August 2015

AN AUDIT OF THE PANORAMA
PUBLIC HEALTH SYSTEM

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CONTENTS

The Honourable Linda Reid
Speaker of the Legislative Assembly
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Dear Madame Speaker:

I have the honour to transmit to the Legislative Assembly of British Columbia my report, *An Audit of the Panorama Public Health System*.

We conducted this audit under the authority of section 11 (8) of the *Auditor General Act* and in accordance with the standards for assurance engagements set out by the Chartered Professional Accountants of Canada (CPA) in the CPA Canada Handbook – Assurance, and in accordance with Value-for-Money Auditing in the Public Sector.

Carol Bellringer, FCPA, FCA
Auditor General
Victoria, B.C.
August 2015

AUDITOR GENERAL'S COMMENTS

In early 2011, Office of the Auditor General staff surveyed a number of eHealth IT systems to understand their status. One of these systems was Panorama. At that time, the team briefed senior officials at the Ministry of Health on concerns about how the ministry was managing the Panorama project. As implementation was just getting underway, the Office decided not to audit Panorama to allow the ministry more time to work through these issues. This audit found that the expected improvements did not take place.

Panorama was a difficult and complex undertaking. The system needed to meet the needs of numerous jurisdictions of varying sizes with different public health processes, and be translated into two languages. Nevertheless, B.C. alone has spent $115 million, and will spend a further $14 million per year on a system that is not fully functional.

Carol Bellringer, FCPA, FCA
Auditor General

A complex, national IT project like Panorama requires experienced project leaders with exceptional management skills. Our audit found that the Ministry of Health lacked project leadership. Health authority input and concerns were largely ignored, which is very disconcerting, as they are the primary users of Panorama.

This audit also identifies issues with the ministry's project and contract management. When IBM could not deliver on the original terms of the contract, we did not find any evidence that the ministry considered other options such as contract termination and tendering for an alternative system. We make three recommendations to improve these practices on future projects. Given the ongoing challenges with the system, we also recommend an independent review to assess viable alternatives to Panorama.

Carol Bellringer, FCPA, FCA
Auditor General
Victoria, B.C.
August 2015

EXECUTIVE SUMMARY

Following the SARS outbreak in early 2003, which claimed the lives of 44 people in Canada, an independent review recommended that the country invest in a *"seamless public health system that will allow public health professionals to coordinate activities in a carefully planned infrastructure."*

In response to this recommendation, the Government of Canada mandated Canada Health Infoway to work with Canada's provincial, territorial and federal governments to develop a national, integrated public health surveillance solution known today as *Panorama.* The provinces and territories expected Panorama to achieve a number of benefits including improved health outcomes related to communicable diseases and more efficient management of immunization programs.

The project to build a national Panorama system (the national build project) was co-sponsored by the Government of B.C. and Canada Health Infoway, and led by the B.C. Ministry of Health (the ministry) on behalf of all the provinces and territories. The ministry also had overall responsibility to implement Panorama in B.C. health authorities (the B.C. implementation project). Panorama was supposed to be a national system, but at present, only five other jurisdictions are still moving forward with implementation. B.C. is the furthest ahead; however, just three of B.C.'s five regional health authorities are using the system to enter the majority of patient information directly.

PART 1: AUDIT FINDINGS

Large and complex IT projects like Panorama are often high risk. Successful projects can provide significant benefits, but these projects often face challenges around factors such as system quality, budget and timelines. We focused our audit on these factors. We expected Panorama to have the quality required to realize the stated benefits of the system, and to have been built and implemented in B.C. health authorities on time and on budget.

System quality

A high-quality public health IT system supports users to carry out their day-to-day work effectively and efficiently. We looked at three attributes of system quality: functionality, stability and usability. We found that all seven Panorama modules were implemented in B.C., but some critical system functionality (system capabilities) was de-scoped or unusable. This included national communicable disease outbreak management, the ability to identify patients who are due for immunizations, and electronic lab results. A number of other major features have significant limitations. And important components, such as provincial outbreak management, are present but not being used for various reasons.

EXECUTIVE SUMMARY

Panorama users have experienced a high volume of stability (reliability or availability) issues, such as problems logging on, an inability to complete and save electronic forms, and freezing. Many of these issues are the result of system defects.

The Panorama system that the ministry accepted on behalf of participating provinces and territories in 2010 contained almost 1,200 defects. Over 11,000 additional defects have been discovered since the system was deployed in 2011 – 2,500 of which continue to affect users. The ministry changed contractual terms requiring IBM to resolve defects within established timeframes during the national build project. Had the terms remained in place, the ministry could have accumulated monetary credits far exceeding IBM's maximum liability of $7 million.

B.C.'s version of Panorama has usability (how easy it is to use the system) issues. It is difficult to navigate, complicated, and confusing. It uses clinically incorrect and counter-intuitive terms and different terms for the same function in different parts of the system. It requires excessive scrolling to view necessary information and has a busy display that makes it difficult to view content.

Timeline

The national Panorama system was delivered almost three years after IBM's initial contractual deadline of March 2007. B.C.'s implementation of Panorama was supposed to be complete in 2009. Today, aspects of the system are in place, but major components are still outstanding. Also of concern is that Panorama is a stand-alone system. This no longer aligns with health authority IT strategies which are shifting towards integrated health systems.

Budget

National build project

B.C. negotiated a fixed price contract worth $27.8 million with IBM for the national build project. Another $9.9 million was allocated for other expenses, bringing the total budget to $37.7 million. The national system cost a minimum of $66 million. Canada Health Infoway paid $44.5 million for the build, and B.C. and other provinces funded another $21.5 million for IBM to fix system defects and make it usable. B.C.'s portion of the $21.5 million is approximately $2 million.

B.C. implementation project

Cost overruns were an even bigger issue on the B.C. implementation project. To date, the Province has spent approximately $113 million – or 420% of what was budgeted at the project outset – and implementation is still not complete. The Province expected to pay $16.2 million for IBM implementation services, but it ended up costing $73.5 million. B.C.'s ongoing support costs are estimated to be approximately $14 million per year.

System impacts

B.C.'s version of Panorama is prone to errors. Slow performance and unexpected system outages mean that the system cannot always provide clinicians with complete and accurate patient information when they need it.

Health authorities reported that Panorama has led to an increase in public health operating costs, a decrease in capacity, and longer appointment wait times, but it does collect additional data. Health authority

estimates indicate that lost efficiencies total $4.5 million annually, almost 1% of the health authorities' combined annual public health budget.

PART 2: WHY DID THINGS GO WRONG?

Leadership

The ministry employed a "command and control" leadership style with Panorama. They dismissed health authority concerns around the safety and efficiency of the system and ignored important system issues. This caused delays and led to higher costs.

The ministry did not allow some health authorities to consider system alternatives even when it became clear to both the ministry and health authorities that the system was impacting patient care. Other health authorities were not mandated to use Panorama.

Risk transfer

IBM planned to knit together a number of separate COTS (commercial-off-the-shelf) products into a single, national system for public health. This plan failed and IBM proposed shifting to a custom solution that was accepted by the ministry. We found no evidence that the ministry evaluated other options such as contract termination and alternative systems.

The ministry agreed to a series of change orders which de-scoped significant pieces of functionality, changed final delivery dates, and eroded system quality by allowing more serious defects to persist in the system without penalty. These change orders transferred risk from IBM to the ministry and ultimately, to taxpayers. In particular, the ministry took on the risks of increasing costs and prolonging time to fix defects.

Acceptance testing & premature acceptance

The ministry hired IBM to develop national acceptance test scenarios and carry out a substantial amount of the national acceptance testing. This is unusual. Both activities are typically carried out by users as the vendor has a financial interest in having its product accepted by the client.

In the end, the accepted system did not meet user needs, and contained thousands of defects. Significant remediation was required along with the identification of more than 320 workarounds to make the system usable. Premature acceptance of the system led to delays in B.C.'s implementation of the system and increased the overall cost of Panorama to the Province.

