

A 21st Century Manifesto: The IT and CE Worlds Need Each Other to Succeed!

Elliot B. Sloane, Ph.D.

Villanova University Business School
Dept. of Decision and Information Technologies

GE Medical Biomedical Advisory Council

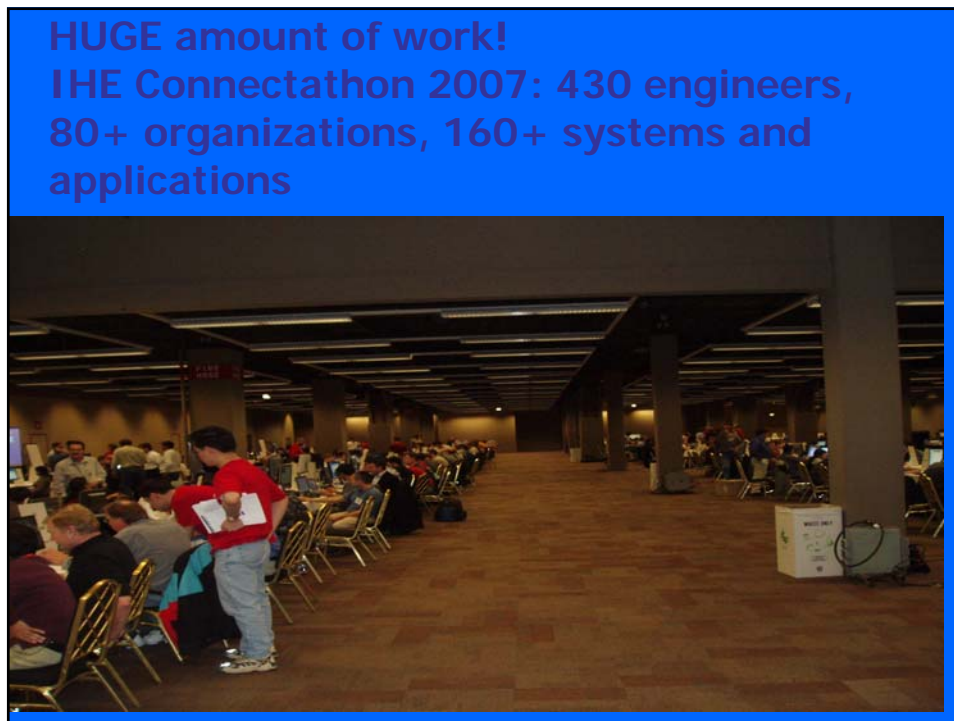
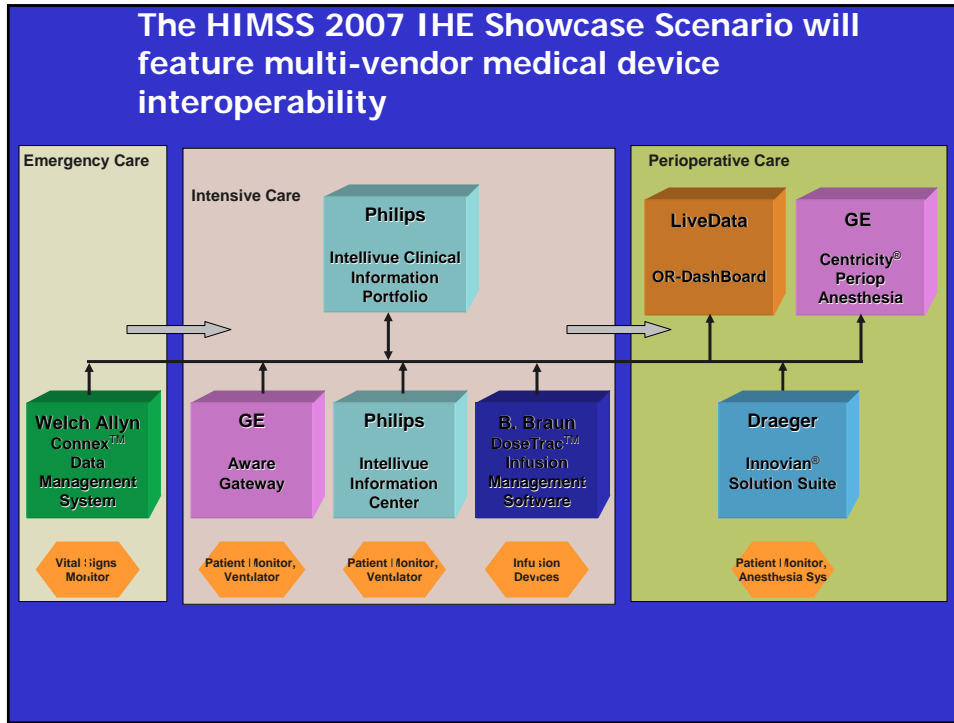
New Orleans - February 23, 2007



