6 NOVA SCOTIA HOSPITAL INFORMATION SYSTEM (NShIS) PROJECT

BACKGROUND

6.1 The overall Nova Scotia hospital Information System (NShIS) project objective as indicated in the Project Initiation document, approved by the steering committee, is "*to achieve an operational Meditech client server system for the province of Nova Scotia interfaced to DHA 9 and the IWK*". The NShIS system is composed of 18 computer software modules (the Meditech system), as listed and described in Exhibit 6.1, to be installed in 34 hospitals. It is a proven product having been successfully implemented in many stand alone hospitals across North America. The key difference between the Nova Scotia implementation and the previous ones is that the NShIS connects all 34 hospitals, which are governed by the 8 District Health Authorities (DHAs) as opposed to a single governing body. The application is operated on a common server.

6.2 The NShIS project was initiated by the government in March 2001. The total project cost is projected to be $55.7 million and the completion date is estimated to be March 31, 2006.

6.3 Provincial and Federal levels of government have been concerned with the adequacy of health information systems for the last decade. The Federal government established the Canada Health Infoway (CHI) initiative with funding of approximately $500 million to improve health information systems across Canada. The NShIS project did not receive funding from CHI.

6.4 Prior to the NShIS project, approximately 70% of Nova Scotia healthcare facilities did not have information systems or support systems in place to fully address the management and patient care challenges faced by the healthcare system. This resulted not only in duplicate testing and patient registration, slow care delivery, and a lack of evidence-based decision making, but also inconsistent forms, procedures, practices and clinical standards within facilities and across the jurisdiction. Further, DHAs could not share clinical information and the Department of Health could not access clinical information efficiently. Not only are hospital professionals and staff intended to benefit from the system, but the physicians working in the Province are expected to benefit as well.

6.5 Exhibit 6.2 reflects the estimated annual volume of activities handled by approximately 6,000 staff in the 34 hospitals in DHAs 1 to 8 across Nova Scotia. Hospitals within DHA 9 (the Capital District Health Authority, CDHA) and the IWK Health Centre are not part of the system being implemented as these facilities use other electronic hospital clinical information systems, but the goal is to provide an interface between NShIS and these entities to achieve interoperability.

6.6   The Nova Scotia hospital Information System will provide health care professionals with quick, accurate, and appropriate access to patients' acute care medical history information, which is important to providing patient care. The Enterprise Electronic Medical Record (EMR) component of the system provides shared access, on an authorized and need to know basis, to providers in the 34 hospitals where the system is being implemented. The NShIS is a foundation component necessary for a Provincial Electronic Health Record (EHR). The EHR, which will include all components of healthcare such as Primary Care, will provide an integrated view of patient information, and will support the sharing of pertinent information among attending care providers within and between Provincial hospitals as well as primary care providers.

6.7   The NShIS system is intended to achieve the following qualitative benefits:

-     a common electronic medical record, providing authorized caregivers access to information about services provided to the patient regardless of the facility in which the service was provided;

-     access to previously unavailable data and information that will allow managers to have the opportunity to manage resources (note that the financial module is not being implemented and that this benefit refers to interfaces and activity information);

-     integration between modules and diagnostic equipment, eliminating duplication of tests and reports; and

-     facilitation of support tools such as identification of drug interactions.

6.8   The equipment and Meditech software were acquired from two suppliers which partnered for this and other similar projects. The software supplier provided training in the area of standards and modules as well as maintaining on-site support staff during implementation. An external project manager, business process analyst and technical information architects were contracted to form part of the complement of the project management office. The project team was comprised of staff from DHAs, the Department of Health (DOH) and the external project manager. The project structure also included sponsors, a steering committee and an advisory committee, see Exhibit 6.5

6.9   The 2002 Report of the Auditor General (page 155) included the results of our review of the status of the NShIS project at that time.

RESULTS IN BRIEF

6.10   The following are the principal observations from our review.

■   The level of assurance provided on the findings and conclusions in this chapter is less than for an audit (i.e., a review provides moderate assurance

while an audit provides high assurance). This is because of the type of work we performed. Our evidence was based on management representations and review of applicable documentation. We did not test controls in place at the various sites visited.

■ DHA management and users have expressed high levels of satisfaction with the system and its benefits.

■ In March 2001, the Department of Finance informed DOH of the opportunity to use newly available capital funds "*so long as we can purchase and receive product by the end of this fiscal year*", three weeks away. Four days later, the Business Technology Advisory Committee (BTAC) and the Department began negotiations to acquire the hospital clinical information system pursuant to a request for proposals (RFP) process concluded in late 1999. On March 30, 2001 the Deputy Minister signed the supplier purchase agreement, amounting to approximately $20 million for hardware and software. We are concerned that this very tight timeframe may have impacted the decision to proceed with the results of the 1999 Request for Proposals rather than enter into a new RFP. We understand that the results of the 1999 RFP had undergone an extensive review process and that DOH wanted to move forward with a system that already had the support of the DHAs.

■ We examined the project management methodology used by the project manager and compared it to the Project Management Institute's *A Guide to the Project Management Body of Knowledge* (PMBOK Guide, 2000 Edition). The project management methodology was consistent with the PMBOK. Although not all documentation was in the exact form suggested by the PMBOK, the methodology applied addressed key PMBOK areas.

■ The development of Province-wide practice standards was necessary for the project to succeed. This was a significant task as the result needed to be that all functional units within hospitals in the Province would capture the same data and document patient-related activities in a consistent and comparable way. The standards changes played a major role in the problems which surfaced at the first patient care system module implementation (DHA 7 regional hospital). Lessons learned from that experience have been incorporated in the remaining implementation plans and activities.

■ There have been reductions in the scope of the project due mainly to issues which were not anticipated in the planning phase. For example, the Patient Care System (PCS module) likely will not be fully implemented by all sites at the conclusion of the project, and there are still issues associated with when physicians will have remote access from their offices. The PCS module has been implemented in 6 of the 34 hospitals. A revised implementation strategy has been developed resulting in extending implementation timing into 2007. Additional funds will be required for related computer equipment. However, the costs of the software and estimated training are included in the NShIS budget.

■ Management indicates security and confidentiality of patient information and records, and system backup and recovery have been addressed, but NShIS data center disaster recovery plans should be formalized and tested.

■ The ability of the three hospital information systems (IWK, CDHA and NShIS) to communicate and share information formed part of the objective for the NShIS. This issue is now being addressed separately as the approach has broadened to include more health systems than just the NShIS. Partial implementation is planned for the summer of 2005.