REPORT HIGHLIGHTS

IMPLEMENTATION COSTS:

420%
OVER BUDGET

PANORAMA COST B.C. TAXPAYERS AT LEAST

$115 million

$14 million

in support costs every year

Panorama is **not fully functional**

1,000s

of system defects increased time & budget

Ministry of Health

TOOK ON FINANCIAL RISK from IBM

Panorama is a **LARGE NATIONAL IT project**

and **inherently complex**

SUMMARY OF RECOMMENDATIONS

WE RECOMMEND THAT THE MINISTRY OF HEALTH:

1   commission an independent review of Panorama and other alternative systems to identify the most cost-effective, integrated approach to meet the current and future needs of public health in British Columbia.

2   review its *project* management practices to ensure future IT projects are managed in accordance with good practice.

3   review its *contract* management practices to ensure future IT projects are managed in accordance with good practice.

4   review its current leadership practices and develop a collaborative leadership strategy for future IT projects.

RESPONSE FROM THE MINISTRY OF HEALTH

THE SARS OUTBREAK in 2003 identified the need for a national public health information system to support an effective response to infectious disease threats. In British Columbia, the public health information systems in use at that time ranged from purely paper-based systems to multiple, separate, outdated, functionally limited information technology systems.

Panorama was envisioned as an integrated public health information system to support public health professionals in the effective management of vaccine inventories, immunization programs, communicable disease investigations and outbreaks across Canada. British Columbia initiated an additional module within the Province to support family health services.

A National Steering Committee, including BC health authority and public health representatives, was formed to oversee the development of Panorama. Due to its experience developing the Integrated Public Health Information System (iPHIS) – which had been in use in several BC health authorities – BC co-led the Panorama initiative on behalf of the country in conjunction with Canada Health Infoway (CHI), the project funding organization.

IBM was selected as the successful vendor in the fall of 2005 with a budget of $37.7 million based on using a commercial off-the-shelf (COTS) solution. When it was determined that the COTS solution could not be adapted to meet the national jurisdictional needs, the contract was amended to provide for a custom-built solution, requiring a contract extension of approximately one year. CHI approved a revised budget of $47 million to reflect this required change to support the development of the national infrastructure phase of Panorama.

Initially all provinces and territories were fully engaged, as was the Public Health Agency of Canada (PHAC). Over time, however, in the face of economic challenges, smaller jurisdictions and Alberta opted out of the national process and PHAC itself declined a central support/coordinating role.

The national product was delivered to provinces to customize for their unique regional needs. In British Columbia, the national version was customized to meet the needs of both British Columbia and Yukon.

Today Panorama provides the basis of a comprehensive tool in BC and across most of the country that will help public health personnel successfully identify and respond to public health outbreaks.

Panorama also allows better management of immunization programs, reduces vaccine wastage and better serves citizens by ensuring a complete health record is available. An evaluation of the benefits of the vaccine inventory management module indicates the

RESPONSE FROM THE MINISTRY OF HEALTH

province can expect to save approximately $2 million annually in reduced wastage, returns and improved productivity. Further, according to an evaluation of the family health/immunization modules, the extent of data being collected by health authorities has improved and is expected to contribute to an increase in appropriate immunization rates, which is the first line of defense against infectious disease outbreaks.

> *Panorama's immunization database is critical for comprehensive, seamless care for tracking patients needing vaccinations to inform clinical decision making in community care settings."* ~ Dr Mitchell Fagan, family physician, Langley Division of Family Practice and Medical Director, Langley Memorial Hospital.

Panorama has also enabled the BC Centre for Disease Control to consolidate information from some 80 different databases developed for tracking and managing communicable diseases, data not previously directly accessible by the health authorities.

Panorama protects the health of British Columbians and Canadians through up-to-date clinical information and, where and when required, provides a single source of comprehensive and standardized communicable disease surveillance data and improved provincial outbreak coordination capabilities leading to better management of public health care spending.

Panorama was an important support tool during British Columbia's recent response to the recent Ebola threat. Its value in directly protecting Canadians was recently demonstrated by supporting the containment of a school measles outbreak in Ontario, allowing public health personnel to quickly and efficiently access non-immunized student records.

> *News of a positive measles test came at 4:45pm. Public health staff were able to use Panorama to find all students whose records were either incomplete or had a Statement of Conscience. They immediately phoned the parents and had them excluded from school. An up to date list of these excluded kids was in the principal's hand before the opening of school the next day. The health unit was then able to have discussions with parents about the importance of immunization resulting in more children immunized. This timely and accurate information would not have been possible previously."* ~ Dr Valerie Jaeger, Medical Officer of Health for Niagara Region Health Unit

BC's First Nations Health Authority already reports significant improvements in access to clinical information within First Nation communities, helping to address a systemic gap in public health care delivery.

> *The use of Panorama by FNHSO [First Nation Health Service Organization] nurses has had a marked positive impact on direct service delivery to our clients. Having timely access to immunization information results in less frustration on the part of nurses and their clients and ensures a higher quality of service (less over or under-immunizing). In addition, the functionality of Panorama in terms of validating doses and providing decision support helps nurses practice more safely."* ~ Cathryn Aune, Community Nurse – eHealth Programs, First Nations Health Authority

RESPONSE FROM THE MINISTRY OF HEALTH

The Ministry of Health believes that the benefits now being realized in BC and other jurisdictions are not articulated in the Auditor's report. The pan-Canadian value of the program is also not fully represented as, in partnership with Ontario, Quebec, Manitoba, Saskatchewan and Yukon, Panorama will cover 82% of the Canadian population.

> *"Under the BC Ministry of Health's leadership, much progress has been made across the country, providing a foundation for continued efforts to optimize the use of digital health solutions to support public health practice, and Panorama will continue to evolve based on the continued feedback of public health professionals."* ~ Trevor Hodge, Executive Vice President, Canada Health Infoway

The Ministry of Health believes that the timing of this audit was not optimal in accurately assessing the value of this program. The audit commenced in the midst of the BC implementation of the Family Health and Immunization module and continued during the deployment of the Communicable Disease Case Management and Outbreak Management modules. This is typically the period during which issues related to stability and items that need to be remediated are commonly identified, and user frustration with learning a new system is highest. Not unexpectedly, Panorama experienced stabilization challenges, which are being actively addressed.

> *"Overall I see that although Panorama is far from perfect, it is leading us towards a more comprehensive approach to client care which has led to a decreased risk in patient safety when compared to our past documentation practices."* ~ Christine Davidson, Clinical Information Specialist, Interior Health

As a program, Panorama is the first of its kind globally, and the partners involved were aware from the outset that a project of this size and scope would present challenges. The Ministry fully acknowledges that there have been significant challenges and lessons learned with this project. The ten-year cycle-time that this project has taken, for a variety of reasons, is obviously sub-optimal. Cycle-time in technology now occurs in cycles of three to five years or less. Over the timeframe of this project, electronic medical record functionality has advanced significantly, and over the past few years there is an increasing emphasis on the value of achieving application interoperability. Data sharing between clinical and public health settings is a critical part of this development. The developments in Northern Health reflect this direction and the evolution of thinking in light of current best practice.

The report correctly identifies the significant challenges of achieving inter-jurisdictional coordination of a project of this magnitude. The complexities of developing a single standardized system to meet the needs of multiple Canadian jurisdictions were more difficult than anticipated. Achieving this goal required jurisdictional and inter-jurisdictional trade-offs. As these challenges emerged, the project partners assessed options and the Panorama national governance committee decided on prudent courses of action. This affected project requirements, extended schedules, and increased budgets.

RESPONSE FROM THE MINISTRY OF HEALTH

The Ministry's responses to the issues raised in this audit are as follows:

System Quality

BC is the first province to fully implement Panorama, and as such has led the way in addressing implementation issues. As other provinces come on board, enhancements required for their business practices will be available to BC. As this report goes to publication, there are two upgrades underway to add treatment and management functionality for sexually transmitted infections and tuberculosis clinical care. More enhancements at the national level are planned for the future, such as mobile solutions and usability improvements.

Planning to extend Panorama access to doctors is also underway. This access will provide them with important clinical support data to ensure they are delivering the right immunization to the right patient at the right time, and allow them to enter information on immunizations performed in their offices so that the patient record is always current and complete. Panorama can be used with the recent development in health information technology to support this through an open, two-way secure messaging between Panorama and electronic medical records of all types.

