NS Digital Health 2020
Enterprise Architecture for NS Healthcare

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WHY?

- Aging and unhealthy population
- Healthcare costs almost 50% of the provincial budget
- Investments in Healthcare IT only ~50% of the national average
Presentation
1. Enterprise Architecture work healthcare context
2. EA in NS healthcare: past, present and the future
3. EA and Provincial Programs
1. Nature and Goals of Enterprise Architecture Work
What is (Enterprise) Architecture? (1/2)

A blueprint?

Architectural work or process?
What is (Enterprise) Architecture? (2/2)

An end result of architectural work?
"Whether it be the sweeping eagle in his flight, or the open apple-blossom, the toiling work-horse, the blithe swan, the branching oak, the winding stream at its base, the drifting clouds, over all the coursing sun, form ever follows function, and this is the law. Where function does not change, form does not change. The granite rocks, the ever-brooding hills, remain for ages; the lightning lives, comes into shape, and dies, in a twinkling.

It is the pervading law of all things organic and inorganic, of all things physical and metaphysical, of all things human and all things superhuman, of all true manifestations of the head, of the heart, of the soul, that the life is recognizable in its expression, that form ever follows function. This is the law."

An American architect Louis Sullivan (1856-1924)

= Our purpose should define our architecture and solutions

Works of Frank Lloyd Wright (1867-1959)
Health System Goals

Health System Goal #1: Health of the Population
Improve the health and wellness of Nova Scotians through health promotion, disease and injury prevention, enhanced primary health care and culturally competent chronic disease management.

Health System Goal #2: Health System Workforce
A workplace culture that fosters leadership, competence, collaboration and engagement.

Health System Goal #3: Experience of Care
Access to quality, evidence-informed, appropriate care.

Q: What kind of Enterprise Architecture helps us to achieve these goals most effectively?
Three Dimensions of EA

1. Business Architecture
2. Information Systems Architecture
   - Data
   - Applications
3. Technology Architecture

TOGAF 9.1 Framework

“Approximately 50% of any EA initiatives are related to TOGAF.”
The Open Group website
Enterprise architecture is the organizing logic for business processes and IT infrastructure reflecting the integration and standardization requirements of the company’s operating model. The operating model is the desired state of business process integration and business process standardization for delivering goods and services to customers.

The MIT Center for Information Systems Research 2007

The purpose of EA is the greater alignment between IT and business concerns. The main purpose of enterprise architecture is to guide the process of planning and design the IT/IS capabilities of an enterprise in order to meet desired organizational objectives. Typically, architecture proposals and decisions are limited to the IT/IS aspects of the enterprise; other aspects only serve as inputs.

Architecture as Alignment

Plumbing and Heating

Ventilation

Interior Design

Electrical
In Our Case, EA is Strategic Alignment of...

- Mandate
  - Legislation
  - Strategy
  - Drivers
  - Goals

- Information
  - Healthcare Services
  - Provincial Programs
  - Clinical Processes
  - Locations
  - Channels
  - People
  - Resources

- Applications
  - Conceptual architecture
  - Logical architecture
  - Application portfolio

- Technology
  - Data governance
  - Privacy
  - Analytics
  - Information flows
  - Standards

- Services
  - Integration layer
  - Service layer
  - Network
  - Hardware

- IT Service Production
  - Providers
  - Service models

NOVA SCOTIA
Nature of Healthcare Requires Interoperability

Public Health Services
Pharmacy System
Radiology Centre
Lab System
Hospital
Physician Office
Telehealth
Web and mobile

Practitioners
Points of Service
Regions
Jurisdictions

NOVA SCOTIA
Intra- vs. Interoperability?

Intraoperable (or “traditional integrated”) system:

Interoperable system:

NOVA SCOTIA
Creating a cohesive EHR system requires the following steps:

1. **Amassing data** ("digitalization") – through a) the use of electronic medical records in physician offices and in healthcare facilities and b) the development of registries and databases of patient data.

2. **Exchanging data** – by permitting electronic access to patient data outside individual offices and healthcare facilities through a) registries and image repositories, b) the transfer of clinical messages, including secure email, such as referrals for specialists, admissions and treatments when in hospital, etc., and c) the ability of telehealth providers to access patient information and document the encounter.

3. **Analyzing data** – through a) the amalgamation of data into databases and data warehouses and b) the use of analytics and business intelligence tools to retrospectively analyze patterns in order to influence care protocols and resource distribution.