REVIEW SCOPE

6.11   The objectives of this assignment were to review and assess the adequacy of:

- project planning practices;

- compliance with the government's procurement policy for purchases related to the NShIS;

- project implementation practices;

- monitoring and control practices;

- change management processes; and

- the processes used to familiarize staff with the new systems and provide training and ongoing support

6.12   We discussed our review plan with Department of Health management in late fall of 2004. We used criteria from recognized sources including the Project Management Institute's *A Guide to the Project Management Body of Knowledge* (PMBOK Guide, 2000 Edition). The Project Management Institute (PMI) is the foremost advocate for the project management profession. This document identifies generally recognized good practices in project management which were developed through a voluntary, consensus-based, standards development process. The practices described in the Guide are applicable to a wide range of projects and there is widespread consensus about their usefulness. The correct application of the skills, tools and techniques identified in the Guide will enhance the chances of success on a project. Other sources of criteria included CMA Canada's *Managing the Human Aspects of Organizational Change*, and Nova Scotia's *Policy on Government Procurement*.

6.13   We conducted our review from January to March 2005. Our review consisted of examination of policies and procedures, review of reports and other documents deemed to be relevant, interviews with a co-sponsor of the project, the project owner, the project managers and project staff. We met with selected management and staff at five hospitals. We did not audit or test controls at the various sites

visited. We conducted teleconference interviews with senior management of three hospitals. We completed detailed testing of expense and procurement transactions.

6.14 During the life of the project, there has been significant turnover in key positions involved with the project including the Deputy Minister, initial project manager, business analyst, chief information officer and chief financial officer. As a result we were not fully able to discuss documents or obtain responses to questions involving former occupants of those positions.

PRINCIPAL FINDINGS

Project History

6.15 The need for a new hospital information system in the Province was first discussed in the mid-1990s. The following are the major steps that led to the initiation of NShIS.

- In the mid-1990s, the government of the day developed but did not implement a provincial Health Information Strategy that envisioned an integrated hospital information system.

- In 1997, the Cape Breton Regional Health Board issued an RFP for a hospital information system. Four other regional boards, with similar system concerns, decided to participate in the evaluation of the proposals received. In all, over 100 senior clinicians and administrative staff participated in evaluating the proposals and ultimately selected a single vendor - Meditech.

- In 1999, an external consulting firm was engaged to complete a business case, system access and data warehouse assessment reports for a Health Care Information System in Nova Scotia. The reports were shared with the DOH Information Management Steering Committee (IMSC).

- In June 1999 the government of the day announced a $30 million investment in health information technology.

- During 2000, the Deputy Minister of Health requested IMSC prepare a strategic document outlining IMSC's vision. The committee described and scored 28 health projects against seven evaluation criteria. The Deputy Minister met with the Business Technology Advisory Committee (BTAC). He noted current systems deficiencies and recommended the following four priorities as well as the possibility of obtaining Federal funding through the newly established CHI Federal initiative:

    - the supplier of choice from the 1999 RFP evaluation, the specific modules of the system and an estimated roll-out of $65 million;
    - Picture Archiving System (PACS);
    - Human Resource (HR) system; and
    - Provincial data warehouse.

■ In the fall of 2000 DOH engaged an external consultant through a standing offer to identify implementation strategy options for a Provincial hospital Information System and high-level plans on how to address the infrastructure challenges in the transition to a Provincial system. The consultant provided the final report, *Implementation Strategy Options*, on March 30, 2001.

■ On March 8, 2001, the Department of Finance informed DOH of the opportunity to use newly available capital funds "*so long as we can purchase and receive product by the end of this fiscal year*", three weeks away. Four days later BTAC and the Department began negotiations to acquire the "*hospital clinical information system pursuant to an RFP process concluded in late 1999*".

■ On March 29, 2001, the Minister of Health informed the Minister of Finance of the project as required by the Provincial Finance Act. On March 30, 2001 the Deputy Minister of Health signed the supplier purchase agreement, amounting to approximately $20 million for hardware and software. The project then moved rapidly to the implementation phase.

6.16   We are concerned that this very tight timeframe may have impacted the decision to proceed with the results of the 1999 Request for Proposals rather than enter into a new RFP. We understand that the results of the 1999 RFP had undergone an extensive review process and that DOH wanted to move forward with a system that already had the support of the DHAs. Alternative procurement forms for acquisition of the system software and hardware were signed by the Deputy Minister on March 30, 2001.

Project Management Methodology

6.17   In July 2001, an external project manager was contracted (see paragraph 6.66 below for discussion of the contract).

6.18   We examined the project management methodology used by the project manager and compared it to the Project Management Institute's *A Guide to the Project Management Body of Knowledge* (PMBOK Guide, 2000 Edition). The following quote from that document provides a description of the status of those standards in the project management profession.

> "*Project management is an emerging profession. The primary purpose of this document is to identify and describe that subset of the PMBOK that is generally accepted. Generally accepted means that the knowledge and practices described are applicable to most projects most of the time, and that there is widespread consensus about their value and usefulness. Generally accepted does not mean that the knowledge and practices described are or should be applied uniformly on all projects; the project management team is always responsible for determining what is appropriate for any given project.*" (page 3)

6.19   We determined that the project management methodology described by the project manager was consistent with the PMBOK. In a few cases, the level of detail

included in the documentation was less than the PMBOK suggested. Although not all documentation was in the exact form suggested by the PMBOK, the methodology applied addressed the following key PMBOK areas:

- integration management;
- scope management;
- time management;
- cost management;
- quality management;
- human resource management;
- risk management;
- procurement management;
- change management; and
- communications management.

6.20   The software vendor provided information on implementation requirements for the system. Detailed project plans were documented and tracked by the project management office. The tool used for that process was a widely-used project management software package. It included detailed work breakdown schedules and timelines for each implementation. Progress towards achievement was monitored.

Initiation and Planning

6.21   In September 2001, the project manager completed the Project Initiation document which was consistent with the request for proposals and the proposal which was accepted. This document includes additional information such as the project goals and objectives; project scope, approach and deliverables; project timelines; project organizational structure including defined roles and responsibilities for individuals, teams and committees; ten phases with identified deliverables and creation of master work plan sequences; key assumptions; risks including assessment and mitigation; and critical success factors.