The audit is critical of the increased data collection in Panorama, leading to longer appointment times as well as excessive scrolling required by the system. While the Ministry does not dispute these concerns, it should be noted that these are two examples of specific business requirements requested by the Canadian public health community. The implementation of Panorama provided an opportunity to mandate consistent collection of minimum public health data requirements for family health and immunization services and to support effective outbreak management.

All large-scale custom developed systems are expected to have defects at the outset and Panorama is no exception. The Ministry's assessment is that the initial number of defects was not out of line with industry norms. At the time the final product was accepted in 2008, there was one severity level 2 defect, which was included in the remediation plan and subject to a hold back payment of $500,000. Upon successful resolution, this holdback was released. It should be noted that the contract was adjusted to reflect the higher risk of a custom-build solution and the defect penalties cited in the OAG's report did not apply at the time of acceptance.

Timeline

As noted earlier, the Panorama contract was amended when it was determined that a COTS solution could not be adapted to meet the jurisdictional needs. Based on the amended contract, IBM delivered the national Panorama system on time. Difficulty accessing much-needed public health expertise during critical project timelines also resulted in delays. That noted, the Ministry of Health clearly acknowledges that a ten-year cycle is not optimal and this is a key area of focus in strengthening its project and contract management practices.

RESPONSE FROM THE MINISTRY OF HEALTH

Budget

In 2005, the budget estimate for the Panorama national build using a COTS solution (excluding family health) was $37.7 million. In 2007, the decision was made to shift to a custom solution and CHI approved a project budget of $47 million. The actual cost of the national build was $44.5 million. The OAG total cost of $66 million includes on-going operational costs for an additional two years after the build was complete.

Early budget estimates for BC were limited to Ministry system development costs and did not include health authority expenses. In 2012, it was recognized that budgeting solely for the IT aspects of the project omitted other important costs that were critical to project success, such as change management and training. As such, in 2012, the Ministry changed its approach to budgeting and developed a "total cost of ownership" approach to incorporate a fuller recognition of costs associated with the project. The total cost of ownership now included costs incurred by health authorities, operating costs for the in-production system, and integration.

Ministry Response to the Recommendations:

The development of custom-built IT systems is complex, particularly when it involves multiple stakeholders and interests. In the case of Panorama, decisions were made by national, provincial and regional representatives. The diverse range of current systems held by the stakeholders, combined with the need to agree on standardized data, business process and naming conventions, added to the project's

complexity. The project was further complicated in British Columbia by the need for Panorama to be a fully interoperable system integrated with the provider registry, client registry, the provincial laboratory information system, Vancouver Coastal Health Authority's community-based care system PARIS (Primary Access Regional Information System), and BEST (the provincial audiology system), and soon to be interoperable with the Integrated Community Care Information System (ICCIS) in the Northern Health Authority.

RECOMMENDATION 1: *The Ministry does not support this recommendation in its entirety. Public health experts across Canada agree there is no other system currently available that can provide the comprehensive solution supported by Panorama. Panorama offers core functionality and a substantive part of a pan-Canadian immunization and communicable disease information system. While there may be systems that provide aspects of what Panorama provides - they do not have the capability to provide a fully integrated, province-wide solution or integration with other provinces' systems – a key tool in managing infectious diseases. Looking forward, public health outcomes will be further advanced through ongoing improvements to Panorama and the onboarding of innovative health information technology applications facilitated through Panorama's interoperability design. However, the Ministry is always cognisant of ensuring best practices are reflected in its decisions and would be open to other options should they present themselves.*

RESPONSE FROM THE MINISTRY OF HEALTH

RECOMMENDATION 2 AND 3:

The Ministry accepts these recommendations, as it is already actively engaged in reviewing its IT project and contract management practices to ensure future projects are managed in accordance with good practice. In addition, the Ministry has already created a unit to better deal with large-scale transformational projects such as Panorama. This unit consolidates in-house expertise to better ensure that the Ministry conducts appropriate oversight of vendors and contracted resources, provides necessary financial oversight and ensures adherence to Ministry and government policy. Furthermore, in recognition of the importance of effectively managing change to ensure the success of large-scale projects, the Ministry has invested in additional change management training and certification for information technology staff.

RECOMMENDATION 4: *The Ministry*

accepts this recommendation noting that building the necessary consensus to develop a single solution across any sector is inherently challenging when a variety of organizations are involved in a large-scale project. However, the Ministry also recognizes that there has been strong feedback on the need to better ensure and enable open feedback that is welcomed and not interpreted as user reluctance to change. To this end, the Ministry continues to pursue activities that will support more collaborative and effective governance structures. The recently released IM/IT enabling strategy recognizes the need to continue to work on governance and to collaborate on all IM/IT projects that are of a common and shared interest.

BACKGROUND

Public health

The public health program plays a vital role in British Columbia's health care system. It is responsible for helping protect B.C. residents from injury and disease, and for helping us stay healthy. In 2013/14, health authorities spent approximately $515 million of the ministry's $17 billion operating budget on the provision of public health services, such as immunizations, early childhood assessments, campaigns to improve the health of the population, and communicable disease management.

Some aspects of public health, such as the management of infectious disease outbreaks, require inter-provincial cooperation. The global SARS (Severe Acute Respiratory Syndrome) pandemic that hit Canada in early 2003, is one example. In total, 44 people in Canada died from the disease, approximately 400 became ill, and 25,000 Toronto residents were quarantined.

The Naylor report

In May 2003, the federal Minister of Health commissioned Dr. David Naylor to conduct an independent review of the public health effort during the SARS outbreak. The report, Learning from SARS – Renewal of Public Health in Canada, identified a number of deficiencies within Canada's fractured, multi-jurisdictional system. Dr. Naylor recommended that the country invest in a *"seamless public health system that will allow public health professionals to coordinate activities in a carefully planned infrastructure."*

In response to this recommendation, the Government of Canada mandated Canada Health Infoway (Infoway), to work with Canada's provincial, territorial and federal governments to develop an integrated public health surveillance solution known today as *Panorama*. Infoway is an independent, not-for-profit organization funded by the federal government.

BACKGROUND

The Panorama system

Panorama is made up of six core modules that support a range of public health functions (see below).

B.C. also commissioned a custom-built seventh module called Family Health to replace portions of iPHIS (Integrated Public Health Information System), the existing system used in the province. The Family Health module facilitates documentation of routine public health services, such as post-partum and newborn assessments, screening services, and other aspects of client care.

Panorama was meant to provide public health officials and staff across the country with the real-time ability to collect, share and analyze health information that is critical for managing infectious disease outbreaks like SARS, Avian Flu and other communicable diseases. The provinces and territories expected Panorama to achieve a number of benefits, like improved health outcomes related to communicable diseases, and more efficient management of immunization programs.

EXPECTED BENEFITS OF THE PANORAMA SYSTEM

- improve health outcomes related to communicable diseases
- identify, investigate and manage communicable disease cases and contacts
- identify, investigate and manage communicable disease outbreaks and risks to the public's health related to communicable diseases
- manage immunization programs efficiently
- communicate important public health information related to communicable diseases through alerts and notifications
- conduct research and analysis to support improved preparedness for future communicable disease outbreaks and for health risks related to communicable disease

Module	Function
Materials/vaccine inventory management	Public health personnel can record and maintain materials and supplies inventories[1]
Immunization management	Tools for public health personnel to forecast and record immunization information, including consent and adverse reactions
Communicable disease case management	Tools to help public health personnel identify and monitor communicable disease cases, trace exposures and contacts, and manage interventions, signs, symptoms and outcomes
Outbreak management	Support for public health personnel who are investigating, monitoring, analyzing, communicating and reporting on communicable disease outbreaks
Work management	Public health personnel can manage tasks and time through scheduling, resource assignment and activity tracking tools
Notifications management	Tools to issue warnings and help public health personnel share information quickly about critical events and emergencies

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[1] B.C. is only using this module for vaccine inventory management at this time.

BACKGROUND

The national and provincial panorama projects

Panorama was to be developed through two separate projects:

1. National build project: B.C. led the development and build of a pan-Canadian system to meet national requirements
2. Provincial implementation projects: provinces were to customize and implement modules specific to their needs

COTS VS. CUSTOM SOLUTION

COTS products (commercial-off-the-shelf) are ready-made and available for sale to the general public. For example, Microsoft Office is a COTS product. Generally, they are thought to be cheaper, more reliable, and higher quality than custom solutions, which need to be designed and built from scratch.