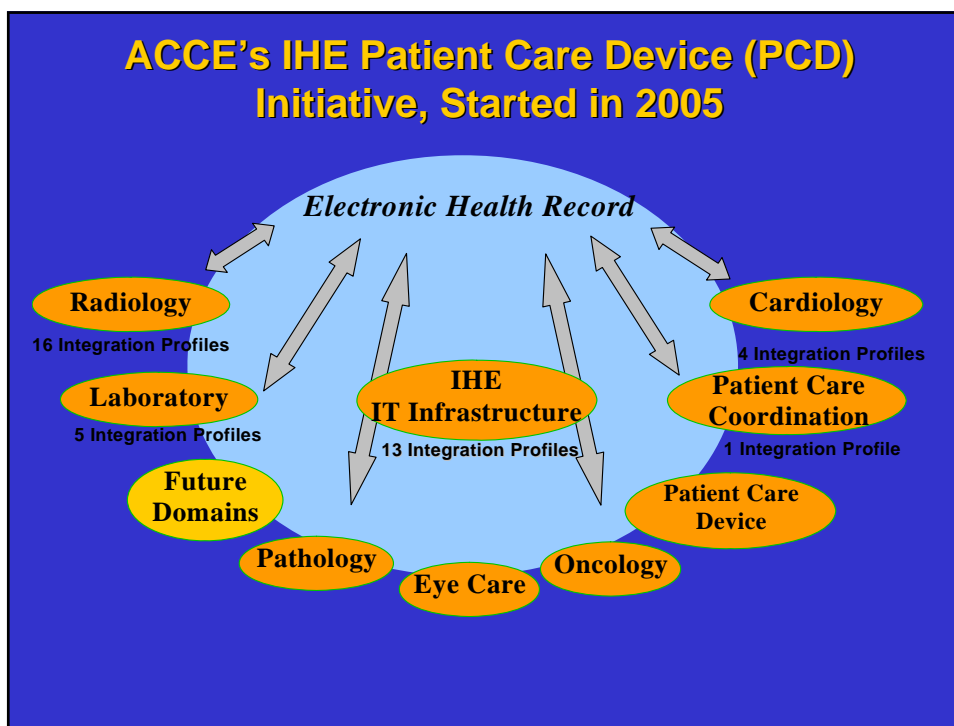
My Bio-Brief

- **Vice President, ECRI - 1975-1990, CIO & CTO**
 - Medical technology research, testing, and education; medical device nomenclature; standards directories; product evaluations; forensic/accident investigations
- **Vice President, MEDIQ/PRN - 1990-2000, COO & CTO**
 - Medical device & drug distribution, service, rental, and manufacturing
 - Registered medical device manufacturer, drug distributor, and repair company
 - 500,000 life-support devices rented to hospitals nationwide, 24x7
- **Faculty, Department of Decision and Information Technologies, Villanova University, since 2000 (*In 12-step CE and MIS Recovery Program...*)**
 - Teaching, research and publishing in databases, decision support, healthcare technology assessment and management, telecommunications, and health informatics.
 - Co-Chair of the HIMSS/RSNA/ACC IHE Strategic Development Committee
 - Board of Directors, IEEE Engineering in Medicine and Biology Society
 - Past President, ACCE; Board of Directors, ACCE Healthcare Technology Foundation
 - Advisor to WHO/PAHO in Healthcare Technology Management since 1985

A 21st Century Manifesto: The CE and IT Worlds Need Each Other to Survive!
GE Medical Biomedical Advisory Council – 23 February, 2007 – New Orleans, LA



A 21st Century Manifesto: The CE and IT Worlds Need Each Other to Survive!
 GE Medical Biomedical Advisory Council – 23 February, 2007 – New Orleans, LA



Clinical And Enterprise Networks...



Waveforms
 Parameter Data
 Alarms
 Alarm Silencing
 Telemetry Data



Scheduling
 Clinical Alerts
 Order/Entry
 Documentation

Vital to Patient Safety

Continuous Real-Time Streaming Data
 Requires High Data Integrity & Security
 Network Quality of Service Is Essential

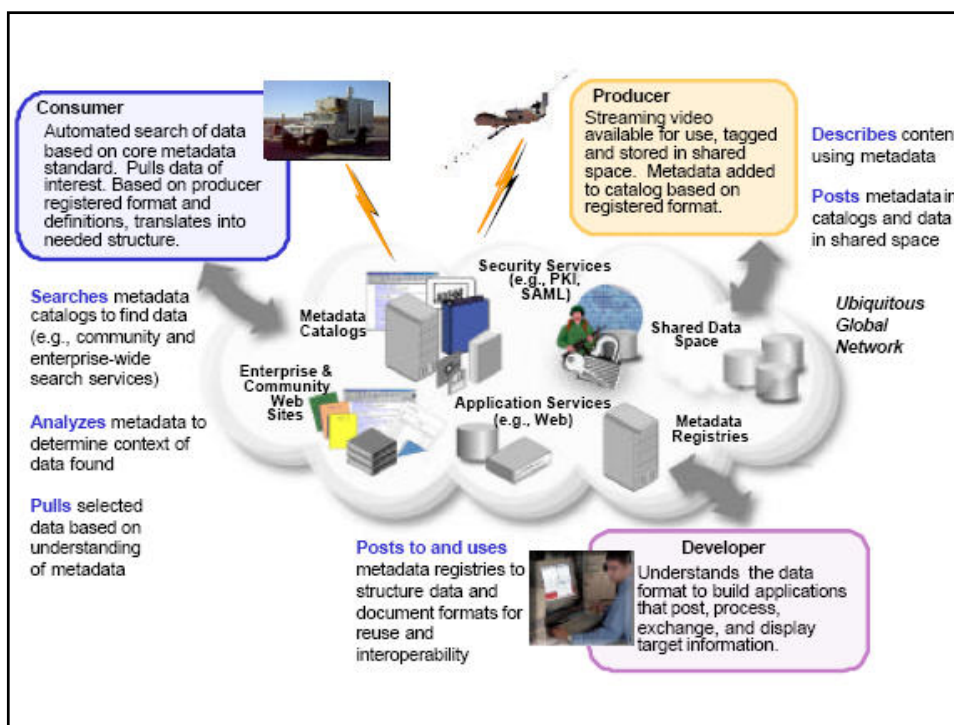
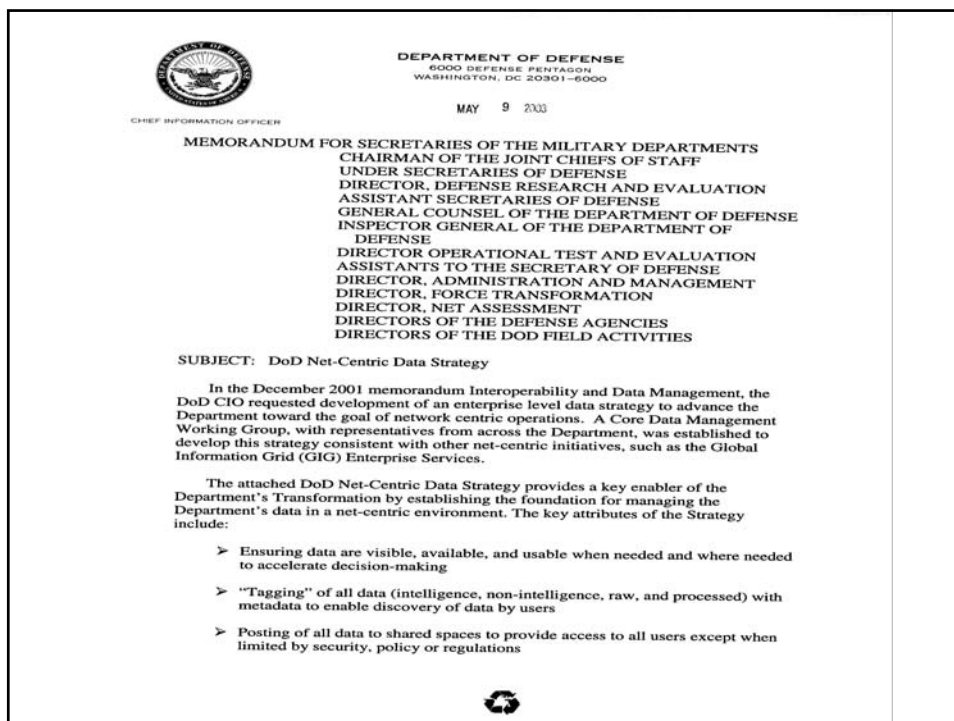
Important for Decision Support

