St. Michael's Hospital:
The Application of Digital Healthcare Technology into an existing Healthcare Expansion Project
Luis Rodrigues / Mike Keen / Phil Chow
St. Michael’s Hospital: The Application of Digital Healthcare Technology into an existing Healthcare Expansion Project

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  • *St. Michael’s / St. Joseph’s / Providence Healthcare*
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  • *Healthcare Technical Integration Specialist*
Smarter Infrastructure for Enhanced Patient Outcomes

The Digital Evolution in Healthcare

Digital Healthcare is foremost about people, process and engagement.

Rely on technology as a fundamental enabler of your organizational strategy.

Using prioritized use cases to promote effective care and improved patient experience through productivity and delivery of more efficient technology / workplace integration.

Traditional

Independent systems on separate networks

Advanced

Convergence of systems onto the hospital's IT network

Digital

Integration and workflow sharing information between systems

St. Michael's

Inspired Care. Inspiring Science.
FAST FACTS

- 463 acute adult inpatient beds
- 507,825 ambulatory visits
- 560 volunteers
- 812 physicians
- 1,689 registered nurses
- 837 Health Disciplines clinicians
- 3,977 students trained
- 330,070 diagnostic, therapeutic and other visits
- 209 investigators (scientists & associate scientists)
- 25,137 inpatient visits
- 30,025 surgeries
- 2,764 babies born
- OVER 2 MILLION square feet of property and growing!
- 73,750 emergency visits
- 77,152

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Patients, Families, Community & Health System
• Advance system transformation and integration
• Deliver the best experience possible to everyone we provide care

Internal Process
• Leverage resources across the network to advance care; take care of our workforce; and update our physical space – all to support continued excellence in patient care

Learning & Growth
• Support the development of our people
• Advance excellence in teaching and learning
• Develop strategies for employee and physician engagement
Technology & Equipment

Critical Care
- Single Room Model
- Family Inclusion

Inpatient Units
- 100% Single Rooms
- Decentralized Care

Surgical
- Imaging-Ready ORs
- Improved Pre and Post Operative Care

Infrastructure

Emergency
- Higher Volumes
- Acuity Streams
- Single Rooms

Ambulatory Clinics
- Standardized Design
- Operational Efficiencies

Public Spaces
- Enhanced Entrances
- Retail Concourse
- Horizontal/Vertical Flow
Redevelopment Goals
Through the Most Advanced Digital Technology:

**Patient Experience Enhancements:**
- Get them to their treatment faster
- Facilitate integration of health care system
- Make their stay safer and more comfortable
- Allow them control of their environment
- Provide accessibility to more information

**Staff Workflow Enhancements:**
- Provide the tools help them react faster
- Reduce those Footsteps walked in a shift
- Reduce the administrative tasks and
  Increase their time for patient and healthcare focused tasks

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Smarter Infrastructure for Enhanced Patient Outcomes!

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3.0 Technology Vision

How did we get here?

✓ Consultative
✓ Collaborative
✓ Flexible
✓ Patient and staff focused
✓ Experience-based
✓ Change Management
✓ Operational Readiness

Master Systems Integrator

Long-term technology partners

Engagement Benchmarking Priorities & Challenges

Customize Develop/prioritize Use Cases

Gap Analysis and 5-year Technology Roadmap

Evaluate / Select Technologies

Implement & Redesign Workflow

Deliver on the Strategy

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Considerations

- Leading edge not bleeding edge, proven technologies
- Portability to existing operations and infrastructure
- Requirements are obtained from the business – clinically led, technologically enabled
- Robust and reliable (24x7) infrastructure
- Sustainable, flexible, scalable,
- Adaptable to changing health care requirements
- Long implementation times
Approach – Prioritize Use Cases

St Michael’s Strategic Directions 2017 – 2020

- Best Patient Experience Possible
- Excellence in Patient Care
- Create a Healthier Workplace
- Advance System Transformation & Integration
- Advance Excellence in Teaching and Learning

Use Cases*

Operational effectiveness
Quality, safety and patient experience
Clinical workflow optimization and staff satisfaction
Security and facility management
Cost avoidance and operational savings

Integration

*Use Cases define interactions between systems and users to achieve specific goals

Technology as a key enabler of organizational strategy
IT Plan Components

Integrated Building Network connecting:
- Fire Alarm System
- Building Automation System
- Security System and CCTV
- Nurse Call System
- A/V and Video Conference expansion
- Master Clock System
- Digital Access Control and Door Lock System
- IP Based environment controls (heating, lighting etc.)
- Sound Masking and Paging
3.0 Technology Vision
How did we get here?