Infoway, the major funder of Panorama, required that the solution emphasize the integration of existing COTS products with a new custom development.

The project to build the national system began in 2004. Infoway, which paid for a significant portion of the national system, and B.C., sponsored the project. A national Steering Committee of executive-level public health and information technology (IT) representatives from all provincial and territorial

jurisdictions, as well as Health Canada, the Public Health Agency of Canada, and other key stakeholders, provided project governance. The B.C. Ministry of Health (the ministry) led and managed the project on behalf of all provinces and territories, because of its reputation for infectious disease management and experience developing Panorama's predecessor, iPHIS.

As the project lead, B.C. negotiated a fixed-price contract worth $27.8 million with IBM for the national build. Under the contract, IBM committed to integrating a number of different COTS (commercial-off-the-shelf) products into a single solution that would meet the pan-Canadian system needs. B.C. was responsible for verifying that the national system met the contractual requirements, or *accepting* it on behalf of the country, upon project completion in 2010.

B.C.'s Panorama implementation project began in 2006. The ministry had overall responsibility for the implementation project, but delegated some of its decision-making power to a Provincial Executive Steering Committee made up of ministry and health authority executives. The health authorities were responsible for moving public health clinicians and staff on to the Panorama system.

ACCEPTANCE OF THE FINAL SYSTEM

Acceptance of the final system occurs when the ministry has completed system testing and is satisfied that IBM has met all contractual terms, including fixing defects and user requirements.

BACKGROUND

The ministry awarded IBM two separate and additional contracts to implement Panorama in B.C. in 2008 and 2009. Under these B.C. implementation contracts, IBM was to be paid a combined maximum of $16.2 million on a time and materials basis. However, scope changes, a revised deployment approach, and major issues with the national system drove up B.C.'s costs. IBM was actually paid $73.5 million, or 450% more than the original contract price.

Progress to date

Panorama was supposed to be deployed across Canada. At present, five other jurisdictions are still moving forward with implementation: Yukon, Saskatchewan, Manitoba, Ontario and Quebec. B.C. is the furthest ahead and has implemented components of all six core system modules, as well as the Family Health module.

Also, even though B.C. has implemented all seven modules, Panorama is not a pan-B.C. system. Vancouver Coastal Health (VCH) does not use Panorama. The ministry permitted VCH to continue using its public health IT system, PARIS, because of its recent investment in the system. And, clinicians and staff at Northern Health use an internally developed system to record many public health visits. This data is then manually transcribed into Panorama by administrative staff. Despite these exceptions, requests from other health authorities to pursue alternatives, and amidst major system issues, the ministry directed Island Health, Interior Health, and Fraser Health to implement all seven Panorama modules.

AUDIT OBJECTIVES

We examined whether the Panorama system provides the information technology solution the B.C. Ministry of Health expected for public health, and whether the build and implementation were completed on time and on budget. We expected Panorama to:

- have the functionality, usability and stability required to realize the stated benefits of the system
- be built and implemented in B.C. health authorities on budget
- be built and implemented in B.C. health authorities on time

We based our audit expectations on the Panorama system business requirements, budgets and timelines, as determined at the start of the Panorama national build and B.C. implementation projects.

AUDIT CONCLUSION

The Panorama system did not meet any of our expectations. We concluded that Panorama:

- does not have the full scope of functionality, and level of stability and usability necessary to achieve all of the stated benefits of the system

- was not built or implemented on budget

- was not built or implemented on time

AUDIT SCOPE

We conducted this audit in accordance with the standards for assurance engagements set out by the Chartered Professional Accountants of Canada (CPA) in the CPA Handbook – Assurance and Value-for-Money Auditing in the Public Sector Section PS 5400, and under the authority of Section 11(8) of the *Auditor General Act*.

We carried out our work between June 2014 and February 2015 and it was completed on May 1, 2015.

Our work involved:

- interviewing over 100 front-line public health staff, project staff, ministry and health authority executives, and representatives from IBM and Infoway

- observing how the Panorama system works in four different health authorities

- reviewing a wide range of documents including contracts, project reports, user surveys, and other relevant documents

- analyzing IBM's defect log for the period of 2009 – 2014

The scope of our audit work is summarized below:

	In	Out
Entities	• B.C. Ministry of Health (primary auditee) • B.C. health authorities, except for the First Nations Health Authority	• Canada Health Infoway • IBM and other Panorama vendors • Jurisdictions outside B.C. implementing or using Panorama
Projects	• The national build project • The B.C. implementation project	• Business requirements gathering • Vendor selection/procurement
Panorama system	• Functionality, stability and usability of the system • Potential achievement of stated system benefits, including clinical and resource impacts	• Whether or not Panorama is the right system for public health • An assessment of alternative public health systems • Privacy and security of the Panorama system

PART 1: KEY FINDINGS

FUNCTIONALITY, STABILITY, AND USABILITY

A high-quality public health IT system supports *users* to carry out their day-to-day work effectively and efficiently. In this audit, we looked at three important attributes of system quality: functionality, stability and usability.

System attribute	Definition
Functionality	System capabilities, including the services, tasks and/or functions that a system is expected to perform
Stability (also referred to as performance)	System reliability (the ability to collect, manage and provide data without failure) and availability (the ability to be operational when it is needed)
Usability	System ease of use and learnability

DEFINITION OF A USER

A user is a person who accesses a computer system to get information or to perform business functions.

As of March 31, 2015, there were almost 1,800 Panorama users in B.C. These users are primarily public health clinicians and administrative public health staff.

We expected to find that the Panorama system implemented in British Columbia:

- includes the major functionality set out at the start of the Panorama project

- is meeting pre-defined stability expectations

- is meeting pre-defined usability expectations

We found that the Panorama system implemented in British Columbia:

- does not have the full scope of functionality necessary to achieve all of the benefits of the system that were stated at the project outset

- has numerous defects and deficiencies, and does not meet defined stability expectations

- does not meet defined usability expectations or good usability principles such as prevention of user errors, consistency and standards, and system match to the real world.

Key functional components of the system were de-scoped, others do not work as intended, and significant functionality has yet to be deployed and/or adopted by users

The ministry's national build contract with IBM outlined the expected functionality of the Panorama system. This functionality was directly linked to the stated benefits of Panorama.

We found that all seven modules were implemented in B.C. As a result, users now have access to information that was previously unavailable. However, certain major functionality was de-scoped or was unusable. A number of other major features are present in the system, but have significant limitations. Others are available but are not being used for various reasons. Exhibit 1 summarizes significant functional gaps and issues in the Panorama system.

PART 1: KEY FINDINGS

Exhibit 1: Functionality findings and impact		
Status	**Functional component**	**Impact**
Not delivered – removed from scope	National outbreak capabilities: ability to use the system to collaboratively manage outbreaks that cross provincial borders A number of technical and governance challenges at the national level resulted in this functionality being de-scoped from the national build contract	The system cannot be used to manage inter-provincial outbreaks, the main reason for which the system was built.
	National alerts: integration with the Public Health Agency of Canada's national alerts and notification system	The system can neither issue nor receive real-time alerts about illness outbreaks from other Canadian jurisdictions.
	Guided screen flows: pre-defined work processes that guide and assist public health clinicians and staff in their work	It is difficult for public health clinicians and staff to navigate the system efficiently.
	Parent and guardian web access to immunization profiles	Parents and guardians are unable to access their children's immunization records online.
	Web-based reservations	Patients are not able to make public health appointments online.
	Disconnected use: the ability to use Panorama offline and upload data once connected to the network	When Panorama is offline, public health staff must chart on paper and transcribe their notes into the system at a later date. This is time consuming and increases the risk of error.
	Vaccine bar-coding: ability to read two dimensional bar codes on vaccine products that contain product information	Users must manually enter and update vaccine inventory information. This is time consuming and increases the risk of error.
Delivered, but unusable	Upload of cohorts: the ability to upload cohorts (a group of patients sharing a common factor, such as age or socioeconomic status) into the system	Patient records from mass immunization clinics such as those that occur in schools, or groups of individuals that have been in contact with a person with an infectious disease (e.g., an airplane manifest), must be entered into the system one-by-one and some are not being entered at all because of the resource burden.
	Client registry interface: enables public health clinicians and staff to verify a patient's identity in the province's Client Registry	Staff must take an additional step to verify patient identity through alternative methods.
	Client merge: allows duplicate records for the same patient to be combined into a single record	Records are manually merged, which is a time consuming process. If not merged, patient information remains split across two records, which contributes to patient safety risk.