Transactions, Transfers in Near Real Time
 Brief Interruptions Do Not Put Patient at Risk
 Dedicated Bandwidth or QoS Not Essential

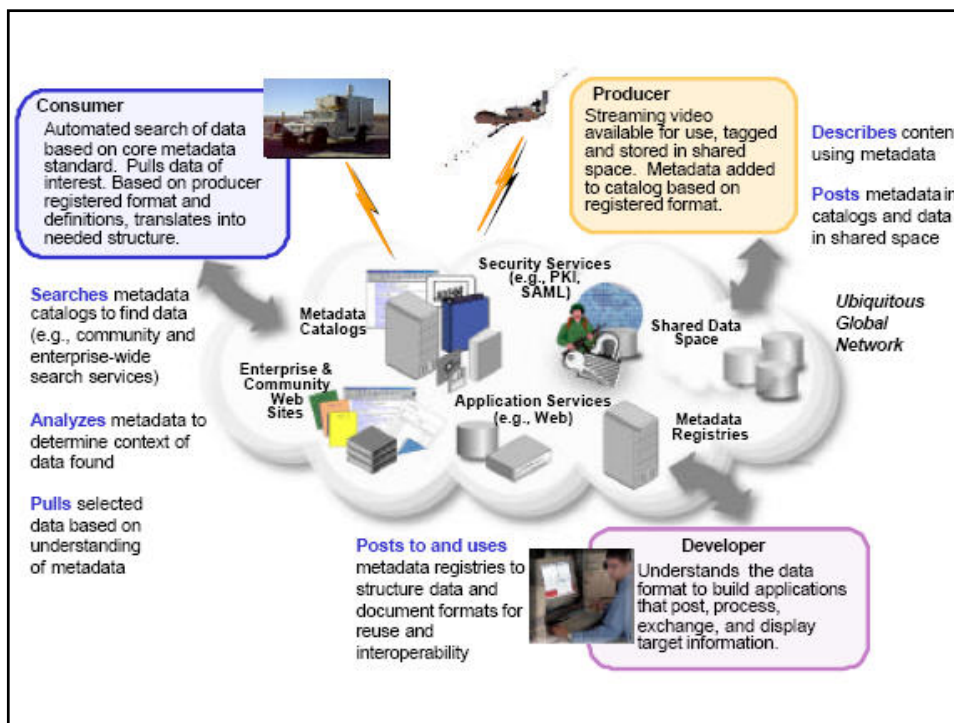
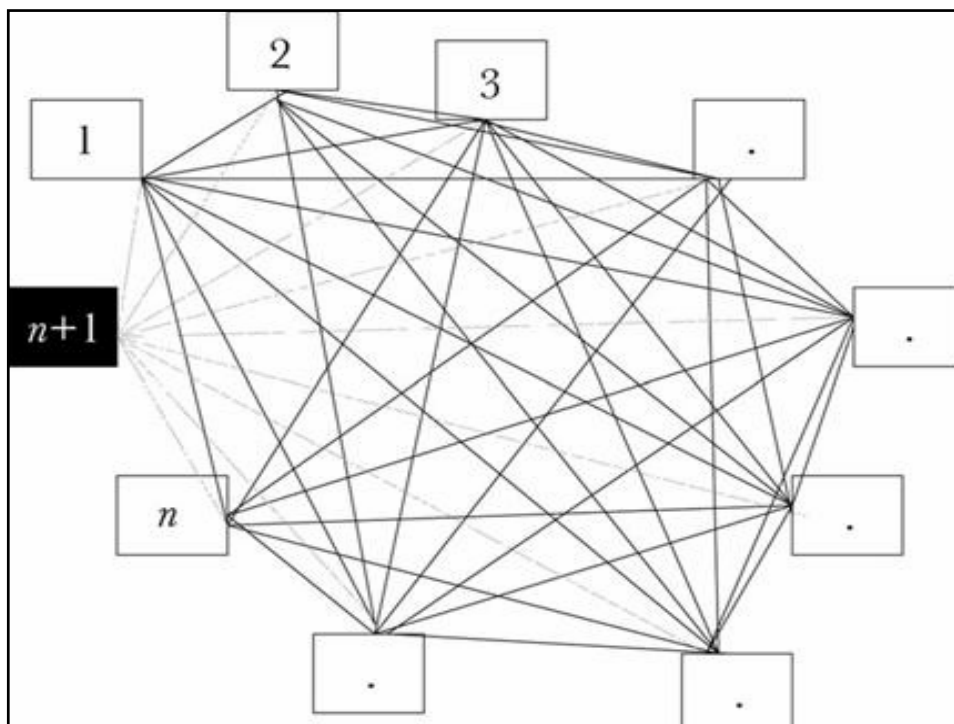
With permission, From Eric Rosow, Premise Development Corp.