6.22   A number of qualitative benefits were identified in the *The Business Case of a Health Care Information System in Nova Scotia* completed in early 1999. Further, the project was undertaken to provide part of the basic infrastructure required to develop an electronic health record for all Nova Scotians.

6.23   The original project schedule identifies four major sections to the implementation:

- development of the standards - August 2001 - February 2002
- implementation in DHA 7 & 8 - January 2002 - December 2002
- implementation in DHA 4-6 - January 2003 - December 2003
- implementation in DHA 1-3 - January 2004 - December 2004

Change Management

6.24   The size and scope of change brought on by this project was immense. Change management deals with moving from the current processes being followed in completing daily activities to the new practices to be followed. Thorough understanding of the new processes is a critical step to achieving the project objectives. This process also included the development of Province-wide standards to be followed.

6.25   Standards - The development of Province-wide practice standards was necessary for the project to succeed. This was a significant task as the requirement was that all functional units within hospitals would follow consistent and comparable procedures and processes, capturing the same data and documenting patient-related activities in a consistent way. The computerized side of the process included development of standards dictionaries or tables of information used by the system for each of the module applications. There are over 300 dictionaries and 20,000 lines of procedures required to accomplish the standardization. As well the system is interfaced with over 180 different types of diagnostic equipment.

6.26   Standards implementation teams were developed and staffed by approximately eight to twelve persons per DHA. In all, 80 representatives from the various clinical disciplines at DHAs participated. The standards process commenced in November 2001 versus the August 2001 planned start date. Development of the standards and the change management processes required more time than the originally planned six months and expanded to slightly less than one year. With this situation, the project was delayed from the planned schedule by approximately one year.

6.27   The standards changes played a major role in the problems which surfaced at the DHA 7 regional hospital patient care system implementation (see paragraph 6.46 below). The challenges associated with change management were underestimated in the planning phase but more thoroughly dealt with in conjunction with the first implementation. Lessons learned from the DHA 7 implementations (PCS and other modules) were carried forward to the remaining implementations.

6.28   Training - It is estimated that approximately one half of the 6,000 person workforce at DHAs 1 to 8 are not fully literate in basic computer skills. Training plans include requirements for basic computer skills training, advanced training at site on the modules, train the trainer, user acceptance testing and training of end users.

6.29   Training schedules, locations for training, lists of staff requiring training, and class lists were developed and attendance at training sessions was tracked. Training facilities were constructed where required. Training manuals were developed for each module, and improved as more implementation experience was gained. Training evaluations were completed following the training sessions. More in-depth training was provided to key users for the various modules as a way of enhancing the on-site support at the various facilities.

6.30   We discussed the adequacy of training materials, manuals, techniques and facilities with the management of the various DHAs and sites visited. All indicated satisfaction with the training provided.

6.31   Impact on patient care - Minimization of disruption of patient care during the implementation process was recognized as a deliverable in the Project Initiation document. The Patient Care Continuity Plan was developed and discussed with management at each implementation.

Project Implementation

6.32   Schedule - The original implementation time frame of three years was based on information provided by the supplier and validated by an external source. The Nova Scotia experience was the first jurisdiction-wide multi-hospital implementation where separate governing bodies (i.e., multiple DHAs) were involved. The Initiation document identified this as a significant risk that could impact duration and costs of implementation. Mitigating strategies employed by the project manager included drawing on supplier experiences, collaboration with the DHAs' senior managers, drawing on experience of other senior health officials and human resource representatives.

6.33   Implementation schedules and detailed work breakdown and site plans are maintained for implementation of the various modules at the 34 hospitals, see Exhibit 6.6 for the current schedule. In summary, the system is currently functional in 26 of the 34 hospitals. The current schedule indicates completion in March of 2006 for the majority of modules. Certain modules are now delayed; see paragraphs 6.39 to 6.43 which describe the impact of scope changes on the schedule. Also see paragraph 6.26 which describes the delay because of difficulty in achieving consistent practice standards.

6.34   Originally the project plan called for DHA 8 to be the first site to go live. This was changed to DHA 7 because it was less complex and of smaller scale. Due to concerns including preparedness, training, conversion of data, and the Master Patient Index, the original November 2002 implementation date was moved to February 2003. This resulted in an additional four month delay. With the one year delay discussed in paragraph 6.26, the project was then cumulatively 16 months off schedule.

6.35   Satisfaction - Implementation of the majority of the modules has been smoother at successive sites. A post-implementation review was completed at DHA 7 by an external consulting firm in spring 2004. The overall findings were favorable. The consultants state in their overall findings that "*from an operational perspective, overall, the Meditech implementation was a success at GASHA* [DHA 7]".

6.36   At DHA 8, the senior management team interviewed each departmental director to assess benefits and issues with the system and issued a report. Exhibit 6.7 includes a sample of the advantages and disadvantages included in the report. In addition, a post-implementation review of the new billing and accounts receivable system has been completed by an external auditor with satisfactory results.

6.37   We discussed the level of satisfaction with operational management and also enquired as to whether the modules offered any improvement in the effort and results of daily work. Management responded affirmatively to both these questions.

Project Scope Changes

6.38   The scope of the project was specific. The plan assigned roles and responsibilities to approve and manage scope changes.

6.39   No major scope expansions occurred. Addition of the material management module was required to allow the Pharmacy module to maintain pharmacy inventories within the system.

6.40   Scope reductions, approved by the steering committee, occurred because of issues which were not anticipated in the planning phase. The Physician Advisory committee cancelled the implementation of the Provider Order Entry (POE) module after deciding that the module as it existed did not satisfy their requirements. The software supplier has since developed a new software program and at this time it is considered outside the scope of this project. This module is very important as it includes information for physicians on patient medication documentation and trending of important activities such as insulin / blood glucose trending (this information is available to other hospital staff).

6.41   In addition, the Initiation document established a Remote Access Team working committee. This team was responsible for dealing with the remote access to the system from physicians' offices. This access has been delayed due to concerns related to privacy and access from within a physician's private office. The Steering Committee is dealing with alternatives. Final decisions and implementation are planned to start in the summer of 2005.

6.42   The Laboratory Bloodbank module is on hold until new Federal and provincial standards are incorporated into the module. Implementation is expected to occur by March 2006. DHA 7 requested a delay in implementing the Laboratory Microbiology module. The module was ready to go live March 2005 when DHA 7 decided to request a change in the laboratory standards, delaying implementation again.