PART 1: KEY FINDINGS

Exhibit 1: Functionality findings and impact *(continued)*		
Status	**Functional component**	**Impact**
Delivered, but unusable	Reminder recall: the ability to identify patients who are due for immunizations	Staff cannot follow up and remind patients who are due for immunizations.
	Sexually transmitted infections (STI) and tuberculosis (TB) case management: the ability to manage STI and TB infections in the system	Deploying this functionality in its current state would introduce an unacceptable level of clinical risk. Continued use of fragile legacy systems is putting patient data and continuity of care at risk.
	Electronic lab results: allows the system to receive electronic lab results from the Provincial Lab Information System	Deploying this functionality in its current state would introduce an unacceptable level of clinical risk due to issues with the way lab results are displayed in Panorama. Users must enter all lab results manually. This does not ensure consistent quality and completeness of lab data.
Delivered, but with functional limitations	Task management: creates tasks for staff follow up	Increases the risk that staff will miss tasks (e.g., notification of communicable disease case to follow up).
	Reports: provides information on the health status of the population (e.g., immunization rates, breastfeeding rates)	Public health managers have access to fewer operational and clinical reports than they did in iPHIS, eroding their ability to manage public health programs.
Delivered, but not widely used	Provincial outbreak functionality: the ability to manage provincial outbreaks	Health authorities are not using Panorama to manage provincial outbreaks.
	Scheduler: allows staff to schedule public health visits for patients	The Panorama scheduler was so deficient that the ministry procured and integrated a third party scheduling tool to perform this function. Only half of the health authorities are using, or are planning to use, this tool.
	Lab quick entry: a streamlined process for entering lab results in Panorama	Two of the health authorities are not using this functionality as they believe it poses a patient safety risk due to issues with the way Panorama displays lab results. To mitigate this risk, some health authorities have directed their users to record lab results as notes. But as a result, this data cannot be searched, or used for reporting and analysis.

Source: Compiled by the Office of the Auditor General of British Columbia

PART 1: KEY FINDINGS

Panorama is impacted by defects, deficiencies and performance issues

A system that is stable is reliable and available with acceptable performance levels. This is fundamental to user productivity. When an IT system is not stable, it will malfunction, slow down, crash or be unavailable. This impacts efficiency, staff ability to deliver services, and may negatively affect patients if their information is inaccessible.

Since the system has been in use, public health clinicians and staff have experienced stability issues with Panorama, including:

* inability to log in
* inability to complete and save forms for collecting data
* frequent system freezing

The Provincial Health Services Authority (PHSA), the organization responsible for Panorama operations, has identified issues with: the network, servers, system design, user verification response time, and processes within the system, such as auditing and reporting that

are slowing the system down. The causes are complex and may not always be the fault of Panorama. For example, on occasion Panorama may be down due to issues with the government network. The ministry and health authorities have made improvements, but many stability issues still persist in the system.

Many of the issues in the system are the result of coding problems, or *defects*. The national build contract with IBM specified that the system contain no severity 1 or 2 defects and 5 or less severity 3 defects. The system B.C. accepted on behalf of all Canadian jurisdictions contained almost 1,200 defects (see Exhibit 2) – or 240 times what was permitted in the contract. However, since the ministry did not discover these defects during acceptance testing, they were not subject to the contract's defect limits. Also, B.C. and the other provinces were financially responsible for their remediation.

DEFECT

A defect is an error in software coding or logic that causes the program to malfunction or produce incorrect/unexpected results.

PART 1: KEY FINDINGS

Exhibit 2: Defects at final acceptance – December 2010				
Severity Deficiency Level per the original terms of the national build contract with IBM (See Appendix A)	Number of allowable defects per the original terms of the national build contract with IBM	Number of allowable defects per amended terms of the national build contract with IBM	Number of defects at final acceptance	Number of defects at final acceptance that were unresolved as of December 2014
1 – a serious error or problem that makes the system unusable or the data unreliable	0	0	0	0
2 – an error or problem that affects use in a noticeable way, but there is a reasonable workaround approved by the ministry	0	2 or less	25	2
3 – a minor defect with no significant consequences and a reasonable workaround approved by the ministry	5 or less	10 or less	656	204
4 – an error or problem which does not constitute a severity 1, 2 or 3 deficiency	NA (see note)	30 or less	515	228
Total			**1,196**	**434**

Source: Compiled by the Office of the Auditor General of British Columbia through analysis of the IBM Defect Log

Note: The severity deficiency level 4 category was introduced through a change order to the national build contract; it was not part of the original contract terms. Therefore, the number of allowable severity level 4 deficiencies was not specified.

To ensure that IBM quickly resolved defects discovered after system acceptance, the national build contract also specified target defect resolution times. Under these terms, the ministry would be entitled to monetary service level credits from IBM when target times were not met.

However, starting in mid-2007, the ministry and IBM began changing the contractual terms around defect remediation. The revised terms:

* replaced monetary credits with credit hours
* removed all credits for unresolved severity level 3 defects

* allowed severity level 1 and 2 defects to be downgraded to level 3 with the identification of workarounds and removed ministry approval of workarounds
* changed severity deficiency levels, resulting in defects being assigned to lower severity levels
* limited the number of defects that IBM was required to fix to a combined national total of 1,450 annually and allowed jurisdictions to prioritize defects

These changes benefitted IBM by transferring financial risk associated with defect remediation from IBM to taxpayers.

PART 1: KEY FINDINGS

Since deployment in B.C. in 2011, IBM, the ministry and health authorities, and other Canadian jurisdictions have discovered over 11,000 new defects in Panorama (see Exhibit 3). Of these new defects, close to 6,000 have affected public health clinicians and staff, often for prolonged periods, due to lengthy delays in defect resolution. As of December 2014, IBM had fixed 3,438 of these defects but 2,561 still remained. IBM resolved the other 5,230 defects before the ministry rolled out the affected versions of the system.

Based on the number and length of time it has taken to resolve system defects, under the original terms of the national build contract, the Ministry of Health could have accumulated monetary credits far exceeding IBM's maximum liability of $7 million. The ministry has never received any service level credits from IBM.

WORKAROUNDS

To compensate for defects and deficiencies, public health staff must use workarounds which include:

- different ways of using the system
- the use of alternate systems
- documenting on paper
- changing business processes
- hiring additional staff to enter data

Exhibit 3: Defects discovered after final acceptance – December 2010

Severity deficiency level	Total number of defects since final acceptance	Number of defects affecting users	Defect resolution maximum target times before full credits apply	Number of unresolved defects at December 2014
1	63	13	24 hours	1
2	1,729	714	5 business days	104
3	7,339	3,843	20 business days	1,624
4	2,098	1,429	N/A	829
Total	**11,229**	**5,999**		**2,561**

Source: Compiled by the Office of the Auditor General of British Columbia

PART 1: KEY FINDINGS

The system is difficult to navigate, complicated and confusing

A system that is highly usable would offer benefits to public health. If public health clinicians and staff were able to use the system to complete their tasks easily and efficiently, they would be more likely to use it to its full capacity, and to record all patient information quickly and accurately. This in turn would provide valid data to inform future services, improve service efficiency, enhance patient safety and free up more time for patient care.

Despite well-developed, commonly-used, industry usability standards at the time, the ministry failed to negotiate comprehensive usability requirements into the national build contract. Of the requirements that the ministry did include, some were still not met when the ministry accepted the national Panorama system. This included common operational expectations of buttons, links and other screen controls.