A 21st Century Manifesto: The CE and IT Worlds Need Each Other to Survive!

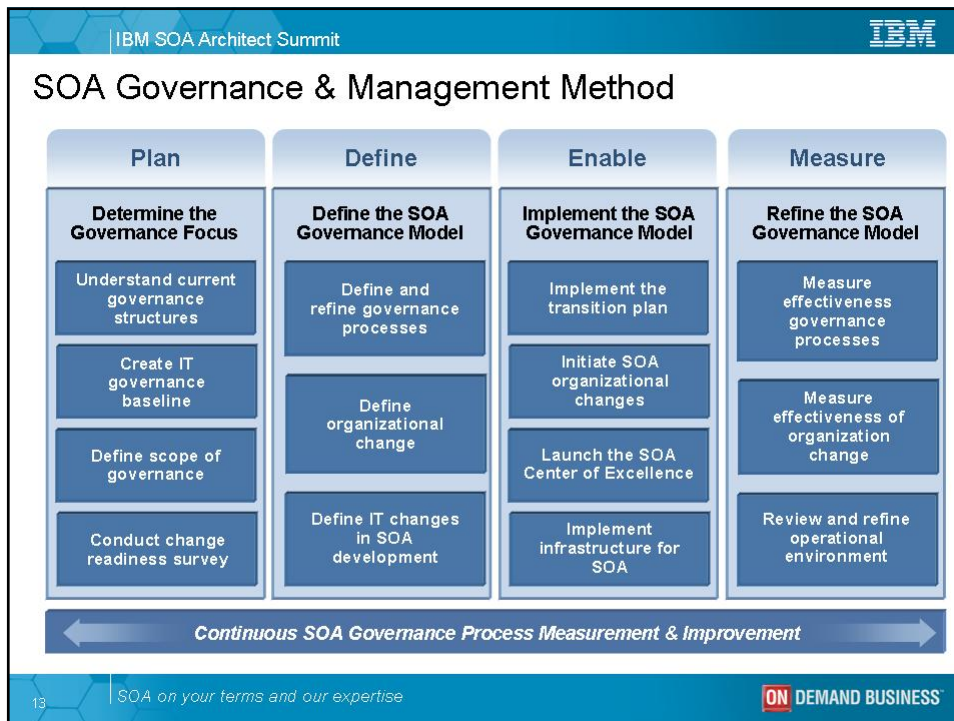
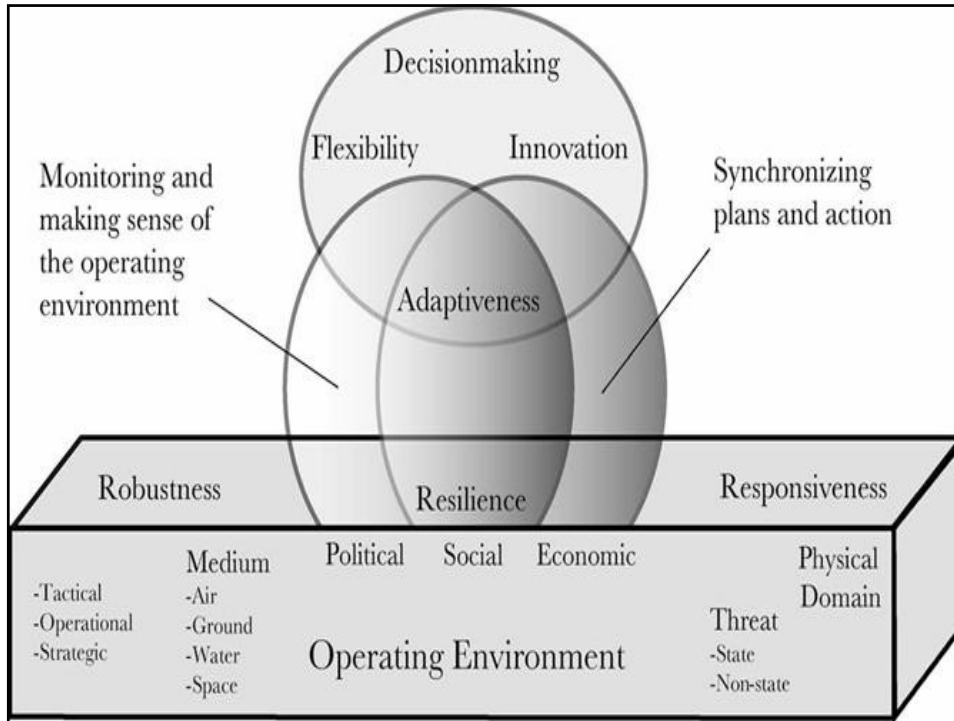
GE Medical Biomedical Advisory Council – 23 February, 2007 – New Orleans, LA



A 21st Century Manifesto: The CE and IT Worlds Need Each Other to Survive!
 GE Medical Biomedical Advisory Council – 23 February, 2007 – New Orleans, LA



A 21st Century Manifesto: The CE and IT Worlds Need Each Other to Survive!
 GE Medical Biomedical Advisory Council – 23 February, 2007 – New Orleans, LA



A 21st Century Manifesto: The CE and IT Worlds Need Each Other to Survive!
 GE Medical Biomedical Advisory Council – 23 February, 2007 – New Orleans, LA

9. SUPPORT DOD BUSINESS PROCESS IMPROVEMENT:

Ensure DoD IT infrastructure is sufficient to support cross-component business process enhancements.

...DoD is committed to the deployment of DoD Business Enterprise Capabilities through disciplined program management.

As stated in the DoD BTA's 2006 Annual Report to Congressional Defense Committees: [24] "Today, a seamless defense business infrastructure is critical to support responsive, agile military operations. The goal for Defense Business Transformation is to provide our U.S. Armed Forces, what they need—when they need it—where they need it."