(C.D. Howe. March 2015)
“Despite the ambitious efforts of the provincial and federal governments in Canada to implement Electronic Health Record (EHR) systems, the level of health information exchange across organizations and care settings in Canada is among the lowest in surveyed countries. Some survey findings revealed that in primary care only 12 percent of physicians are notified electronically of patients’ interactions with hospitals or send and receive electronic referrals for specialist appointments. Fewer than three in ten primary care physicians have electronic access to clinical data about a patient who has been seen by a different health organization.

Certainly, progress has been made, namely in the development of the infrastructure to store and share health information, as well as some use of information technology in primary care, but the delivery of healthcare in Canada has yet to take full advantage of the major potential benefits.”
Figure 1: Connected Health Maturity Index: Primary Care vs. Secondary/Specialist Care

Source: Accenture (2012).
Development of Cohesive EHR and Value Produced

Value from better decisions

Value from accessible information

+ Value from new applications and services enabled by solid architecture

Capturing value:
- Savings from digitalization
- Savings from automation

Prototype better decisions

NOVA SCOTIA
What Enterprise Architecture (EA) is NOT

EA is **not**
- software or application architecture
- systems architecture

...but it has a relationship with these: EA can be a *regulator* (providing standards or best practices), an *enabler* (proposing technologies or services), or an *advocate* (facilitating and championing strategic change) in these areas.
2. Enterprise Architecture Work in NS Healthcare
Three Development Stages of Enterprise Architecture in NS

1. As-is Architecture: The architecture and systems in place, the baseline (-2014)

2. Interim Architecture: A transitional architecture from the baseline into the future “Megasuite” era (2015-2020)

3. Megasuite Architecture: The architecture based on the OPOR initiative and Infoway Digital Health Blueprint (2020-)

Nova Scotia
Government
Federal Healthcare Security
Messaging Connectivity Routing and brokering
Data Access Integration Clinical Terminology Surveillance Case Management EHR Services EHR Index Insurance Data (MSI) Registries Point of Service (POS) Applications Pharmacy Radiology Center PACS/RIS
Lab Systems (LIS) Hospital Systems LTC, CCC, EPR Physician Office EMR Other Clinical Applications Administrative Systems Office and Productivity Warehouse and Analytics EHR Record Systems Master Health Record Drug Information System Diagnostic Imaging Laboratory Results Privacy, Access and Audit EHR Viewer Personal Health Record Telehealth Public Health Systems Health Information Exchange Client Registry (CR) Provider Registry (PR) Location Registry Service Registry Employee Directory Consent Registry Enterprise Bus Health Information Access Layer (HIAL) Common Services Identity and Access Privacy Virtualization...
Stage 1: As-is Architecture

- Based on Canada Health Infoway Blueprint (2003/2006)
- Jurisdictional implementation(s) of the blueprint
Current Situation - Challenges

Health Information Systems are not sustainable or scalable

Health Information does not flow across the continuum of care
Information isn’t easily shared for planning and monitoring of the health system

Costs are increasing
Infrastructure/functionality is declining
A key vendor is leaving the marketplace

The changes required in healthcare in Nova Scotia are not attainable with current systems

“A state-of-art healthcare services system that is enabled by innovative and efficient use of information technology.”

What are our ingredients?
"Writing on the Wall" (Gartner 2011)

“With this move [i.e. discontinuing Horizon product line], McKesson has correctly assessed the current healthcare IT market and recognized a shift wherein:

- Health systems are turning to "megasuite" vendors of integrated patient financial systems (PFSs), access and electronic healthcare record (EHR) systems.
- More PFS decisions are made in conjunction with next-generation core clinical systems, rather than as stand-alone products.”
Infoway Digital Health Blueprint

- An interplay between functional aspects of digital health, environments and solutions
- Rather a collection of frameworks than a blueprint as such
- Points out the need to integrate devices and mobile apps/solutions
OPOR Vision

**TODAY**

**Hospital Clinical Information Systems (185)**
- Hospital Information Systems (HIS):
  - McKesson (CDHA)
  - Meditech Client Server (DHAs 1-8)
  - MediTech Magic (IWK)
- Lab/Diagnostic Imaging:
  - Cerner (CDHA)
  - Meditech Client Server (DHAs 1-8)
  - MediTech Magic (IWK)
- Others including:
  - Pharmacy
  - Anesthesia
  - Oncology
  - Cardiology
  - Food Services
  - ...
- Electronic Health Record (EHR): SHARE (repository)

**Primary Care Physician Information Systems**
- Electronic Medical Record (EMR):
  - Nightingale
  - Practimax
  - QHR
- Others:
  - .....