There were a number of usability issues with the version of Panorama deployed in B.C., many of which were known prior to system acceptance. Public health clinicians and staff repeatedly raised concerns that Panorama was difficult to navigate, complicated, and confusing to use. More specifically, they reported that Panorama:

- was neither intuitive nor user-friendly
- had clinically incorrect or counter-intuitive terms
- had different terms for the same function, depending on which part of the system the user was in

- required a significant amount of scrolling to view necessary information
- had a busy display, which made it difficult to view content

EXAMPLES OF SYSTEM USABILITY ISSUES INCLUDE:

- save button is labelled "cancel"
- submit, save or cancel can all mean "save"
- terms, such as "prescriptions" to describe medications administered or dispensed by a nurse, are incorrect
- inconsistent placement of the same button on different screens

The system has contributed to patient safety risks and increased operating costs

B.C.'s version of Panorama contributes to patient safety risks. Problems with functionality prevent public health clinicians from using some fields as intended; this, along with usability issues and a high number of workarounds, make the system prone to errors. Slow performance and unexpected system outages mean that Panorama cannot always provide clinicians with complete and accurate patient information when they need it.

Also, health authorities reported that Panorama has led to an increase in public health operating costs, a decrease in capacity, and longer appointment wait

PART 1: KEY FINDINGS

times. The system collects data that was not previously recorded in legacy systems. This, coupled with its slow and unreliable performance, and the high volume of workarounds, means that nurses cannot see the same volume of patients they used to. Time trials from a number of health authorities show that appointments that used to take 25 to 35 minutes now take 35 to 52 minutes. These extended appointment times, along with other Panorama-related costs such as hiring data entry clerks, have resulted in lost efficiencies of approximately $4.5 million annually, or almost 1% of the health authorities' combined annual public health budget.

The bulk of Panorama's intended benefits were meant to improve the management of communicable diseases and outbreaks. The system was also supposed to enable better research and analysis to support improved preparedness for future communicable disease outbreaks, and risks to health related to communicable disease. Achievement of these benefits will require greater use of the system, as well as improvements in data quality and the system's reporting capabilities.

The issues with functionality, stability and usability have significantly impacted the health authorities' commitment to the system. Over the years, health authorities have explored other systems and identified viable alternatives for aspects of Panorama. However, the ministry has not permitted the health authorities to pursue these options. Only Vancouver Coastal Health and Northern Health have been allowed to use different systems for some public health functions. While most of the senior leaders we spoke with still believe in having a provincial, if not national, public health IT system, there may be safer and more cost-effective ways to achieve this objective using current software/technology.

BUDGET AND TIMELINE

More money for less system

Project estimates are often used to compare different options, and determine which one is the most cost-effective. At the start of the project, the ministry reported that contracting the Panorama projects out to the private sector, rather than in-house development, would save taxpayers between $2.7 and $61.9 million.

In order to achieve these savings, we expected to find that the ministry had established budgets for both the national build and B.C. implementation projects, and then met them. We found costs were escalated through change orders, and neither the build nor implementation project budgets were met. The ministry's failure to meet established budgets and deliver the full scope of both projects indicates that Panorama did not achieve value for money.

CHANGE ORDER

A change order is work that is added to, or deleted from, the original scope of work of a contract, which alters the original contract amount and/or completion date.

National build project

The ministry had a total budget of $37.7 million for the national build project. This budget included the cost of detailed design, procurement, detailed specification, and a $27.7 million fixed-price contract with IBM. The total cost of the national build project was at least $66 million. This figure does not include in-kind resource contributions from the health authorities.

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Infoway paid $44.5 million to build the system. But, B.C. and the other participating Canadian jurisdictions paid an additional $21.5 million to fix defects and make the system usable.

B.C. implementation project

Cost overruns were a significantly bigger issue on the provincial implementation project. The total budget was approximately $27 million ($6 million for the Family Health module, and $21 million for the six core Panorama modules).

To date, the ministry has spent approximately $99 million on implementing the six core Panorama modules and Family Health, and the health authorities report spending at least an additional $10 million. This total includes some costs that were not part of the original budget such as change management and interfaces to other eHealth systems.

The Panorama Executive Steering Committee recently approved another $4 million for PHSA to complete outstanding work. This puts the estimated total cost of implementing Panorama at $113 million, which is $86 million over budget or 420% of what was budgeted at the project outset (see Exhibit 4).

Exhibit 4: Summary of B.C. implementation project costs (in millions)

Organization	Budget	Actual
Ministry	$27	$99
Health authorities	$0	$10
PHSA	$0	$4
Total	**$27**	**$113**

Source: Compiled by the Office of the Auditor General of British Columbia

This significant cost is even more of a concern given that functionality, such as the client registry interface, task management, and cohort creation (necessary to use the mass immunizations and contact tracing functionality), is still not working, thousands of defects persist, and usability remains a significant issue. Fixing these issues will require additional funding.

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B.C.'s ongoing support costs

In addition to build and implementation costs, there are ongoing costs to provide technical and user support, and maintain and upgrade the system, as well as maintenance fees that are paid to IBM.

The most recent estimates indicate that the ministry's annual support costs will be $9.74 million. This includes an IBM maintenance fee of $1.78 million until December 31, 2016 at which point it may be renegotiated. Health authorities are expected to

pay approximately $0.5 million per year for system enhancements, $1.94 million to support and maintain interfaces to other eHealth systems, and $1.74 million in internal operating costs (e.g., staff to support the application, training), for a total annual cost of $4.18 million (see Exhibit 5).

Altogether, the ministry and the health authorities expect to pay approximately $14 million per year, or 30% of the initial system build cost to support Panorama.

Exhibit 5: Summary of annual, ongoing support costs (in millions)		
Fee category	Ministry of Health	Health authorities
Panorama national fees (IBM & Project Coordination Office)	$2.50	
Panorama operations	$4.42	
Technical maintenance	$2.82	
Enhancements		$0.50
Interface sustainment		$1.94
Internal operating costs		$1.74
Total $13.92	$9.74	$4.18

Source: Compiled by the Office of the Auditor General of British Columbia

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The Panorama system is five years late and still not fully implemented

Timeline adjustments can impact the quality and cost of projects. If timelines are too ambitious and heavily enforced, there is a risk of cutting corners and/or de-scoping important system capabilities. On the other hand, delays in meeting timelines can lead to increased costs, and create a risk that business needs and technology will change before the project is delivered.
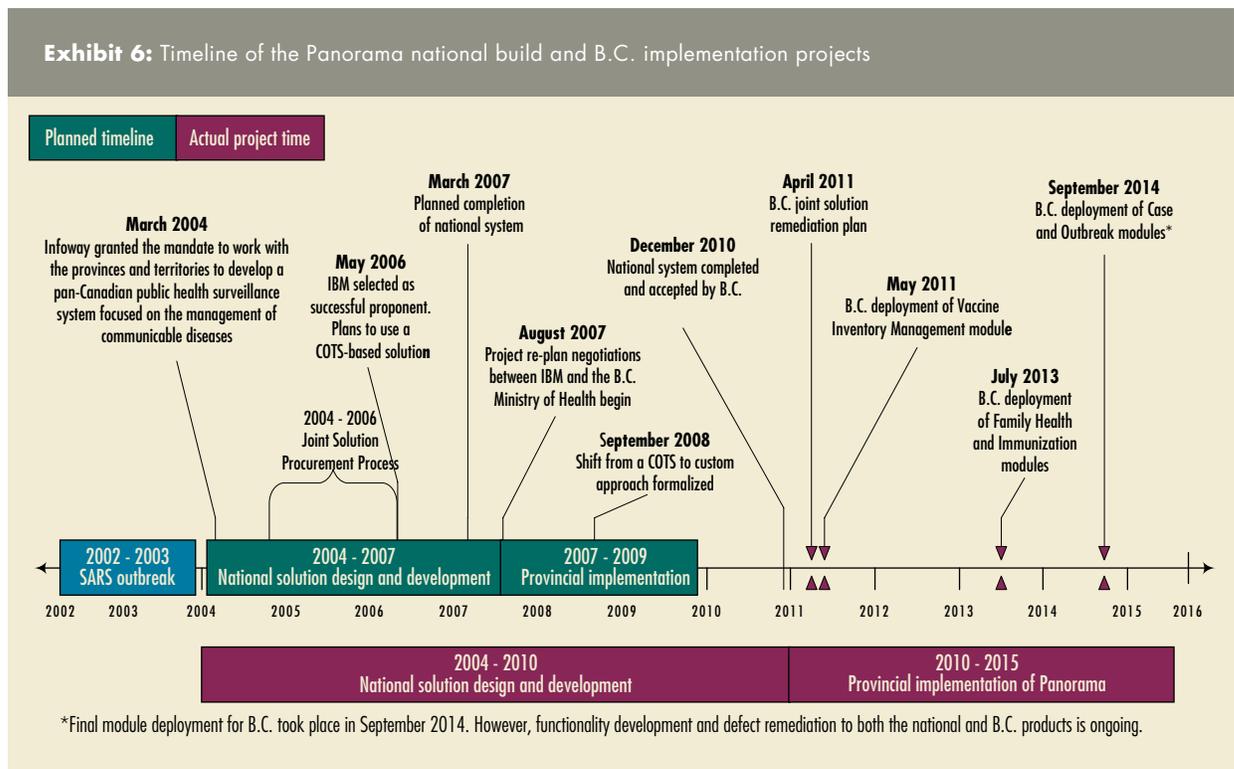
Consistent with good project management, we expected to find that the ministry had set realistic timelines for both the national build and B.C. implementation projects, and to have met them, or come reasonably close. We found that this was not the case.

