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The “NOT-SO-SMART” Building

February 11, 2020

Peter A. O’Connor, RCDD, EMT-B
Principal, Director, Technology Design
Hoefer Wysocki

Cheryl L. Stoddard, MEng, PMP
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Technology Integration Engineering

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Moderated by:
John Kreidich AIA, CHC, LEED AP B+C,

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Beyond the Basics Series

As part of the Academy's multi-channel, on-line approach, these sessions provide emerging and experienced professionals with convenient and economical opportunities to develop their chosen area of interest.

The Beyond the Basic Series are tailored to healthcare design professionals with sufficient exposure to jump-start interest in wanting to learn more.

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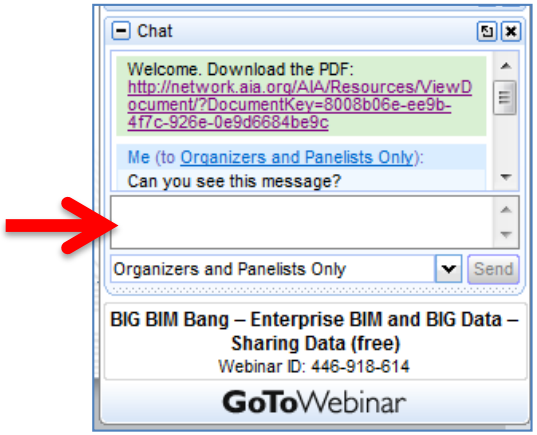

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We design an experience

De-Buzzing the Buzzwords

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De-Buzzing the Buzzwords

- **"Smart" Hospital**
  - Building with "Smart" stuff vs. a truly "Interoperable" environment.
- **Internet of (Healthcare) Things - IoT**
  - Stuff that talks
  - What/Who does it talk to?
  - What does it have to say?
  - Does it listen?
  - How will it help with staff efficiency?
  - How will it help with the patient experience?
  - What will we do with all this data and information?

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De-Buzzing the Buzzwords

- **"Can Do" vs. Have Done..**
  - **"Can do":** "Smart" fire alarm, "Smart" security/access controls, "Smart" chillers, "Smart" AHUs, etc.
  - **"Can Connect to Everything":** "Embedded controls and secure connectivity to reduce the risk of downtime, improve serviceability while optimizing efficiency and reducing energy costs"
  - Have they successfully done it?
  - Where have they done it?
  - Can we see it?

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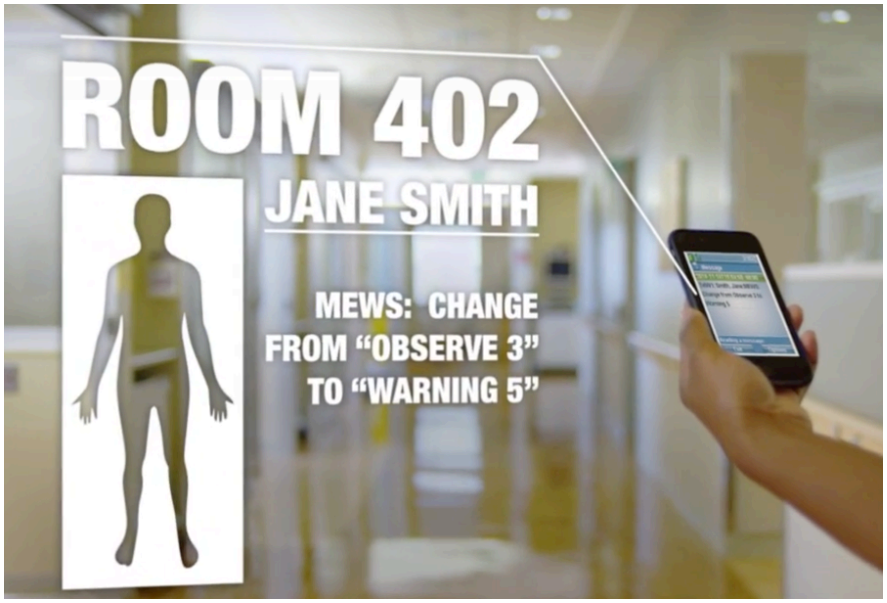
De-Buzzing the Buzzwords

AI vs. **Machine learning** vs. **Predictive Analytics**

- **Artificial Intelligence (AI)** is the broader concept of machines being able to carry out tasks in a way that we would consider “smart”.
- **Predictive Analytics** = Use of an algorithm to anticipate an outcome.
  - **Use Case:** Patient monitoring predicting patient decline based on physiological values/parameters.
  - **Use Case:** EMR Sepsis Surveillance