6.43   Another scope reduction is related to the Patient Care System module (PCS) which is discussed in more detail below.

Patient Care System (PCS) module

6.44   The PCS module focuses on care planning and documentation for care providers. It involves a dramatic change in nursing practice. PCS forces a different way of working than that previously followed at the local unit level within a DHA site. It is a transition not just to technology but to a new process and terminology. The implementation of PCS became the most difficult aspect of NShIS implementation.

6.45   Many different care providers use this module; nursing, occupational therapy, physiotherapy, respiratory therapy, and clinical dietary staff. It impacts the largest single component of the hospital work force. One of the key benefits of the PCS is the standardization of patient assessments and care plans, a critical benefit to patients, and the ability to share this information, traditionally included in the patient chart, with other facilities providing services to the patient.

6.46   The DHA 7 rural areas had implemented the patient care system in May 2003, with minor difficulties that were overcome. However, difficulties were experienced when implementing the PCS module at the regional hospital. While a higher level of acuity is a contributing factor, it appears that resistance to change may have also played a part. In addition, clearer definition of ownership and responsibility between the DHA and the project team would have improved this situation. The difficulties at the DHA 7 regional hospital were discussed publicly including at the House of Assembly.

6.47   Our site visit to DHA 8 at the end of the first day of implementation of the PCS module indicated a much smoother implementation. No difficulties were reported.

6.48   As a result of the experience at DHA 7, a separate patient care system project plan and team were developed. Lessons learned and key activities for each DHA/phase were documented for future implementations of the patient care system and all other modules.

6.49   To be successful, PCS requires specialized technology (wireless laptops with carts) to support documenting at the bedside. Funding requests for this technology have not been successful and as a result PCS has had limited implementation to date (GASHA and North Sydney). Additional funding and time will be required to bring this module to all 34 facilities within scope. The Project Office is working with key stakeholders to develop an implementation strategy with projected costs and timeline to complete PCS. This strategy is anticipated to be complete in June 2005.

6.50   Technology requirements - The March 2001 *Implementation Strategy Options* included technology profiles of the various hospitals. Early in 2002, the Technology plan detailed requirements for technology inventories at the sites, identification of additional requirements, lab instrument interfaces and specific configurations. In some cases, facility renovations are required both for technology and process changes by the DHA. In the case of DHAs 4 to 6, completion of the renovations is causing changes in the implementation schedule.

6.51   Point-of-care portable units had been identified in the standards development phase as a desired technological improvement for the PCS module. These units, piloted at the DHA 7 sites, allow documentation and other system interaction to occur as close to the delivery of care as possible. Similar devices were funded and deployed by DHA 8 for PCS because project funding was not provided. Requests for capital funding of approximately $1.4 million were rejected by the responsible

committee at the Department of Finance as the individual units do not meet the necessary Provincial threshold for capital assets. The project owner is now reviewing the supply market for types, costs and availability of other point-of-care units.

Project Costs and Budgeting

6.52   A Budget and Planning Coordinator (employed by the external project manager) was hired in the spring of 2002 and a Financial Working Group with defined terms of reference was established in the fall of 2002. The Financial Working Group reviews expenditure reports, cash flow forecasts and procurement activities and reports to the Project Owner. The Steering Committee receives summary updates.

6.53   The *Implementation Strategy Options* dated March 30, 2001 includes the initial budget of $41 million, consisting of both internal and external costs. On April 19, 2001, the Minister announced "*a $30 million investment over three years in a critical component of Nova Scotia's comprehensive health information management strategy, which includes electronic patient records.*" As the project progressed, the initial budget was increased, mainly in the implementation and training areas. The risk analysis had identified this possibility, as the jurisdiction wide multi-hospital implementation was a first in North America. Due to the extension of the project schedule, the contracted project management costs also increased. A number of smaller items not detailed in the original plan have arisen, individually under $1million. The current budget of $55.7 million, see Exhibit 6.8, was established in the fall of 2002 and has remained unchanged. This budget is time-phased annually over the life of the project. While there are movements within the budget categories, the projection to completion of the project remains at $55.7 million. The budget is reviewed regularly through the project governance process.

6.54   Adequate funding was identified as a critical success factor in the Initiation document. The time-phased budget provides the linkage to enable DOH financial management to ensure and coordinate project funding over the life of the project. The 2003-04 project funding budget was $3.6 million less than requested, resulting in a lengthening of the overall schedule. During 2003-2004 the project funding was further reduced. Project management noted that availability of staff was a difficulty and the project schedule did not suffer as a result of the second reduction.

6.55   The *Implementation Strategy Options* indicated costs for backfilling staff positions at the DHAs, for those involved in standards and implementation teams, would be reimbursed at 100%. Discussions among the Council of CEOs, the project sponsors and DOH management concluded that standards and implementation team costs would be reimbursed at 100% of the incremental costs while training costs would be reimbursed at 50%. The number of training days, based on experience provided by the supplier, forms the basis of the training budget and training schedules. We tested a number of claims submitted by the DHAs and found the rates were being complied with. However, the timing of claims submissions was to be quarterly, and this requirement was not complied

with consistently. There were delays exceeding 12 months in filing of claims. Management acknowledges the process to be cumbersome as it is too detailed. We concur that changes should be made to eliminate the detail and streamline the process.

6.56 The project budget does not include all costs, for example 50% of the training costs referred to above. As well, it does not include:

- the cost of the space occupied by the project management office within DOH leased premises;
- the point-of-care units; and
- the cost of the new physician Provider Order Entry Module (see paragraph 6.40).

Project Controlling

6.57 External consultants recognized project governance as an area to be defined in the planning stages, including project organization structure, roles and responsibilities and terms of reference for individuals, committees and teams. Processes have been established for:

- reporting formats, routing and frequencies;
- meeting schedules, status reports, communications and updates to the various stakeholders;
- Advisory Committee and Steering Committee minutes;
- circulation and discussion of regular project status reports; and
- circulation and discussion of regular project manager reports.

6.58 All of the above focus on the topics of scope, timeline, budget, risks and issues management.

6.59 The project manager performs regular status reviews and monitors issues and risks with the following groups:

- project management staff;
- various implementation teams;
- senior-management teams of the active DHAs; and
- managers/directors of the affected areas within the DHAs.

6.60 Communications via the internet site established for the project also include reports on the status of the project. BTAC requested and received regular updates on the project commencing October 2001.