The report further states that the four key objectives of the Department's business transformation efforts

In support of the BTA, the DoD CIO will support development of the GIG infrastructure necessary to operate the SOA envisioned by the draft Enterprise Transformation Plan [25], August 4 2006. This infrastructure will enable interoperation and interconnection of business systems and applications when they need to exchange information, expose functionality, or consume information across federation boundaries. Identification and monitoring of Business Enterprise Architecture (BEA)

8. CAPTURE SAVINGS THROUGH WISE IT INVESTMENTS: Align DoD IT investments with its warfighting and business strategies.

Making wise IT investments is one of the main tenets of the *Clinger-Cohen Act of 1996* [20] and has been a key foundation within DoD for IT systems acquisition for several years. The 2006 QDR states, "As an enterprise asset, the collection and dissemination of information should be managed by portfolios of capabilities that cut across legacy stove-piped systems."

On October 10, 2005, the Deputy Secretary of Defense signed the *Information Technology Portfolio Management*

The DoD must integrate portfolio management into the major decision systems of the Department, organize effectively to perform portfolio management, and continue to implement techniques to analyze, select, control, and evaluate IT investments. Decisions on which IT investments to make, modify, or terminate must be based on the GIG Architecture [22], mission area goals, risk tolerance levels, potential returns, outcome goals, and performance. All three decision support systems (JCIDS,

The DoD must integrate portfolio management into the major decision systems... to analyze, select, control, and evaluate IT investments.

A 21st Century Manifesto: The CE and IT Worlds Need Each Other to Survive!

GE Medical Biomedical Advisory Council – 23 February, 2007 – New Orleans, LA

NAE/IOM System Engineering Tools that were identified:

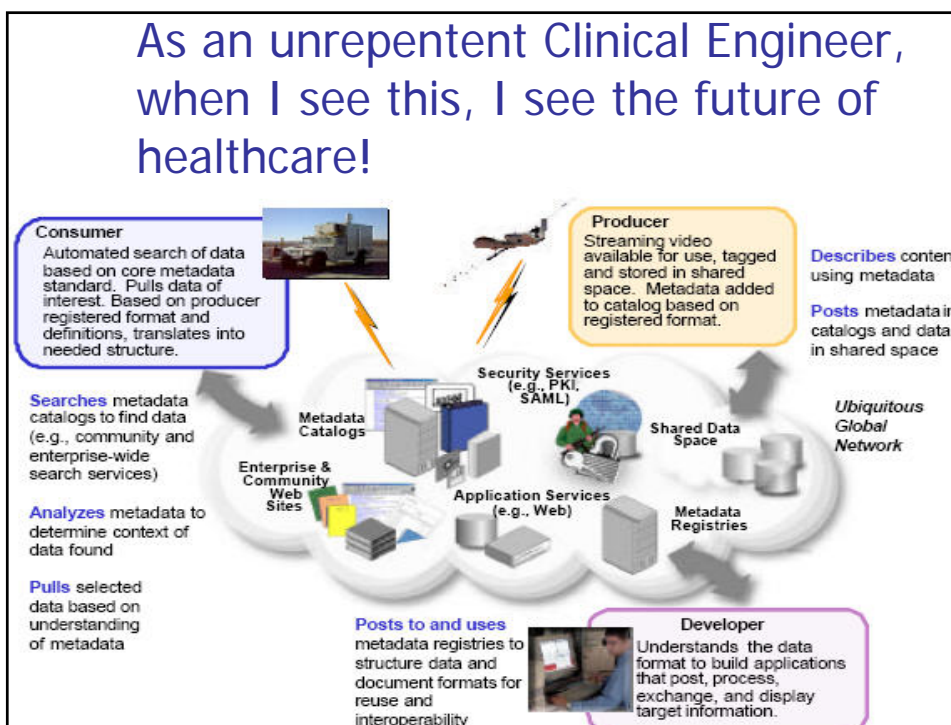
TABLE ES-1 Systems Engineering Tools and Research for Health Care Delivery

Tool/Research Area	System Levels of Application			
	Patient	Team	Organization	Environment
SYSTEMS-DESIGN TOOLS				
Concurrent engineering and quality function deployment	X	X	X	X
<i>Human-factors tools</i>		X	X	
Tools for failure analysis		X	X	
SYSTEMS-ANALYSIS TOOLS				
Modeling and Simulation				
Queuing methods		X	X	
Discrete-event simulation		X	X	X
Enterprise-Management Tools				
<i>Supply-chain management</i>		X	X	X
<i>Game theory and contracts</i>		X	X	X
<i>Systems-dynamics models</i>		X	X	X
<i>Productivity measuring and monitoring</i>		X	X	X
Financial Engineering and Risk Analysis Tools				
<i>Stochastic analysis</i>			X	X
<i>Value-at-risk</i>			X	X
Optimization tools for individual decision making		X	X	X
<i>Distributed decision making: market models and agency theory</i>			X	X
Knowledge Discovery in Databases				
<i>Data mining</i>			X	X
<i>Predictive modeling</i>		X	X	X
<i>Neural networks</i>		X	X	X
SYSTEMS-CONTROL TOOLS				
Statistical process control		X	X	
Scheduling		X	X	

NOTE: Italics indicate areas with significant research opportunities.

I think that more patient-centric applications are feasible, but they'll come later on...

Three brief examples for today's presentation.



Clinical vs. Enterprise Networks...



Waveforms
 Parameter Data
 Alarms
 Alarm Silencing
 Telemetry Data



Scheduling
 Clinical Alerts
 Order/Entry
 Documentation

Vital to Patient Safety

Continuous Real-Time
 Streaming Data

Requires High Data
 Integrity & Security

Network Quality of Service
 Is Essential

Important for Decision Support

Transactions, Transfers in
 Near Real Time

Brief Interruptions Do Not Put
 Patient at Risk

Dedicated Bandwidth or QoS
 Not Essential

With permission, From Eric Rosow, Premise Development Corp.