Philips InteliVue Guardian

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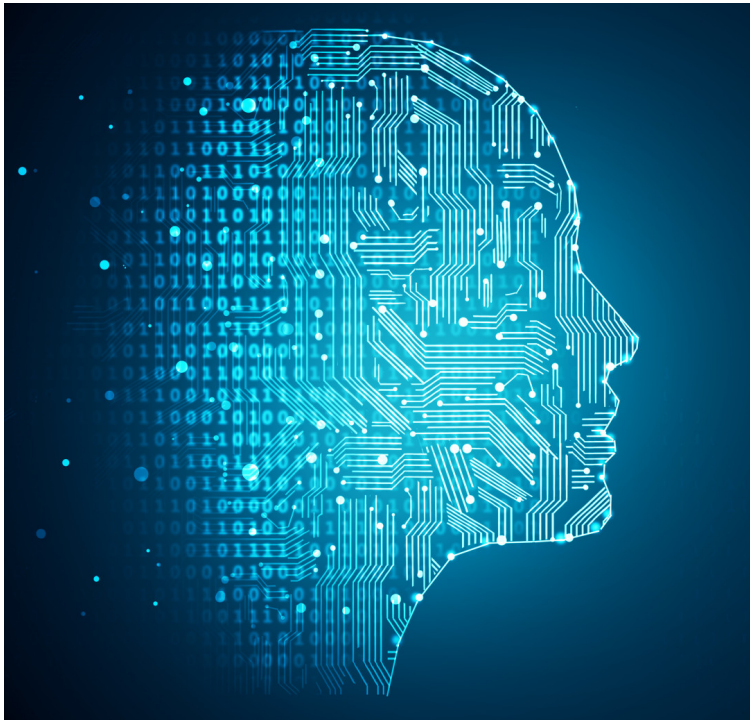
De-Buzzing the Buzzwords

Machine learning automates analytical model building. While machine learning is based on the idea that machines should be able to learn and adapt through experience, AI refers to a broader idea where machines can execute tasks "smartly."

- **Use Case:** A classification algorithm, decision tree can be used to develop a clinical (i.e. diabetes, heart disease) prediction system.
- **Use Case:** A smart thermostat will learn your habits and adjust the temperature automatically based on your regular routine



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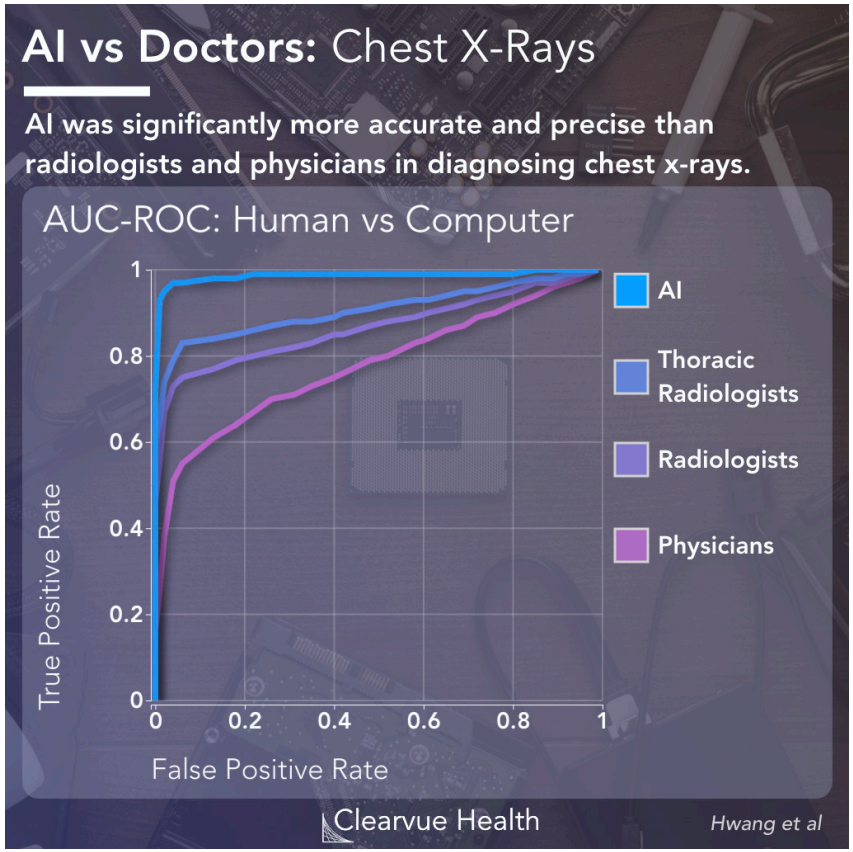
De-Buzzing the Buzzwords

Computer vision relies on pattern recognition and deep learning to recognize what's in a picture or video. When machines can process, analyze and understand images, they can capture images or videos in real time to interpret surroundings

- **Use Case:** computer-aided detection (combined with machine learning) for cancer, auto-segmentation of organs in 3D postprocessing
- **Use Case:** Access control panels that use biometrics (facial recognition) to detect potentially harmful entrants



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De-Buzzing the Buzzwords

- **Natural language processing** is the ability of computers to analyze, understand and generate human language, including speech.
- **Use Case:** Patient/Provider keyboard-less documentation
- **Use Case:** Alexa and Siri

Nuance's Ambient Clinical Intelligence

Traditional Approach

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Transcending Tradition

- Legacy Structure
  - CSI Master Format (1948)
  - Published (1963)
  - Construction & Product Centric
  - “Four walls” focused
- Transformational Technologies
  - Connexall (1999) - Middleware
  - Vocera (2000) – Voice “badge” platform
  - Emergin Middleware 2004 - Middleware
  - Philips hue 2012 – Smart devices
  - Alexa 2014 – Conversational AI
  - “Hey Epic” 2020