6.61 As part of the control and monitoring, discussions and presentations occurred. However, signed approvals and formal sign offs were not well documented throughout the project. For example, under the BTAC terms of reference section on assigned responsibilities, BTAC is responsible for approving major and non-compliant information technology projects and initiatives. However, at the outset,

BTAC did not provide formal approval, although as indicated in paragraph 6.15, BTAC members were aware of the project, participated in the procurement of the system and received regular updates.

6.62 Formal sign-offs are also not documented in other areas although management has indicated that the reviews and approvals take place but are not formally documented. For example, the following are not formally signed off:

- pre-and post-implementation acceptance;
- meeting minutes; and
- detailed project budgets.

Procurement

6.63 We found that procurement transactions were in compliance with Provincial Procurement Policies and the project procurement policy guideline.

6.64 We tested the more significant project procurements for compliance with Provincial Procurement Policy requirements. A project procurement policy guideline had been issued to deal with travel, accommodations, overtime, and facility renovations and how these various items would be processed. We tested claims submitted by the DHAs for backfill, training, travel, accommodations, overtime, and facility renovations and found compliance with the policy.

6.66 In June 2001, DOH issued an RFP for a project manager to implement an effective methodology to manage the project. Following a competitive bid process, an externally contracted project manager was engaged in July 2001 and the project management staffing commenced. The consultant selected submitted the lowest cost proposal. The initial contract of $1 million was extended twice for an additional total of two years due to the extended project schedule. This extension resulted in an increase in the vendor's project management contract of $1.6 million. A lack of availability of administrative staff within DOH resulted in the project manager having to contract administrative staff. While this resulted in a $1.9 million increase in payments to the project manager, these were included in planned project costs. The total project management contract cost was $4.5 million.

Security and Privacy of Patient Information

6.67 As indicated in paragraph 6.13 above, we did not perform any assurance work in this area but relied on management representations and review of selected documents.

6.68 The Privacy Policy working committee established policy and legal requirements with regards to access to patient information. Access to the patient record is controlled by an authorization access matrix which restricts users, modules and locations and is controlled by the system. Some access is limited to receiving reports while other access is live. Access to the system at the DHA level has certain protocols including passwords and user identification.

6.69   Remote access from the physicians' office has been delayed due to concerns over privacy and access from within a physician's private office. Once inside the hospital, physicians with privileges are able to access patient records using the security protocols mentioned above.

6.70   A central data centre maintains all of the application software programs and all patient records. The DHAs are provided local copies of the Master Patient Index (demographic information on patients). At the time of a hospital visit, the secure N.S. Health Intranet retrieves and transmits the patient record.

6.71   Data storage is measured in trillions of bytes of information. The central data site has backup power facilities, fire control systems and proper housing facilities for the 63 servers used by the system. Access to the center is limited to authorized persons. Regular offsite backup occurs.

6.72   The current point-of-care wireless units are laptop computers configured with wireless transmission capabilities to enable patient care data to be transmitted from the patient bed-side. Regular sign-in and password protocols are required with these units. The system validates the identity of the unit, its location and operator. No patient data is retained on the hard drive. The patient care provider obtains the patient record, updates it at bed-side and re-transmits it through the secure intranet to the central data center using encryption codes. Management advises that testing of the wireless signal outside the buildings has indicated very minimal availability. The use of encrypted code mitigates this risk.

6.73   The NShIS Privacy and Security policy requires that random auditing be conducted on access to the NShIS system. The main goal of the audit is to identify unauthorized, unusual or unnecessary access of the system. A team comprised of representatives from each District has developed a process for generating and reviewing random audits. The team members, appointed by the District Chief Executive Officers, generate the audits for each District Health Authority on a monthly basis. The District reports to the NShIS Project Privacy Team indicating that the logs have been reviewed and provides the general results of the review.

6.74   A threat risk assessment to the network and software application was completed by DHA 9 (Capital District Health Authority) information technology staff. Recommendations included improved computer virus protection for individual work stations and documentation of changes likely to impact on the computer environment. These recommendations were addressed.

6.75   The Department of Health indicated that it has established a mutual backup capability with the Capital District Health Authority. Data stored on the DOH data centre storage devices is backed up to the CDHA's data centre storage devices and vice versa. The technology used mirrors every transaction between the two sites. The two sites are connected to each other via high speed fibre optic cable. The system is further backed-up on an incremental basis to digital tape for off-site storage. Processes have been put in place to ensure continued hospital operation when a "System Down" situation occurs.

6.76   DOH has no formalized plan for NShIS disaster recovery. The unofficial plan is to operate the system from the backup location at DHA 9 and then acquire the new hardware necessary to reestablish the system, which is estimated to take two weeks.

Recommendation 6.1

We recommend the disaster recovery plans and procedures be formalized and tested.

6.77   The Department indicated that a project is currently underway to formalize procedures, including system recovery plans to address business continuity requirements. The plan will include the utilization of current production servers that are being replaced to establish a business continuity environment. The Department indicated that appropriate fail-over testing will be conducted without disrupting the ongoing operation of the system. The Department anticipates plans to be in place by late fall 2005.

Interoperability with other Clinical Systems

6.78   Within Nova Scotia there are three clinical information systems. The NShIS system will be operational in DHAs 1 to 8. The IWK has a functionally similar, but different version, of the information system modules. The CDHA (DHA 9) does not have a single information system but has selected *best of a breed of products* for each functional area in its sites and integrated those. In order for the objective of a Province-wide information system to be achieved, all of these systems need to be able to share patient information. The overall NShIS project objective is "*to achieve an operational Meditech client server system for the province of Nova Scotia interfaced to DHA 9 and the IWK*". The ability of these systems to communicate was identified in the plans as a risk. A working committee, the CDHA and IWK Interface team, began early in the project to address this risk. The Department of Health and CDHA engaged external consultants to suggest alternate approaches that could be followed to enable better alignment with the NShIS.

6.79   Application has been made to CHI for funding support to develop more detailed plans to implement interoperability. The application is not just for NShIS but for many other Provincial programs, such as primary health care, long term care, home care, emergency health services, acute care, public health, specialty health and community pharmacy.

6.80   One way communication is planned to be implemented in 2005 for results reporting modules. Phase two will extend interoperability to remaining clinical systems and provide two-way flow of information. The planning phase is to commence in the spring of 2006.

