2000, the government completed PLNet, a network giving all BC public schools, colleges and other educational institutions full access computer networking over the Internet. PLNet provides learners, teachers and administrators a full range of online educational and administrative resources. The network is housed on SPAN/BC.
- In May, 2004, government released the e-BC Strategy, a plan to focus IM/IT on improved and enhanced electronic service delivery and information management.

Summary

The evolution of Information Technology in the BC Government has seen significant shifts in the last quarter century. The initial emphasis was on computers and their capability to automate manual processes. As applications became increasingly powerful and connectivity improved, the appropriate management of information has become the primary objective, including its protection and security. With increased user sophistication and Internet accessibility, electronic service delivery has emerged as the second objective.

The heavy reliance on electronic technology, and the greater access to information, has resulted in a critical need to ensure that the security of the network and the information holdings are protected. Throughout the various IT innovation eras, the government has successfully managed to harness the potential use of IT to meet these operational and service delivery challenges.

The BC Government has succeeded in being well positioned by making a series of sound strategic IT decisions by being committed to finding effective business solutions and by accurately anticipating significant IT directions. This resulted in government's current robust IT infrastructure that can support the critical management of information and increasing demands for electronic service delivery.

The province is now well positioned to move forward to expand the use of information technology to transform business process and enhance service to citizens and business.