Hospital ICU circa 1960’s

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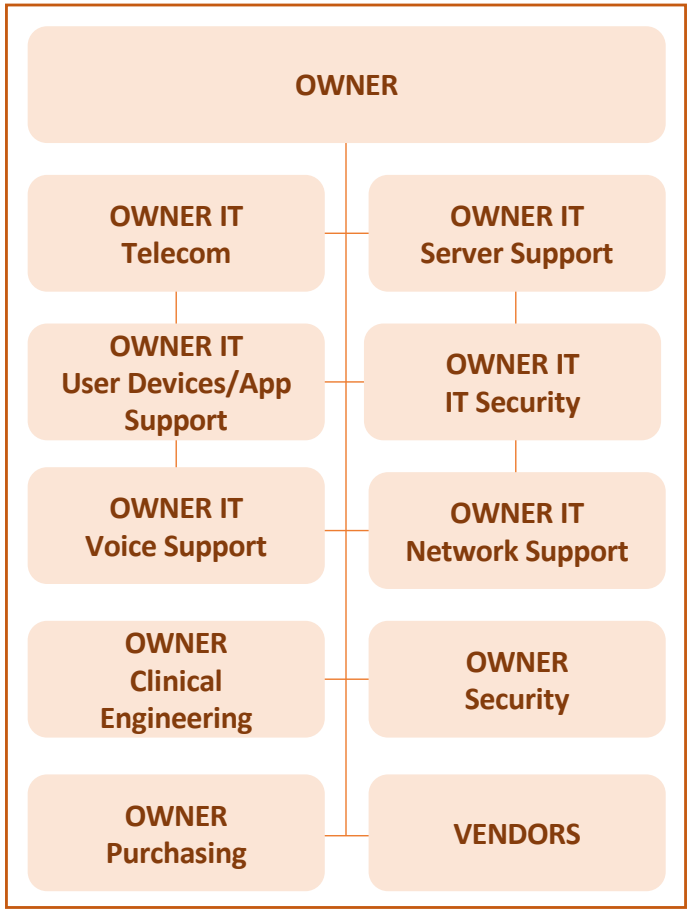
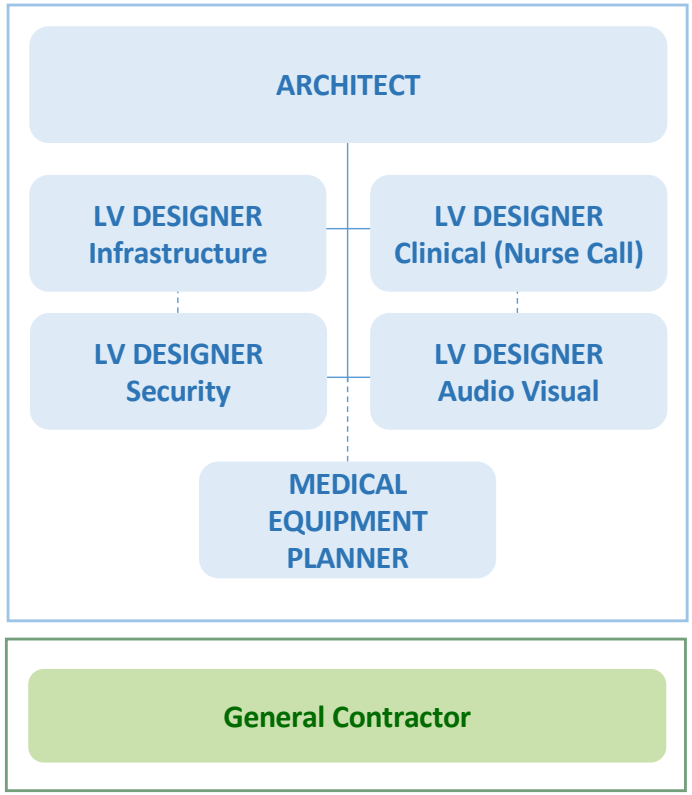
Historically Siloed



Owner's Rep



General Contractor

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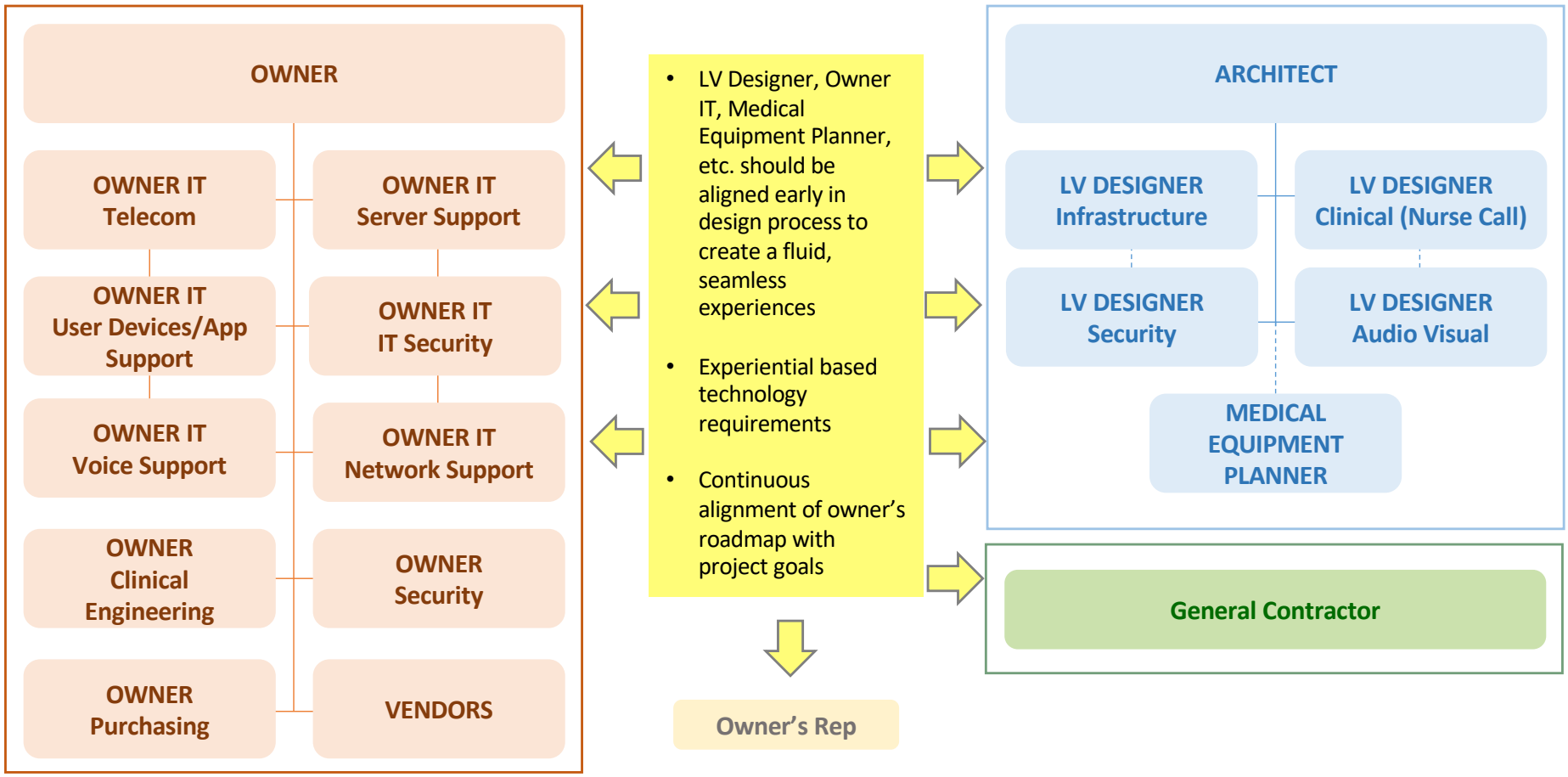
How to "Un-Silo"