Ongoing Support

6.81   Operational support - Following implementation, the support teams remain on site for a week or more to assist in the transition. A Provincial Help Desk, was implemented early in the project life cycle, under the direction of the operations manager. Service-level agreements and operational service agreements have been completed. Help desk service operates 24 hours a day, 7 days a week through a 1-800 telephone number. Incoming calls are tracked for prompt response. Weekly statistics on volume of calls and response times are reviewed. The response time statistics are operational only for DHA 7 at this time. The operations manager discusses issues and unresolved issues with the DHA information technology directors.

6.82   Districts 1 to 3 and 4 to 6 rely on the Provincial Help desk. Districts 7 and 8 have a help desk during the week and rely on the Provincial help desk after hours and on the weekends.

6.83   We discussed the adequacy of on-going support with the management of the various DHAs and sites visited. All indicated satisfaction with the on-going support provided at the Provincial and local levels.

6.84   Operational sustainability and support structure organization - Considerable investment has been made in information technology projects by DOH and DHAs. The Department recognizes the need to establish an adequately funded, fully staffed and managed support organization to reduce the risk of failure of these systems. An external consultant has been engaged for development of an operational support structure for the NShIS and other health initiatives. There are different organizational models that could be followed. We support and encourage the Department to conclude on the operational sustainability and support structure for the NShIS and other health IT initiatives.

CONCLUDING REMARKS

6.85   The NShIS project has many benefits, both medical and financial. Before the benefits can be achieved, 6000 professional and other staff will change and standardize the way their daily activities are completed and 3000 nurses will change and standardize nursing practices. Physicians will also benefit from the system.

6.86   With the majority of the system implemented, benefits have already been informally identified by management, such as:

- improved standards of practice;
- drug interaction checking;
- reductions in cost, fewer repeat tests, reduced length of stay;
- less duplication in registration and information gathering; and
- availability of previously unavailable information.

6.87 The duration of implementation will exceed the planned schedule. As pointed out by external parties, the implementation schedule was aggressive. The Nova Scotia experience was the first jurisdiction-wide, multi-hospital implementation in North America where separate governing bodies (i.e., multiple DHAs) were involved. We concluded that the project management techniques used were consistent with best practices.

6.88 As the number of implementations increases, users repeatedly state their satisfaction with and support of the system and their desire to utilize more of what the system has to offer.

Exhibit 6.1   **NShIS Modules Implemented**

Admissions - This admissions module expedites the registration and admission process for inpatients, outpatients and other patients who arrive in emergency rooms, for surgical day care, observation or those referred to other facilities.

Billings and accounts receivable - This module provides an automated billings and accounts receivable system based upon electronic patient care information.

Case management - This module provides additional abstracting capabilities.

Corporate management - This module facilitates the process of making changes to computer software.

Community wide scheduling - This module provides for the scheduling of all resources (physician, examining room and equipment) for inpatient and outpatient visits including surgical services, outpatient departments, diagnostic and therapeutic departments and any other service provided within the facility.

Data repository - This module allows for the creation of ad-hoc reports and statistical analysis.

Enterprise medical record - The electronic medical record contains information on patient visits conducted in a community or regional hospital across Nova Scotia.

Imaging and therapeutic services - This module expedites the entire exam process, from patient registration to the final test results. Exams can be conducted for diagnostic imaging, cardiology, neurology and pulmonary function testing.

Internet gateway - This module allows access to the computer system via the internet.

Laboratory - The laboratory system consists of four modules – laboratory, microbiology, blood bank and anatomical pathology. This module assists in processing requests, collecting specimens, organizing tests and capturing and reporting test results.

Medical records and abstracting - This module contains a database of the demographic, insurance and clinical visit history information for every patient, including patient charts. Data can be abstracted, stored and summarized to produce in-house reports as well as information for the Canadian Institute for Health Information.

Order entry - This module allows staff of nursing units, clinics and ancillary departments, including laboratory, diagnostic imaging and pharmacy, to enter orders. Test reports and treatment results from diagnostic and therapeutic departments are electronically reported.

Outpatient campus - This module allows for the entry of orders with abridged patient information in offsite locations.

Patient care system - This module allows care providers to electronically view, update and process relevant information components of a patient care plan. Clinically significant data on the patient's progress is captured and is readily accessible.

Pharmacy - This module assists pharmacists in their daily activities such as processing orders and filling prescriptions.

Nova Scotia hospital Information System Statistics

Exhibit 6.2

Hospitals involved		34
Impacted users		6,000+
Number of hospital beds		1,800+
Inpatient admissions		61,000
Outpatient visits		346,000
Emergency room visits		506,000
Diagnostic images		585,000
Laboratory	- specimens	3,000,000
	- orders	5,500,000
	- tests	12,000,000
Microbiology	- specimens	437,000
	- orders	365,000
	- tests	1,000,000
Pathology	- specimens	290,000
	- orders	186,000
	- tests	587,000
Blood	- specimens	89,000
	- orders	100,000
	- tests	339,000

Source: Department of Health
Estimated for the 2000-01 fiscal year.

Exhibit 6.3

Nova Scotia Health Information Framework

CIHI
Statistics Canada
Clinical
Demographic
Research

TOWARDS ACCOUNTABILITY/EBM

Provincial Health Data Warehouse
Management/Planning/Reporting/Research

ANONYMOUS INFORMATION

PATIENT-SPECIFIC INFORMATION

Data Repository: Health Care Operational Data

TOWARDS THE EHR

NShIS
Capital District hIS
IWK hIS

Public Health

Home Care Support
Systems

Community
Pharmacies

Emergency
Services

PACS
(Picture Archiving
and
Communications
System)

Hospital
Administration
Finance/Human
Resources/Payroll etc.