"Between the rock and the hard place."

We have a VERY rapidly aging population, and cannot afford healthcare without these changes.

Older Population by Age: 1900 to 2050 (Numbers)

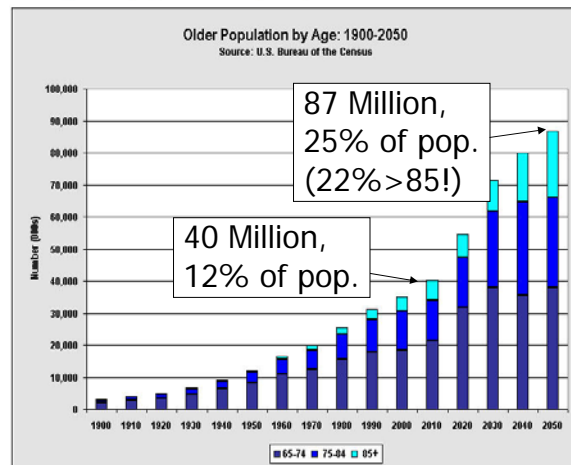


Table compiled by the U.S. Administration on Aging based on data from the U.S. Census Bureau.

In 2005, the Social Security Administration extended the US life expectancy tables to 119 years!



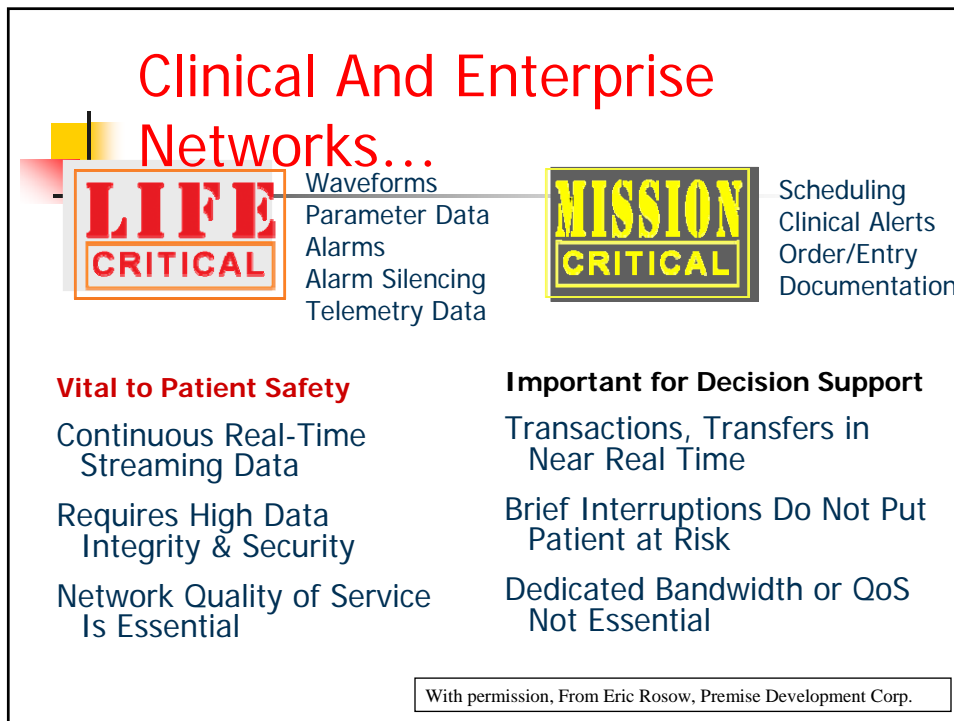
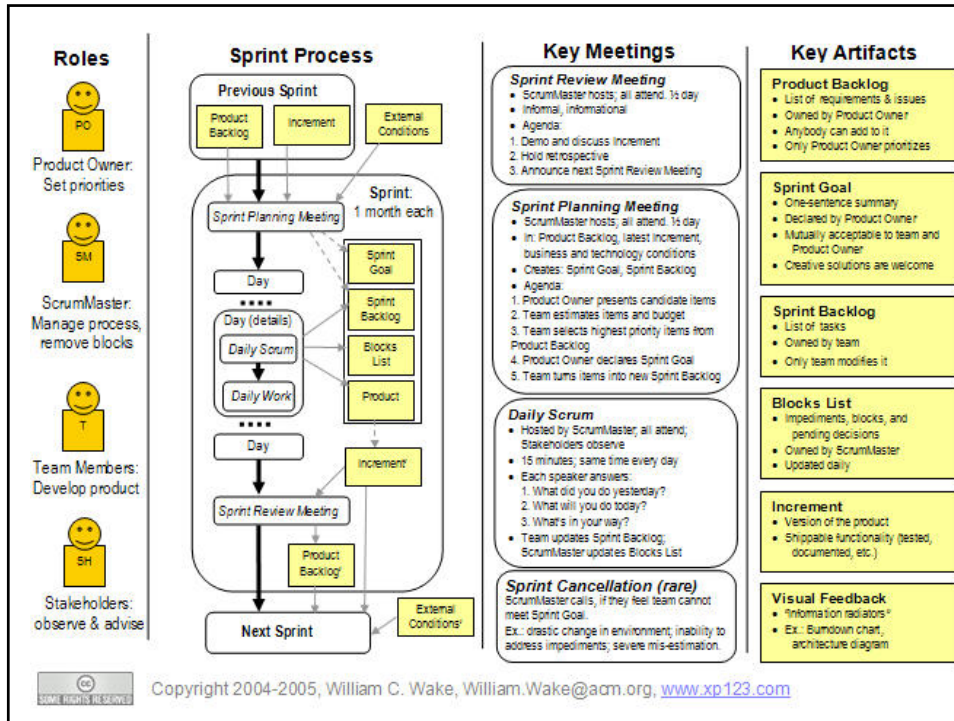
What's the impact going to be?

- Much more medical technology, in more far-flung places...
- Ever growing challenges for safe and effective support of medical technology...
- In a **LEAN** economic and operating environment that will resemble Dell or Toyota, not the 20th century health enterprise...