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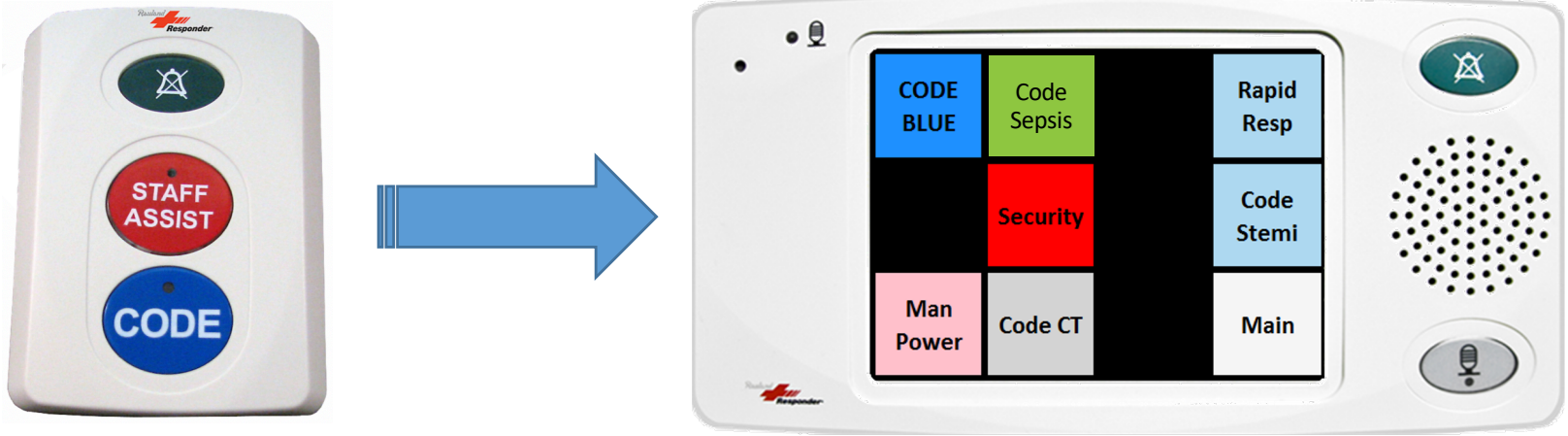
Transcending Tradition



- STEMI – Reduces ECG to Reperfusion Time (Cath Lab)
- SEPSIS – Quick access to the sepsis bundle (lactate and blood cultures, starting antibiotics within an hour, and fluid resuscitation)
- CT/Stroke - Alerts all the team members including CT, X-ray, EKG, lab, pharmacy and the stroke nurse

What should you consider when a client asks for a technology roadmap as part of your design?