- Consultative
- Collaborative
- Flexible
- Patient and staff focused
- Experience-based
- Change Management
- Operational Readiness

Master Systems Integrator

- Long-term technology partners
- Engagement Benchmarking Priorities & Challenges
- Customize Develop/prioritize Use Cases
- Gap Analysis and 5-year Technology Roadmap
- Evaluate / Select Technologies
- Implement & Redesign Workflow
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Procurement

Master Systems Integrator

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THE POWER OF CONNECTED
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Smarter Infrastructure for Enhanced Patient Outcomes
The Digital Evolution in Healthcare

Independent systems on separate networks

Convergence of systems onto the hospital’s IT network

Integration and workflow sharing information between systems

Traditional

Advanced

Digital
Infrastructure in a Typical Hospital today

Nurse Call
Patient Entertainment
Access Control
Intercom
CCTV
Phone Systems (PBX)
DECT/Pagers

Data Networks

Lighting control
Blinds
Air condition
Facilities Control

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Honeywell
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All Infrastructure Connected over IP

Guiding Principle - Everything over IP with IP Everywhere
## Digital Health Technologies
### Interdependent and Driven by Use Cases

**Digital Hospital Components provided by Honeywell**

% Total Use Cases (n=61); % of Infrastructure touched by Use Cases

<table>
<thead>
<tr>
<th>Use Cases</th>
<th>Productivity (38%)</th>
<th>Patient Satisfaction (29%)</th>
<th>Safety/Compliance (20%)</th>
<th>Cost Avoidance (13%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Asset Location</td>
<td>Patient Flow – Registration</td>
<td>Infant Abduction</td>
<td>Asset Protection</td>
</tr>
<tr>
<td></td>
<td>Operational Workflow</td>
<td>Patient Flow - Wayfinding</td>
<td>Hand Hygiene Compliance</td>
<td>Asset to Patient</td>
</tr>
<tr>
<td></td>
<td>Care Coordination – eWB</td>
<td>Infection Control</td>
<td></td>
<td>Association</td>
</tr>
<tr>
<td></td>
<td>Bed Management</td>
<td>Patients Education (IBT)</td>
<td></td>
<td>Fall Risk Minimization</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Infrastructure</th>
<th>RTLS (40%)</th>
<th>HIS / EMR (70%)</th>
<th>Mobility (70%)</th>
<th>IBT (25%)</th>
<th>Security (20%)</th>
<th>Nurse Call (30%)</th>
</tr>
</thead>
</table>

**Enterprise Service Bus (ESB) (80%)**

**Network Infrastructure (ICAT) (100%)**

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Use Case: Staff Safety & Duress

- Nurse encounters an aggressive patient
- Nurse pushes the ‘assist’ button on RTLS badge
- Notification is sent to security, the nursing station, and nearby staff
- Security camera zooms in on the nurse’s location, staff in area see the nurse’s location and go to the area, security initiates a Code White response

Technology

- Enterprise Service Bus (ESB)
- Network Infrastructure
- RTLS
- HIS / EMR
- Mobility
- Integrated Bed Terminal
- Security
- Nurse Call

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Use Case: Code Coordination through Facility Integration

- Code Team receives Code Blue on mobile devices.
- Code Team mobilizes and transports patient to critical care.
- Location of staff, patient and assets are identified and nearby doors are triggered OPEN.
- Nearby elevators are called UP / DOWN and door OPENED, ready to transport patient and Code Team promptly to next destination.