Insured Services

Mental Health

Telehealth

Primary Care
Community Based

Long Term Care
Support Systems

Speciality
Clinics/Provincial
Programs

Integrated Provincial Infrastructure

Privacy/Access/Security policies and tools
Data standards/Unique identifiers/Registries
Electronic data communications

Legend:
EBM – Evidence-based management
EHR – Electronic health record

Source: Department of Health
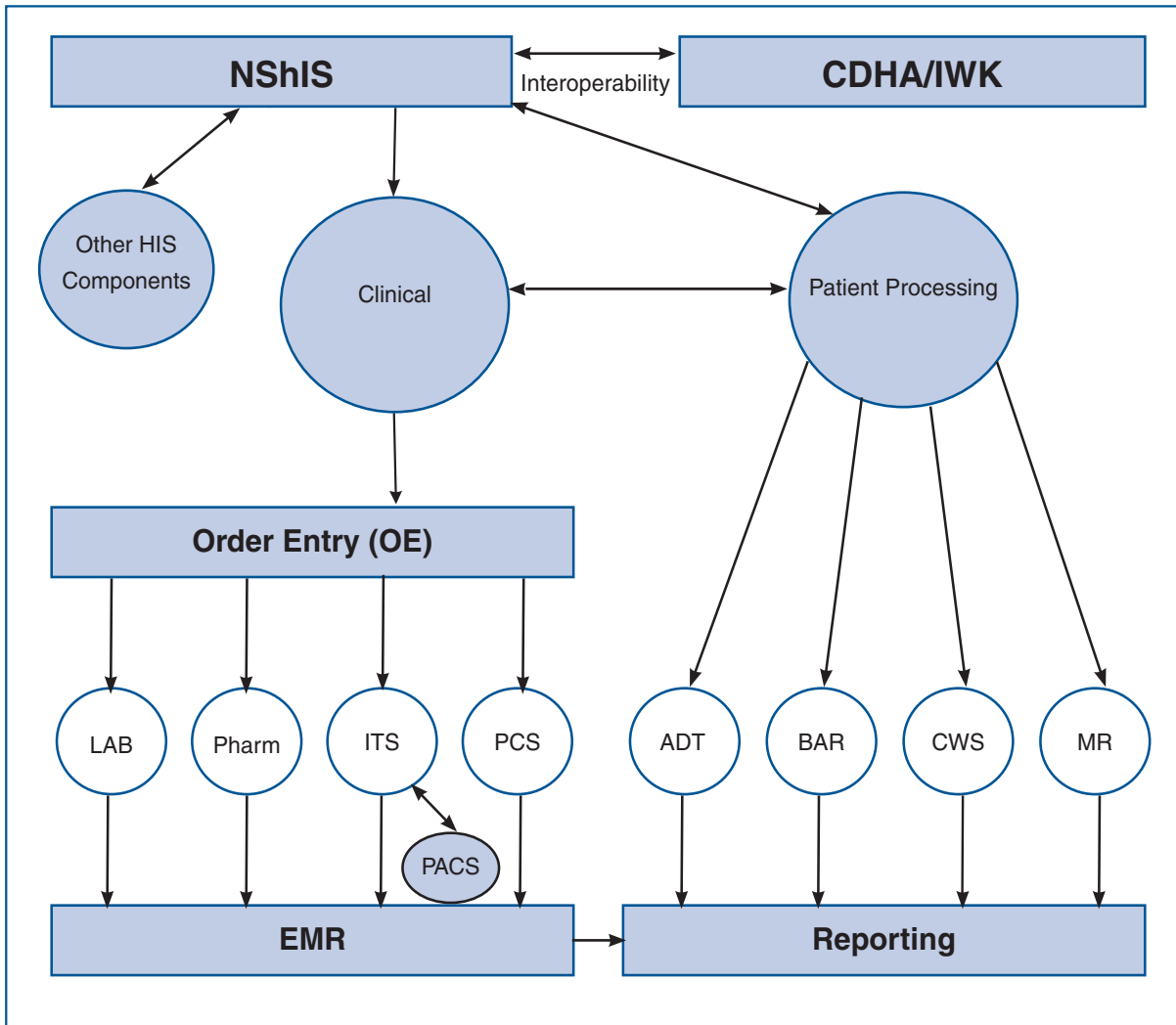
Legend:

ADT –   Admissions, discharge and transfer
BAR –   Billings and accounts receivable
CWS –   Community wide scheduling
EMR –   Electronic medical record
ITS –   Imaging and therapeutic services
LAB –   Laboratory
MR –   Medical records
PACS –   Picture archiving and communications system
PCS –   Patient care system
Pharm –   Pharmacy

Source: Department of Health

Exhibit 6.5

Nova Scotia hospital Information System
Summary of Current Responsibilities and Accountability

Executive Sponsors
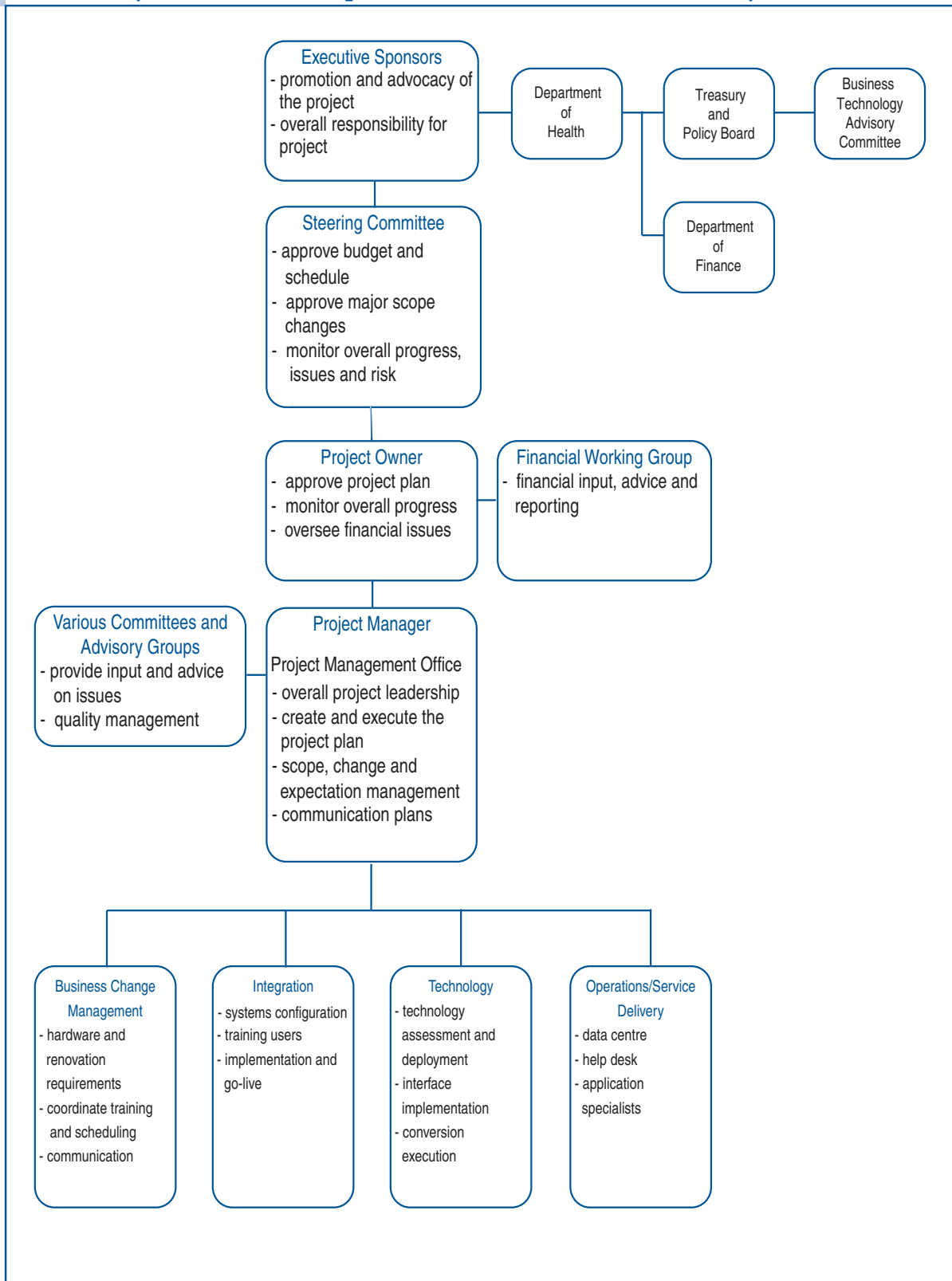- promotion and advocacy of the project
- overall responsibility for project