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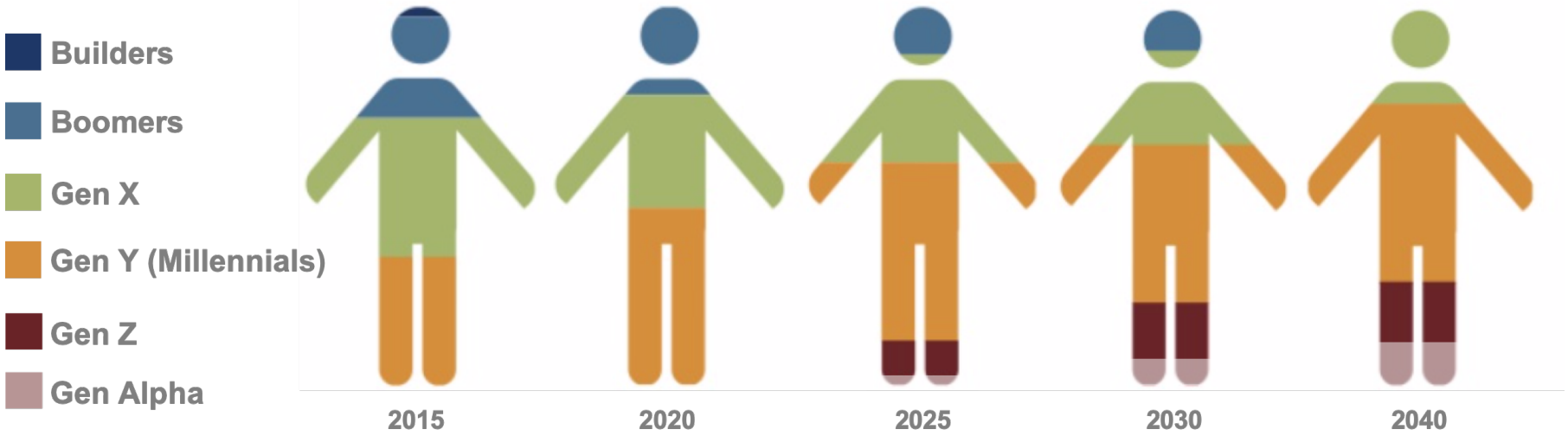
Understanding Our Future

World Population by Generation



Impacts:

- Treating 5 generations of patients
- Each generation has distinct experience preferences & expectations
- Each has different rates of technology adoption
- 4 Generations of Staff

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Understanding Our Future

Changes in Design

Decentralization

Larger Units/Facilities

Medical Campus

Multi-site Health Systems

Focus on Outpatient/ Home Care

Changes in Technology

New/Emerging Tech

“IoT”

More Alerts/Alarms

Greater Exchange of Data

Complex Interoperability

Numerous Mobility Options

Changes in Expectations

New Work “Environment”

We Live in a ”Connected” World

Same as at “Home”

“It Just Works”

BYOD

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Owner Expectations

- Enterprise Centric
- Standards Based
- Enhancing the Experience is a must
- Interoperability is an expectation
- Collaboration is a requirement
- Supports process and workflow
- In-line with the goals of the project and the culture of the facility
- Enhances the “Brand”

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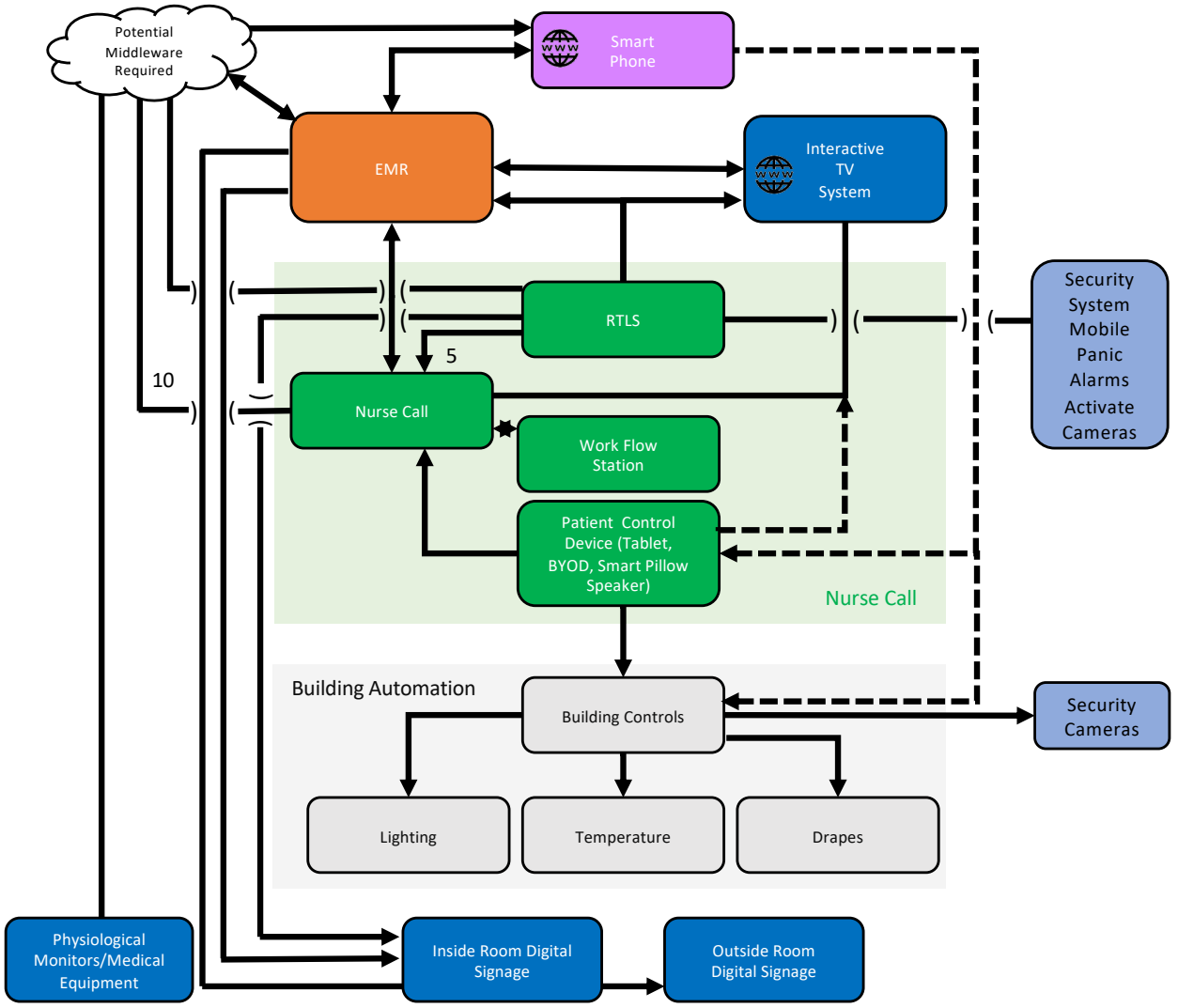
Interoperability Expectations