National project

The original deadline for completion of the national build of Panorama was March 31, 2007, 10 and a half months after the contract was signed. At the time, this was thought by some to be aggressive or ambitious, and project leaders quickly determined that it was unrealistic. In 2007, IBM and the ministry made a number of changes to the national build project scope, timeline and cost in a major re-plan. Final acceptance occurred on December 31, 2010, making completion of the national build project two years and nine months later than originally scheduled (see Exhibit 6).

Delays and revisions to the national build timeline had a number of significant impacts on costs and cross-country commitment to the system. As project issues increased and timelines were extended, other

Exhibit 6: Timeline of the Panorama national build and B.C. implementation projects

Planned timeline | Actual project time

March 2004
Infoway granted the mandate to work with the provinces and territories to develop a pan-Canadian public health surveillance system focused on the management of communicable diseases

May 2006
IBM selected as successful proponent. Plans to use a COTS-based solution

2004 - 2006
Joint Solution Procurement Process

March 2007
Planned completion of national system

August 2007
Project re-plan negotiations between IBM and the B.C. Ministry of Health begin

September 2008
Shift from a COTS to custom approach formalized

December 2010
National system completed and accepted by B.C.

April 2011
B.C. joint solution remediation plan

May 2011
B.C. deployment of Vaccine Inventory Management module

July 2013
B.C. deployment of Family Health and Immunization modules

September 2014
B.C. deployment of Case and Outbreak modules*

2002 - 2003 SARS outbreak | 2004 - 2007 National solution design and development | 2007 - 2009 Provincial implementation

2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016

2004 - 2010 National solution design and development | **2010 - 2015** Provincial implementation of Panorama

*Final module deployment for B.C. took place in September 2014. However, functionality development and defect remediation to both the national and B.C. products is ongoing.

Source: Compiled by the Office of the Auditor General of British Columbia

PART 1: KEY FINDINGS

jurisdictions dropped out. Currently, five provinces and one territory remain. In B.C., the Panorama implementation was delayed and costs increased.

B.C. implementation project

The original deadline for B.C.'s implementation project was June 2009, but this was quickly revised to December 2009, as part of the re-plan of the national build project. IBM and the ministry made several subsequent revisions to this and other key milestone dates over the course of the B.C. implementation project. Today, all of the Panorama modules have been implemented, but there are still some major pieces of functionality outstanding (see Exhibit 1 on p. 23 for details).

Delays in implementation have affected health authority commitment to the initiative. Health authorities indicated that as a stand-alone system, Panorama is inconsistent with the current move toward integrated health systems. The Northern Health Authority recently moved to an alternate system for Family Health and Immunizations, although they have hired administrative staff to transcribe this data into Panorama. Other health authorities have explored integrated approaches to recording public health data, but the ministry has prevented them from pursuing these approaches.

Delays and revisions to the B.C. implementation timeline have also led to increased costs. The ministry contracted a project team and an IBM technical team to work on the B.C. implementation project, contributing approximately $1 million per month to the overall implementation cost of $113 million.

PART 2: WHY DID THINGS GO WRONG?

THIS SECTION ANALYZES the issues and challenges with the Panorama system, budgets and timelines outlined in Part 1.

The initial COTS approach was unrealistic

A condition of Infoway funding for Panorama was that the system have a particular emphasis on the integration of existing COTS (see page 17 for a definition) components together with a new custom development. This approach was typical, as many government and business programs mandate the use of COTS products in the hopes of reducing system development and maintenance costs.

According to the ministry, there were no COTS products that met public health's requirements at the time. IBM proposed knitting together a number of separate COTS products into a single, public health IT system for the country. This proved to be an incredibly complex endeavour. The system needed to meet the needs of many jurisdictions of varying sizes with different public health processes, and be translated into two languages. Given this complexity, it would have been prudent for the ministry to perform a high level of due diligence to ensure IBM's proposed approach was feasible.

In early 2007, IBM's plan to integrate a number of independent COTS products was determined to be unrealistic. National Steering Committee minutes indicate that IBM acknowledged that the problems to date with the integrated COTS solution were their fault, and proposed a major shift in their approach.

Options were not evaluated

Change is a normal part of large IT projects. However, when change occurs, it is important for organizations to update their project goals or make sure that the changes still enable them to achieve the objectives set out at the start of the project. Neither of these actions were taken in response to IBM's revised plan.

Both the ministry and an external review identified significant risks with IBM's revised plan. We found no evidence that the ministry evaluated its options, including contract termination and alternative solutions. Instead, the ministry continued forward with IBM.

PART 2: WHY DID THINGS GO WRONG?

In moving forward with IBM, the ministry agreed to a series of change orders to the national build contract. These change orders:

- formalized the shift from a COTS-based approach to a custom solution

- de-scoped significant pieces of functionality

- changed final delivery dates, lengthening the national build timeline by almost three years

- downgraded defect severity levels for many unresolved defects

- removed compensation for unresolved level 3 defects

- capped the number of defects IBM was required to resolve per year at 1,450 (previously, this was unlimited)

The change orders transferred risk from IBM to the ministry and ultimately, to taxpayers. In particular, the ministry took on the risks of increasing costs and prolonging time to fix defects. Under the new terms, the ministry must use the majority of maintenance fees to resolve defects, rather than for system enhancements as originally intended. As well, IBM is no longer accountable for resolving all defects within a particular timeframe. Under the original terms, if IBM had taken this long to fix defects, the ministry could have accumulated monetary credits far exceeding IBM's maximum liability of $7 million.

The ministry did not receive any tangible compensation in return for these significant concessions. As a result, the ministry lost out on many of the expected benefits of contracting out the project to an external vendor such as lower costs and reduced project risk.

The resulting gaps in national system functionality carried through to B.C.'s version. B.C. users expected the system to have far greater capabilities than it does. Some of the functionality removed was critical – such as national outbreak capabilities – and if added back into the system, will be an additional cost to B.C. and the country.

Issues with system functionality, stability and usability – some of which were known at the time of acceptance – required remediation during the B.C. implementation project. This caused delays in implementation and prolonged the use of contractors and IBM staff. Some of these same issues persist in the system today and continue to negatively impact ongoing public health operations.

Major functional components were not realistic

A number of Panorama's major functional components depended on the existence of supports and/or infrastructure that were not yet in place. As a result, they could not be built into the system as expected. For example, the ability for parents and guardians to book immunization appointments online depended on a separate B.C. solution to verify that the parents or guardians were who they said they were, and one did not exist at the time. Where such supports and/or infrastructure did not exist, the ministry and IBM de-scoped the affected features with no financial adjustments.

PART 2: WHY DID THINGS GO WRONG?

Acceptance testing was inadequate

Acceptance testing is critical to ensuring that a system is working as it should, and meets user needs. We found issues with acceptance testing of the national Panorama system and with user acceptance testing prior to the B.C. implementation.

Normally with software development, the client develops test scenarios and performs acceptance testing to certify that the requirements are met and to validate the business flow. We found that the ministry obtained the scenarios used to test the national system from IBM. This is quite unusual. We also found that B.C. contracted IBM to carry out a substantial amount of the national acceptance testing. This is also unusual.

As the service provider, IBM has an interest in having the system accepted quickly. This is because after acceptance, the ministry, other participating jurisdictions, and ultimately taxpayers, are financially responsible for the remediation of deficiencies. Before acceptance, IBM is responsible for fixing deficiencies.