Technology:

- Enterprise Service Bus (ESB)
- Network Infrastructure
- RTLS
- HIS / EMR
- Mobility
- Integrated Bed Terminal
- Security
- Nurse Call

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Use Case: Handwashing Compliance

Nurse enters patient room without washing hands

Failure of this nurse to use the dispenser is logged (identity known via RTLS badge)

Once in the room, RTLS badge beeps within ‘x’ seconds to remind nurse to wash

Nurse uses soap dispenser; beeping stops

Nurse gives meds and repositions patient in bed

Nurse leaves room without using the soap dispenser

Failure to use the dispenser is logged

RTLS badge beeps to remind nurse to wash

Technology

<table>
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<tr>
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Use Case: Connecting Assets with People

Nurse to patient: We’re going to need a stretcher to take you to radiology.

Nurse assesses ‘available stretchers’ on her phone, and then adds ‘available Porters’ to the view. Porter #3 is closest to the patient and there is a stretcher on his route.

Nurse messages Porter #3: 312 (2) needs to go to radiology. Stretcher is outside the south elevators on the 3rd floor.

Porter #3: I can see it. I’ll take that route up. On my way.

Porter #3 changes his status to “in transit” in the system.

Technology Stack

- Enterprise Service Bus (ESB)
- Network Infrastructure
- RTLS
- HIS / EMR
- Mobility
- Integrated Bed Terminal
- Security
- Nurse Call

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Technical Road Map

- Staff & Patient's Safety
- Hand-washing compliance
- Infant Protection/Abduction
- Fall Risk - minimization
- Asset Protection
- Bed/OR Management
- Patient Wandering
- Patient Education
- Visitor and Patient Wayfinding
- Patient Comfort
- Patient Location and Transportation
- Coordination of Health Care

IT Infrastructure

- RTLS
- Mobility
- IBT
- ESB
- EMR/HIS
- Nurse Call

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Lessons Learned

1. Early Design Engagement
2. Installation and Maintenance
3. Laws of Physics
4. Capacity and Accuracy
5. Application Design
1. **Design for Success**

**Engage MSI in Early Design Stage**

- **Design Phase**
  - Architects
  - Master Systems Integrator: Honeywell
  - Consultants

- **Implementation Phase**
  - General Contractor
  - Mechanical Contractor
  - Master Systems Integrator: Honeywell
  - Electrical Contractor

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St. M

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2. Installation and Maintenance

• Interference is common with incorrect installation
• Most common – signal bleeding between floors or across hallways
  - Infrared: Light travels through glass and reflects off mirrors; leads to inaccurate location of tag; TV remote has same light wavelength as many RTLS systems
  - Ultrasound: Similar frequency sounds will impact location accuracy (e.g. pneumatic tube system, water in pipes, equipment used for hearing tests)
  - RF/LF: Signals travel along metal structures, which act as an antenna, leading to signal bleeding or ‘floor hopping’
    ▪ Some technologies are better suited to a hospital environment
    ▪ Combination of technologies are needed
    ▪ Maintenance is critical – understand how changes in the hospital environment will impact RTLS functionality
3. Laws of Physics

Mitigate to account for the Laws of Physics:

- RF does not penetrate water – signal is lost
- Light, glass and mirrors interfere with light sensors
- Light sensors cannot penetrate heavy clothing
- LF will not penetrate aluminum foil
- The LF frequency of 125 KHz used by most RTLS systems is also used by card readers, laptop and LCD screens and smartphones creating interference and inaccuracy of location
4. Capacity and Accuracy

• Performance and scalability of the server is critical
• Performance is dependent upon the number of moving objects
• Each tag:

  (Many messages) x (Update frequency)

  = Thousands of messages concurrently

Design for Success → Commission for Failure
5. Application Design

- Effective planning
- Clearly defined use cases
- Well-defined requirements for integration to other systems (e.g. EMR, security, etc).
- Many frustrating challenges can be avoided through proper design
- Experience counts!
Conclusion

- Patient Centric Approach
- Develop a Vision
- Engage Master Systems Integrator EARLY!
- Prioritize Initiatives
  - Develop a Technology Roadmap
- Operational Readiness
  - Emphasis on Change Management

Design for Success ....
Commission for Failure