- Real Time Location Services (RTLS) will be a utility
- Building Systems will be a component of patient experience
- The EMR Push/Pull data to more “non-traditional” systems
- Medical equipment status/alarms require more connectivity/data exchange
- Mobility Platform use cases continually evolve
- Room digital signage trends increasing



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2019 Security Technology Innovation

- Access control panels that use biometrics (facial recognition) uses database validation customizable to identify sex offenders, non-desirable family members, restraining orders
- Smartphones to grant entry, geofencing, digital wayfinding, find your car
- Autonomous robots roaming lobbies and corridors after hours, allows for situational awareness to protect the staff

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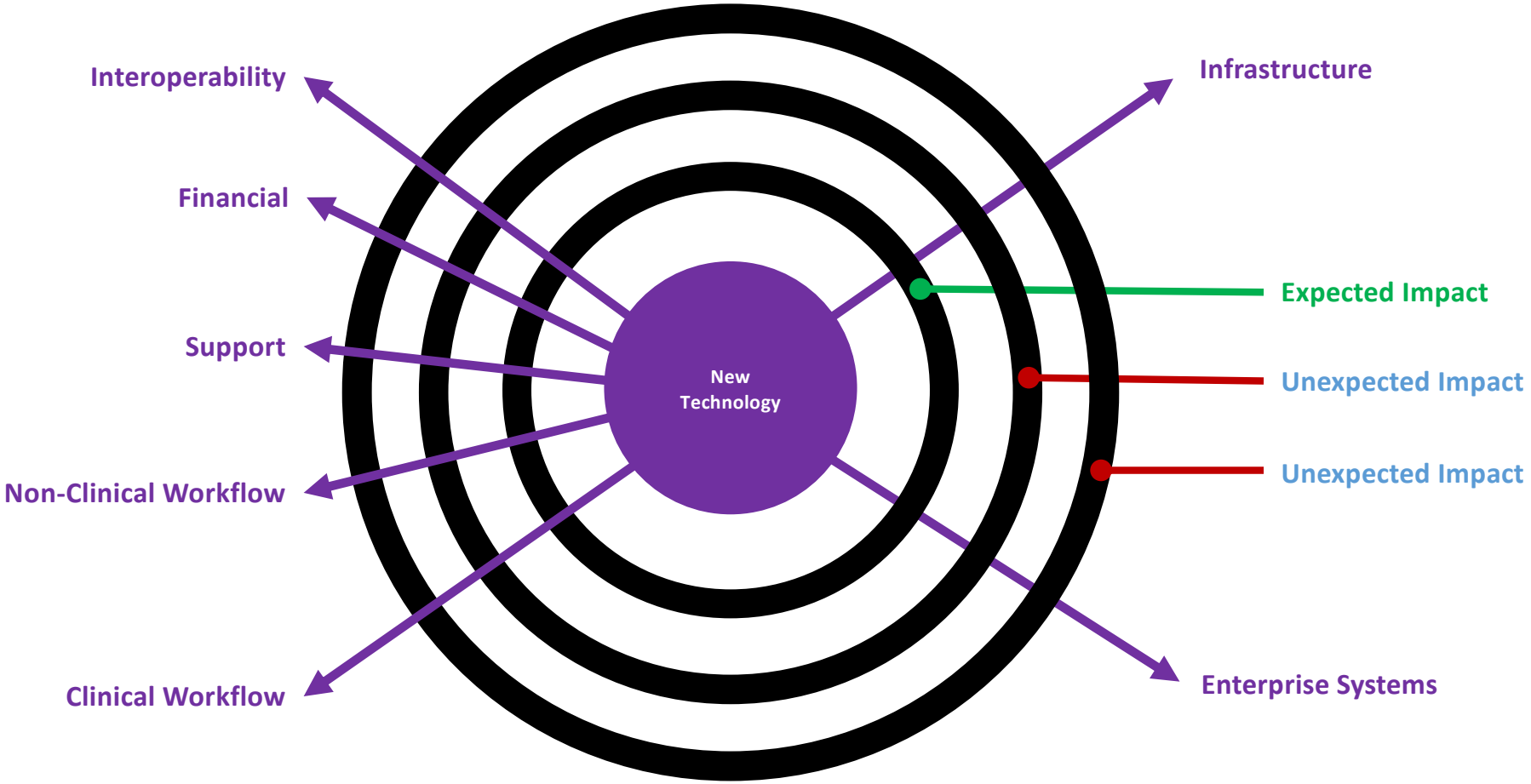
360⁰ Technology Impact



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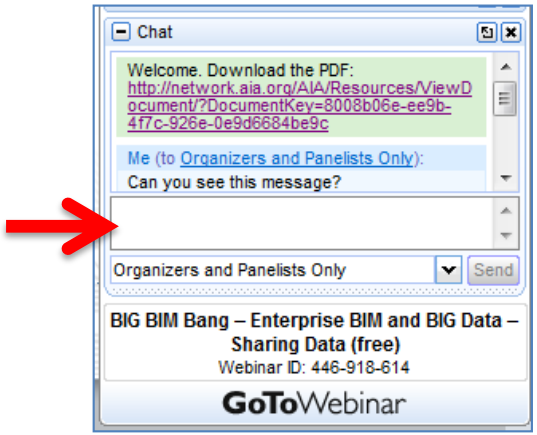
Question Reminder!