THE AGILE ORGANIZATION

FROM INFORMAL NETWORKS
TO COMPLEX EFFECTS AND AGILITY

A 21st Century Manifesto: The CE and IT Worlds Need Each Other to Survive!
 GE Medical Biomedical Advisory Council – 23 February, 2007 – New Orleans, LA



Is Wi-Fi Proliferation a Challenge for Us? YES

- Though these information and communication technologies are not “new,” per se, we **DO NOT INTRINSICALLY HAVE** the appropriate system design, testing, and validation tools to safely, effectively, and efficiently support the advanced and complex “system of systems” concepts that the NAE/IOM is pointing towards.

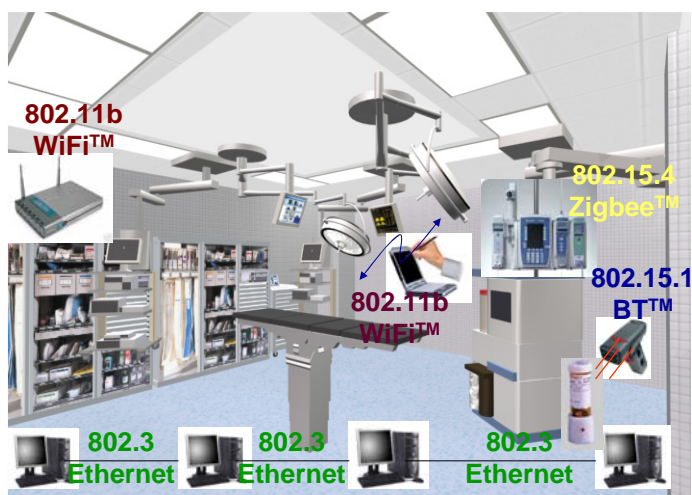
EXAMPLE of a novel “hospital-created medical device:” Using universal wireless interfaces to replace hard wires and proprietary data link communications for the “Operating Room of the Future.”

Untethered access to information

Mobility

Interoperability

Reduced cost and complexity



Courtesy of NIST, CIMIT, and ORF

A 21st Century Manifesto: The CE and IT Worlds Need Each Other to Survive! GE Medical Biomedical Advisory Council – 23 February, 2007 – New Orleans, LA

Chicago Tribune
— ONLINE EDITION —

Cutting-edge hospitals hooked to Wi-Fi support

By Terri Yablonsky Stat, Special to the Tribune, February 18, 2007

The sometimes desperate isolation of a hospital stay or visit is fast giving way to the digital age. Today's hospitals have Wi-Fi Internet access, patient-information portals and patient blogs. And many electronic gadgets, including iPods, once banned from within hospital walls for fear of interference with equipment, now pose little or no problem. Among those leading the way is the University of Chicago's Comer Children's Hospital. When it opened in February 2005, patients were provided with an entertainment and education system, including a 42-inch LCD television in each patient room, said Todd Hollowell, executive director of information technology at University of Chicago Hospitals. Patients can surf the Internet, get e-mail, view educational content, download movies and play games right from their beds. Patients and visitors also are given free, secure wireless Internet access, as long as they bring their own laptops. All material is filtered for children. "As we planned for our new kids' hospital, we wanted to take the hospital out of the hospital," Hollowell said. "We wanted it to feel as much like home as it could."

The same wireless services came on line in Bernard A. Mitchell Hospital, the U. of C.'s adult-care facility, last October. Starting this month the hospital will offer free wireless access to outpatients and visitors in the Duchossois Center for Advanced Medicine.

This spring, Evanston Northwestern Healthcare will begin installing a new Wi-Fi system that gives patients Internet access in their room and throughout the hospital. Evanston Hospital will have the service by September, Glenbrook Hospital by September 2008 and Highland Park Hospital by '09, according to Tom Smith, chief information officer for ENH. This system covers all wireless devices, including cell phones and pagers.

Evanston and Glenbrook Hospitals already have public areas with Internet connections for visitors with laptops. Highland Park Hospital will have a center ready this summer.

The final words of the joint 2005 National Academy of Engineering and Institute of Medicine Report ring true:

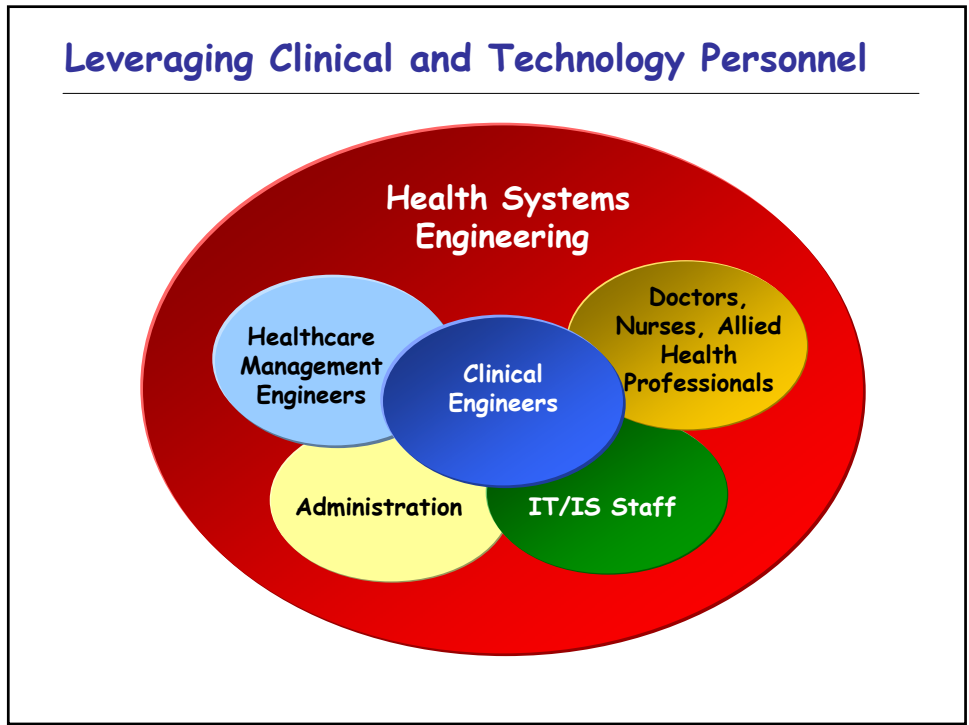
"The committee recognizes the immensity of the task ahead and offers a word of encouragement to all members of the engineering and health care provider communities..."