**Personal Health Information Systems**
- Personal Health Record (PHR):
  - RelayHealth

**PLANNED**

**Emergency Department Information System (EDIS)**
- Computerised Physician Order Entry (CPOE)
- Mental Health Information System

**OPOR VISION**

One Person One Record (OPOR)
An integrated source of data with multiple views:
- Specialist
- Nurse
- Allied Health
- Pharmacist
- Lab Tech
- Family Doctor
- Long-Term Care
- Public Health
- Others...
- Citizen

**OPOR Stage 1**

**OPOR Stage 2**

**OPOR Stage 3**
Staged Approach

Stage 0: Finding the right vendor [and partner] for OPOR (Year 1)

Stage 1:  
   a. Replacing Hospital Systems by a staged approach (Years 2-5)  
   b. Building an OPOR Platform for subsequent stages

Stage 2: Implement missing functionality and replace some old applications (years 2-8)  
   Implementing innovative new care/service models, applications and systems leveraging OPOR Platform

Stage 3: Replacing the rest of the legacy applications by OPOR Suite (years 5-10+)  
   Implementing more innovative new care/service models, applications and systems leveraging OPOR Platform
Starting With an “OPOR Platform”

- Current Clinical Systems
  - NSHA
  - IWK
  - CHDA

- Current Hospital Systems
  - OPOR Stage 1

- New Clinical Systems
  - SHARE 2
  - PHR Pilot

- Provincial Programs
  - NS HEALTHCARE
  - eResults II
  - eResults

- Drug Information System
  - Future EMR Systems

- Business Intelligence and Analytics
- Public Health

- Cloud: nshealth.nsgov

- “OPOR Platform”

- Nova Scotia
Ingredients of “NS Digital Health 2020 and Beyond”

- **Legacy Infrastructure and Applications**
  - Replaces 40-60% of applications

- **Digital Health Innovations**
  - Innovation happens HERE

- **New Technologies and Business Models**
  - Stability is needed HERE

- **OPOR - The “Megasuite”**
  - Replaces 40-60% of applications

- **Government Enterprise Architecture**

- **New Infrastructures, Standards and Services**

- **Insurance Data (MSI)**
Two Modes of Management: “Bimodal IT” (Gartner)

Mode 1:
Stability, reliability, price-for-performance, plan-driven, approval-based, long-term deals and commitments, mature technologies, big vendors, continuous improvement

Mode 2:
Agility, empirical, innovative, business centric, close to customers, piloting, continuous feedback, iterations

Mode 2 How-To:
- EA and roadmapping
- Rethinking RFPs
- Rethinking project management
- Better business analysis
Conclusion: EA Work in NS

1. Finalize the “1st generation” work (DIS, SHARE, EMRs) AND invest in projects that reap value from the previous investments
2. Focus on projects that provide quick value (PHR), facilitate transitioning into the future (HIE), AND implement specialized systems that will not be replaced by “the Megasuite”
3. Transitioning into the “Megasuite” era by modular approach, starting with “the OPOR Platform,” replacing existing EHR components (HIS/CIS) with new ones as feasible (“Mode 1”) AND designing new solutions and services (“Mode 2”)
Benefits of Enterprise Architecture

- **Organizational design**: provides support in the areas related to design and re-design of the organizational structures during mergers, acquisitions or during general organizational change.

- **Organizational processes and process standards**: helps enforce discipline and standardization of business processes, and enable process consolidation, reuse and integration.

- **Project portfolio management**: supports investment decision-making and work prioritization.

- **Project management**: enhances the collaboration and communication between project stakeholders; contributes to efficient project scoping, and to definition of more complete and consistent project deliverables.

- **Requirements engineering**: increases the speed of requirement elicitation and the accuracy of requirement definitions, through publishing of the enterprise architecture documentation.

- **System development**: contributes to optimal system designs and efficient resource allocation during system development and testing.

- **IT management and decision making**: helps to enforce discipline and standardization of IT planning activities and to contribute to reduction in time for technology-related decision making.

- **IT value**: reduces the systems implementation and operational costs, and minimizes replication of IT infrastructure services across business units.

- **IT complexity**: contributes to reduction in IT complexity, consolidation of data and applications, and to better interoperability of the systems.

- **IT openness**: contributes to more open and responsive IT through increased accessibility of data for regulatory compliance, and increased transparency of infrastructure changes.