Submit your questions and comments via the chat box.



What processes and tools can we implement to manage this evolution?

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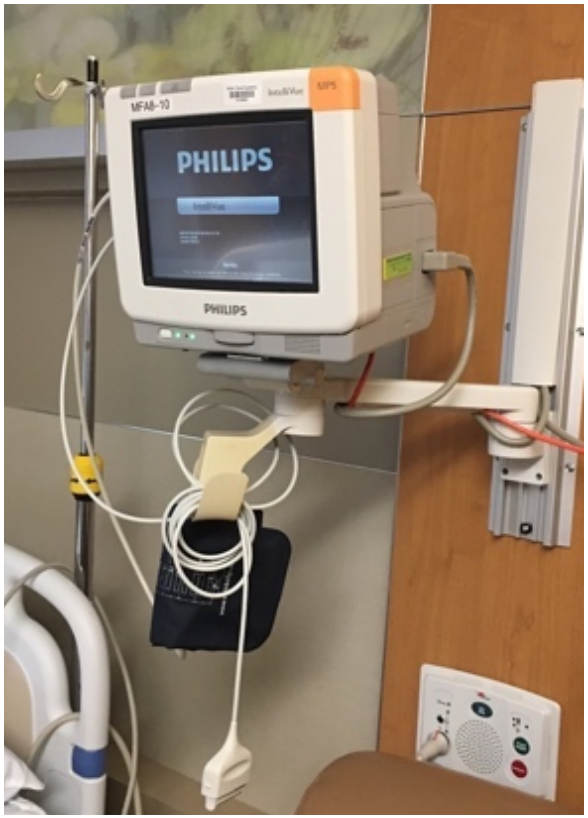
Planning Process - Visioning



Current State Observation

- In-depth multi-day on-site observation of the current state of technology as it relates to patient, family and staff experiences.
- Wired/wireless infrastructure study to understand interoperability between systems to ensure systems are not clashing and degrading coverages
- Communications
  - Mobility
  - Nurse Call
  - Middleware
- AV Technology - patient rooms, staff huddle spaces, and meeting rooms
- Security - All systems report to and be monitored by campus DPS. Stand-alone and other “unmonitored systems” are liabilities
- Clinical & non-clinical workflow enablement
- Medical device interoperability (or lack thereof)
- Project impact on enterprise systems and infrastructure

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Planning Process – Visioning

Goal: Visualize and document desired future state and related technology

- Understand the clinical and non-clinical workflow (both present and future state)
- Work backwards into potential enabling technologies
- Evaluate expected technologies
- Explore innovative technologies (AI, conversational interfaces, predictive early warning, geolocation, mobility, RTLS, EMR interoperability, etc.)
- Maintain awareness of current state enterprise impacts, system/interoperability limitations, cultural impacts, and financial ramifications.
- Identify the gaps that must be bridged in order to achieve the future state.
- Bi-Directional Alignment between current IT/Biomed roadmap and project vision

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Planning Process – Early Design

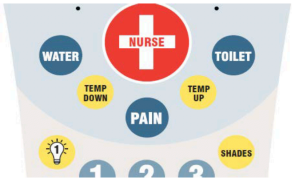
Patient Room Experience

PATIENT ROOM ENVIRONMENTAL CONTROLS

The expectation for increased capabilities for patient room environmental controls was discussed. Similar to the hotel and hospitality building-types, these technologies allow patients to control various in-room comfort, and safety, aspects of their room without requiring assistance from clinical staff.

Control Items

- **Lighting:** Traditional lighting controls in the patient room consisted of staff controlled (inside door) patient room, bathroom and patient controlled lights were limited to overbed up and downlights controlled by the pillow speaker. Advances in lighting technology (PoE) as well as control technology allows for both an enhanced and safer patient experience. Examples of these capabilities include:
  - **Lighting Scenes**: Preprogrammed settings (on/off) and dimming that can be controlled by the patient. A good example of this would include "all lights off (including the bathroom)", room lights at 50%, lights controlled based on time of day, etc.
  - **Safety:** Examples of how intelligent lighting can enhance safety include "path lighting to the bathroom upon bed exit", "all lights on 100% upon code/staff assist switch activation", "staff area lighting raised upon staff presence (RTLS)".
- **Room Temperature**: Should the HVAC system have the capability for individual room temperature control, the patient should be able to change the setpoint +/- 5 degrees for example. The one challenge with this concept is displaying the actual room temperature as well as the setpoint.
- **Digital Art:** Through the use of 4k displays framed like artwork, patients would be able to change the artistic theme of the room from either pre-loaded galleries or personal pictures from MyScripps BYOD app.
- **Window Shades**: Ability to raise and lower motorized shades.



Traditional Pillow Speaker Controls

Sample Overbed Tablet Mount

Patient Room Experience

Methods of Control

- **Pillow Speaker:** The most traditional method of control and will likely remain the primary method as it is required by code for nurse call and easy to use for all patient populations.
- **App via BYOD or provided device:** The app should have a room control section that would provide easy access to the environmental control elements listed above in addition to access to other features and capabilities listed previously.
- **Voice Control:** While a commonly accepted method of controlling phones, smart devices and smart homes, voice assistants are only beginning to transition into the healthcare arena. Voice assistants such as Alexa™ are currently being trialed in other institutions to enable environmental control as well as conversational access to the Epic. Voice enablement in the digital front door application may also be a possibility.
- **Advanced Pillow Speaker:** More advanced pillow speaker technology is available (i.e. Curbell Rego). This device replaces the traditional pillow speaker (both cannot be used at the same time) and is tethered to the headwall for power. This solution is simply a vehicle of delivery. All education, entertainment and room control capabilities reside in 3rd party apps. This solution is an in-patient only content delivery device and does not address outpatient or same day patient populations.