The ministry accepted Panorama on behalf of all Canadian jurisdictions based on the results of acceptance testing. This decision had significant financial implications. In the two years it took for IBM to resolve the defects identified during acceptance testing, B.C., IBM and other provinces identified thousands more that needed to be fixed to make the system usable. The jurisdictions had to pay an additional $21.5 million to remediate these defects.

The scenarios used to test the system before the B.C. implementation of Panorama followed a set user workflow. However, the design of the system allows users to perform the same tasks in a number of different ways. For this reason, it is important to test that the system holds up under non-standard scenarios. Testing under non-standard scenarios was not performed.

Finally, no testing was performed before the system was deployed to users to see how the system would react under typical usage. Doing so may have identified performance issues before the system was rolled out. This became evident when users experienced extreme performance issues following implementation.

The system was accepted prematurely

The ministry accepted the national Panorama system before it was ready. The ministry, IBM and other jurisdictions identified thousands of defects after the ministry accepted the system, and it was unusable in 2009 when IBM staff began training health authority staff to deploy it in B.C.

In 2009 and 2010, IBM fixed defects in the national system while B.C. prepared for implementation. Despite these efforts, in 2011, it became clear that the system did not meet user needs, and the ministry and IBM initiated a remediation plan. This process, which brought together B.C. subject matter experts for all of the different modules, identified critical system issues as well as the development effort and over 320 workarounds required to make the system work for users. This resulted in significant changes to the implementation timeline and increased costs.

PART 2: WHY DID THINGS GO WRONG?

Decisions were made without full, unbiased project information

Over the course of our work, we heard concerns that ministry staff and executive sanitized information they provided to senior decision-makers. We share this concern, as we noted instances where ministry decision-makers did not appear to have a good understanding of the Panorama project and system issues.

From the project outset, the ministry employed a "command and control" leadership style. Numerous letters to the health authorities from senior officials, including the Minister of Health, stated that implementation of Panorama in accordance with the ministry's schedule was not optional. In fact, the health authorities were told at a meeting with the ministry that if they did not implement Panorama, they "would not get another dime [for public health IT] for another ten years." The ministry perceived the health authorities to be resistant to change. When health authorities tried to raise concerns around the safety and efficiency of the system, they were often dismissed and/or painted as trouble-makers and warned to stay quiet.

This had a silencing effect on joint ministry-health authority committees such as the Provincial Executive Steering Committee; members stopped speaking up – which the ministry interpreted as agreement with their approach. In reality, some were afraid that doing so would put their jobs at risk. The ministry's discounting of health authority concerns, combined with fear among health authority staff to raise concerns, resulted in the ministry missing or ignoring important issues. This caused delays and led to higher costs.

The ministry did not consider cost-effective system alternatives

Health authorities are responsible for the quality of care provided in their regions. Therefore, when it became clear that Panorama was affecting patient care and increasing public health costs in a time of scarce resources, most health authorities began to explore the idea of using an alternative system to collect data, which could then be fed into Panorama. In their view, there was a faster and more cost-effective way to capture public health information.

The ministry allowed Vancouver Coastal Health's continued use of their public health system (PARIS), and later allowed Northern Health to use an alternative system (ICCIS), to record family health and immunization information as long as it was transcribed into Panorama. However, the ministry did not permit other health authorities to explore other systems. For example, in early 2014, after hearing concerns about the Panorama system and its impact on the region's immunization rates, the Fraser Health Board of Directors ordered an independent study of alternatives. The ministry directed Fraser Health to cancel this study shortly before it was to be completed. At the time, the ministry indicated that the Province had invested significantly in Panorama, and that it was concerned that FHA was considering other options without consultation.

The approach to health information systems has changed significantly since the ministry signed its contract with IBM in 2006. COTS products that offer some of the same functionality as Panorama are available. Health authorities are shifting their focus from stand-alone systems for each area of healthcare (e.g., hospital care, mental health, public health, etc.)

PART 2: WHY DID THINGS GO WRONG?

to integrated systems across the continuum of care. These are important considerations going forward.

The ministry and health authorities had competing priorities

The ministry was responsible for delivering the national build and B.C. implementation projects on time and on budget, and the health authorities are responsible for delivering patient care.

We noted many instances where the ministry cut functionality and made other decisions that reduced stability and usability of the system in an effort to contain ever-increasing costs and lengthening

timelines. However, the health authorities – focused on patient care – could request system features without having to consider the cost and time. These split responsibilities made it difficult to reach optimal system decisions.

Adding to this, the ministry's leadership style deterred health authority representatives from delivering honest feedback. When health authorities did provide feedback, the ministry did not always take this input seriously and made decisions in spite of health authority concerns. Many of the ministry's decisions eroded the quality of the system, led to increased costs, and extended project timelines.

RECOMMENDATIONS

THE PANORAMA EXPERIENCE has been difficult for the ministry and health authorities, and challenges with the system continue. Panorama does not have all of the functionality required to achieve all of the stated benefits of the system, and health authorities continue to be concerned about its impact on patient safety and health authority costs. Further, Panorama is not a pan-B.C. system.

In the ten years that the Panorama national build and B.C. implementation projects have been underway, health authorities have shifted towards integrated health systems, and away from stand-alone systems like Panorama. Health authorities believe that there may be a more up-to-date, cost-effective way to achieve the stated business objectives of Panorama. To date, the ministry has been unwilling to consider alternative systems.

RECOMMENDATION 1: *We recommend that the ministry commission an independent review of Panorama and other alternative systems to identify the most cost-effective, integrated approach to meet the current and future needs of public health in British Columbia.*

Good practice in project management is well documented. We identified numerous deficiencies in this area. Most significant, health authority public health staff and users were not adequately engaged in the Panorama project. They did not have meaningful decision-making authority, and their ability to raise concerns was compromised.

RECOMMENDATION 2: *We recommend that the ministry review its project management practices to ensure future IT projects are managed in accordance with good practice.*

Good practice in contract management is also well established. There are detailed guides explaining how to carry out these activities to achieve value for money. We saw examples on this audit where ministry actions diverged from good practice. For example, the ministry did not assess the impact of the re-plan on the contract's value for money or carry out benchmarking for the revised services.

RECOMMENDATION 3: *We recommend that the ministry review its contract management practices to ensure future IT projects are managed in accordance with good practice.*

We found that the ministry employed a "command and control" leadership style on the Panorama projects. Leading healthcare organizations are moving away from dominant leadership styles, in favour of more collaborative approaches. Emerging leadership styles focus on building a shared purpose and derive power from connection and the ability to build networks, rather than positional authority. These new leaders develop and foster an organizational culture free from "blame and shame" and seek to bring perceived trouble-makers into the fold by learning from their concerns.

RECOMMENDATION 4: *We recommend that the ministry review its current leadership practices and develop a collaborative leadership strategy for future IT projects.*

APPENDIX A:
SEVERITY DEFICIENCY LEVEL DEFINITIONS

Severity deficiency level	Original national build contract term	Alterations to national build contract via change orders
1	serious error or problem that causes the operation to be materially impaired or causes the data to be unreliable	◆ catastrophic error or problem that causes the operation to be unusable and there is no workaround. ◆ sufficient severity 2 deficiencies such that the functionality of the system deliverables is impaired as described above
2	error or problem such that the use of the system is affected in a noticeable way as compared to the specifications but there is a workaround which is reasonably acceptable to the ministry	◆ a serious error or problem such that the system is difficult to use for a selected function or its dependents, as compared to the specifications and there is no workaround ◆ sufficient severity 3 deficiencies such that the functionality of the system deliverables is impaired as described above
3	error or problem which is a minor defect with no material consequences and there is a workaround which is reasonably acceptable to the ministry or no workaround required for full functionality	◆ an error or problem affecting the system in a noticeable way as compared to the specifications and there is a workaround
4		◆ an error or problem which does not constitute a severity 1, 2 or 3 deficiency; a usability error; screen or report error that does not materially affect quality and correctness of function, intended use or results; any error that is minor in nature; and there is a workaround or no workaround is required for the full functioning of the deliverable or final deliverable

Source: The 2006 Master Services Agreement between IBM Canada and the Province of British Columbia, Change Order #6 to the 2006 Master Services Agreement

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