Department of Health

Treasury and Policy Board

Business Technology Advisory Committee

Department of Finance

Steering Committee
- approve budget and schedule
- approve major scope changes
- monitor overall progress, issues and risk

Project Owner
- approve project plan
- monitor overall progress
- oversee financial issues

Financial Working Group
- financial input, advice and reporting

Various Committees and Advisory Groups
- provide input and advice on issues
- quality management

Project Manager

Project Management Office
- overall project leadership
- create and execute the project plan
- scope, change and expectation management
- communication plans

Business Change Management
- hardware and renovation requirements
- coordinate training and scheduling
- communication

Integration
- systems configuration
- training users
- implementation and go-live

Technology
- technology assessment and deployment
- interface implementation
- conversion execution

Operations/Service Delivery
- data centre
- help desk
- application specialists

Nova Scotia hospital Information System
Approximate Dates for Implementation of Meditech Modules

Exhibit 6.6

DHAs	2003 Quarter				2004 Quarter				2005 Quarter				2006 Quarter				Notes
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	

Implementation Dates

DHA 1 — implementation 2004 Q2–Q4

DHA 2 — (dotted) 2005 Q3 — Note 3

DHA 3 — (dotted) 2005 Q2–Q3 — Note 3

DHA 4 — 2004 Q2–Q4 —

DHA 5 — 2005 Q1–Q2 (dotted)

DHA 6 — 2004 Q4–2005 Q2 (dotted) — Note 4

DHA 7 — 2003 Q1 — Note 5

DHA 8 — 2003 Q3–2005 Q1

Original Implementation Plan — 2003 Q1–2005 Q1 — Note 6

——————— Implementation has occurred as of March 31, 2005

· · · · · · · · Implementation will occur after April 1, 2005

Note 1 – The implementation date for the bloodbank system of the laboratory module has not been determined.

Note 2 – The patient care system was implemented in the community hospitals in DHA 7 in May 2003, and in St. Martha's Regional Hospital in November 2003. This system will be implemented in the community hospitals in DHA 8 during March to December 2005. No implementation date has been established for the Cape Breton Regional Hospital. No implementation date has also been established for DHAs 1 to 6.

Note 3 – The implementation for the community scheduling modules for these two DHAs has not been determined.

Note 4 – The implementation date for the pharmacy module has not been determined.

Note 5 – The implementation date of microbiology system of the laboratory module has not been determined.

Note 6 – The original project schedule showed DHA implementation planned for January 2002 to December 2004.

Exhibit 6.7

Cape Breton District Health Authority
Certain Advantages and Disadvantages of the NShIS

Advantages

Admissions - While the initial registration can be lengthy, subsequent visits are quick to register and demographic data is easily updated.

Patients - There is less repetition of personal information. Computerized patient records allow relevant information to be available where and when it is needed.

Laboratory - Specimens are labeled at their source using bar codes and all processing uses the bar codes. This improves specimen tracking, patient safety and utilization of laboratory resources.

Laboratory - Standardization among all provincial laboratories has made ordering more consistent, comparisons easier and more meaningful.

Pharmacy - Automated drug interaction checking prevents errors and results in better patient care.

Nursing - The use of bar codes for patient identification has resulted in fewer errors, not just transcription errors, with automated data capture.

Physicians - The integrated view of patient data, with quick and easy access to up-to-date patient information results in more timely diagnosis and treatment.

Diagnostic Imaging - Report distribution is greatly improved as the nursing units get their reports immediately after they have been signed.

Management - Ad-hoc reporting can be used to make evidence based decisions and maximize the utilization of resources.

Management - Measures of quality of care and other performance measures are available to help identify opportunities for process improvement and ensure compliance with accreditation standards.

Disadvantages

Clerical workload has significantly increased in some areas.

Sometimes responsiveness of provincial support can be slow.

Source: Cape Breton District Health Authority

Nova Scotia hospital Information System
Summary of Actual and Projected Costs ($ millions)

Exhibit 6.8

Category	Budget*	Actual Cost to March 31, 2005*	Projected Cost to Complete*
External costs			
Meditech software	14.1	14.1	-
EMC^2 hardware	6.1	6.1	-
Interface engine (Data Center)	1.4	0.7	0.7
Interface and conversions	1.4	1.2	0.2
Hardware and software	4.9	3.9	1.0
Project Management Office	4.5	3.7	0.8
Other external resources	1.4	1.0	0.4
Internal costs			
Core implementation team (backfill, travel and meals)	14.8	11.8	3.0
Other process implementation costs	1.0	0.7	0.3
Staff training (note 1)	2.1	1.0	1.1
Other change management costs	2.7	2.3	0.4
Miscellaneous	1.3	1.0	0.3
Total	**55.7**	**47.5**	**8.2**
*Contingency included in various cost categories	1.9	1.3	0.6

Note 1: *PCS training costs of $80,000 (7,700 training days) are included in the projected cost to complete.*

Source: *Department of Health*