"Over-hauling the health care delivery system will not come quickly, and achieving the long-term goal of improving the health care system will require the ingenuity and commitment of leaders in the health care community, as well as practitioners in all clinical areas."

"...But if we take up the call now to change the system, we can perhaps avoid crises, reduce costs, reduce the number of uninsured, and make affordable, high-quality care available to all Americans."

Clinical And Enterprise Networks...

<div style="display: flex; align-items: center;"> <div style="border: 2px solid orange; padding: 5px; margin-right: 10px;"> <p style="margin: 0;">LIFE</p> <p style="margin: 0; font-size: small;">CRITICAL</p> </div> <div style="font-size: small;"> <p>Waveforms</p> <p>Parameter Data</p> <p>Alarms</p> <p>Alarm Silencing</p> <p>Telemetry Data</p> </div> </div>	<div style="display: flex; align-items: center;"> <div style="border: 2px solid green; padding: 5px; margin-right: 10px;"> <p style="margin: 0;">MISSION</p> <p style="margin: 0; font-size: small;">CRITICAL</p> </div> <div style="font-size: small;"> <p>Scheduling</p> <p>Clinical Alerts</p> <p>Order/Entry</p> <p>Documentation</p> </div> </div>
<p>Vital to Patient Safety</p> <ul style="list-style-type: none"> Continuous Real-Time Streaming Data Requires High Data Integrity & Security Network Quality of Service Is Essential 	<p>Important for Decision Support</p> <ul style="list-style-type: none"> Transactions, Transfers in Near Real Time Brief Interruptions Do Not Put Patient at Risk Dedicated Bandwidth or QoS Not Essential
With permission, From Eric Rosow, Premise Development Corp.	



We live in an age of miracles...

Tiny Baby Has Bright Future

World's Youngest Surviving Premie Will Spend More Time in the Hospital



Amillia Sonja Taylor, born Oct. 24 after just under 22 weeks in the womb, will spend a few extra days in a Florida hospital as a precaution. Amillia, now a relatively robust 4½ pounds, was 9½ inches long and weighed 10 ounces at birth. (Baptist Hospital via [The Miami Herald/AP Photo](#))

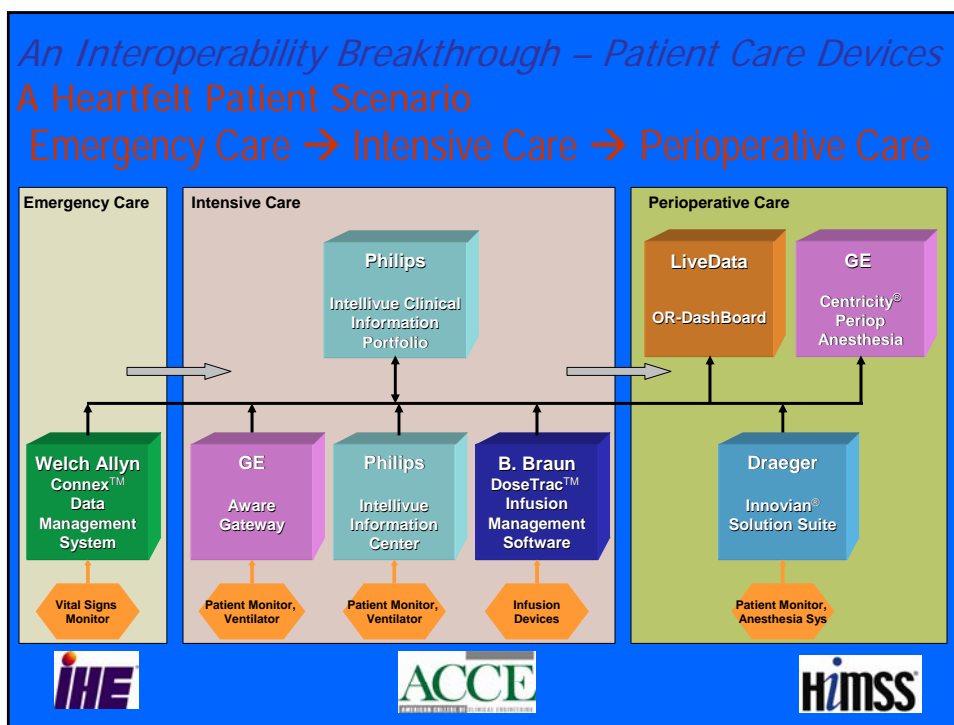
Feb. 20, 2007 — Amillia Sonja Taylor, born Oct. 24 after just less than 22 weeks in the womb, will spend a few extra days in the hospital as a precaution. Amillia, now a relatively robust 4½ pounds, was about to be released from Baptist Children's Hospital in Florida, but today doctors unexpectedly decided to postpone her release. A hospital spokeswoman told The Associated Press that she did not have details on why doctors had changed their minds about sending Amillia home. On Monday, Amillia was between 25 and 26 inches long, doctors said. She was 9½ inches long and weighed 10 ounces at birth.

Always, we must remind ourselves to
do good, but *first do no harm*.



My 21st Century Manifesto:
The IT and CE Worlds
Need Each Other to
Succeed!

Together we can do anything we commit ourselves to; alone, we'll fail ourselves, our professions, our children, and our community.





**Thank you for your
attention and participation!**

QUESTIONS?

Elliot B. Sloane, Ph.D.

Villanova University

ebsloane@ieee.org

www.homepage.villanova.edu/ebsloane