Voice Control

Advanced Pillow Speaker

IT Narrative

- Captures the intent of the multiple technologies
- Sets levels of operational and financial expectations
- Identifies new technology trends that should/can be considered
- Review details with stakeholders to get approval of needs vs. wants to include as budget allows
- Identify opportunities to build out infrastructure during construction in order to minimize disruption of operations later

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Planning Process – Defining Roles

CATEGORY	PLAN	DOCUMENT	BUDGET	PURCHASE	INSTALL	CATEGORY	ON-GOING OPERATIONAL EXPENSE
WIRELESS SYSTEMS							
Hardware							
802.xx A/B/G/N Propagation and Traffic Plan	OWNER IT	OWNER IT	OWNER IT	N/A	N/A	BASE	NO
Access Points	OWNER IT	LVD	OWNER IT	OWNER IT	OWNER IT	BASE	YES
Dedicated Wireless Refrigerator Monitoring Network	OWNER BIO	OWNER BIO	OWNER BIO	OWNER BIO	OWNER BIO	BASE	YES
Real Time Location Services (RTLS)	LVD	LVD	OWNER IT	OWNER IT	VENDOR	BASE	YES
Bluetooth Beacons (BLE)	LVD	LVD	OWNER IT	OWNER IT	VENDOR	FUTURE	YES
Pocket Page Reinforcement Design	LVD	LVD	OWNER IT	OWNER IT	OWNER IT	BASE	NO
Multicarrier Distributed Antenna System for Cellular Reinforcement	LVD	VENDOR	OWNER TELE	OWNER TELE	VENDOR	FUTURE	YES
EMS Radio	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Flight Operations Helicopter Radio	HELI CONSULTANT	LVD	GC	GC	GC	BASE	TBD
HAMM and Disaster Radio	LVD	LVD	OWNER IT	OWNER IT	OWNER IT	FUTURE	NO
Satellite Phone	LVD	LVD	OWNER IT	OWNER IT	OWNER IT	FUTURE	TBD
Inter-Building Microwave and Laser Communications	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Business and Security Radio Systems	LVD	LVD	OWNER IT	OWNER IT	VENDOR	BASE	NO
Infrastructure							
Conduit/Boxes	LVD	LVD	GC	GC	GC	BASE	NO
Cabling	LVD	LVD	GC	GC	GC	BASE	NO
Software							
Applications/Licensing	OWNER IT	OWNER IT	OWNER IT	OWNER IT	OWNER IT	BASE	YES
Servers/PCs	OWNER IT	OWNER IT	OWNER IT	OWNER IT	OWNER IT	BASE	YES

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Planning Process – Financial Impact

5	Legend: Contractor Provided Owner Provided		Procurement Responsibility	Each	PROJECT Base Technology		PROJECT Requires Decision		PROJECT Total
6					QTY	Ext Cost	QTY	Ext Cost	
93	**Medical Communication Systems**								$ -
94	Nurse Call System Base (Med surg/ICU)		Contractor	$ 6,000.00	158	$ 948,000	0	$ -	$ 948,000
95	Nurse Call System Basem(OR/PACU, etc)		Contractor	$ 3,000.00	47	$ 141,000	0	$ -	$ 141,000
96	Touchscreen Workflow station (must be added to base system)		Contractor	$ 2,000.00	173	$ 346,000	0	$ -	$ 346,000
97	Manual workflow (stand alone/hardware or software based)		N/A	$ 1,000.00	0	$ -	0	$ -	$ -
98	OR Intercom		N/A	$ 1,500.00	0	$ -	0		$ -
99	Camera Monitoring System (sitter)		N/A	$ 2,500.00	0	$ -	0	$ -	$ -
100	Camera Monitoring System (OR)		N/A	$ 2,500.00	0	$ -	0	$ -	$ -
101	RTLS Room Coverage		Owner	$ 2.00	0	$ -	400000	$ 800,000	$ 800,000
102	Infrastructure		Contractor	$ 400.00	0	$ -	0	$ -	$ -
103	RTLS Departmental Coverage		Owner	$ 750.00	0	$ -	0	$ -	$ -
104	RTLS 802.11 (15'-30' non room specific) coverage		Owner	$ 30,000.00	0	$ -	0	$ -	$ -
105	BLE Beacons		Owner	$ 100.00	0	$ -	0	$ -	$ -
106	Infrastructure		Contractor	$ 400.00	0	$ -	0	$ -	$ -
107	RTLS Tags		Owner	$ 40.00	0	$ -	1000	$ 40,000	$ 40,000
108	Pocket Page (TAP) Output		N/A	$ 5,000.00	0	$ -	0	$ -	$ -
109				**Construction Subtotal**		$ 1,435,000		$ -	$ 1,435,000
110				**Owner Subtotal**		$ -		$ 840,000	$ 840,000
111				**Combined Subtotal**		$ 1,435,000		$ 840,000	$ 2,275,000

- Includes contractor AND owner costs
- More detailed than thumbnail per sf estimates
- Identifies base technology as well as items requiring decision

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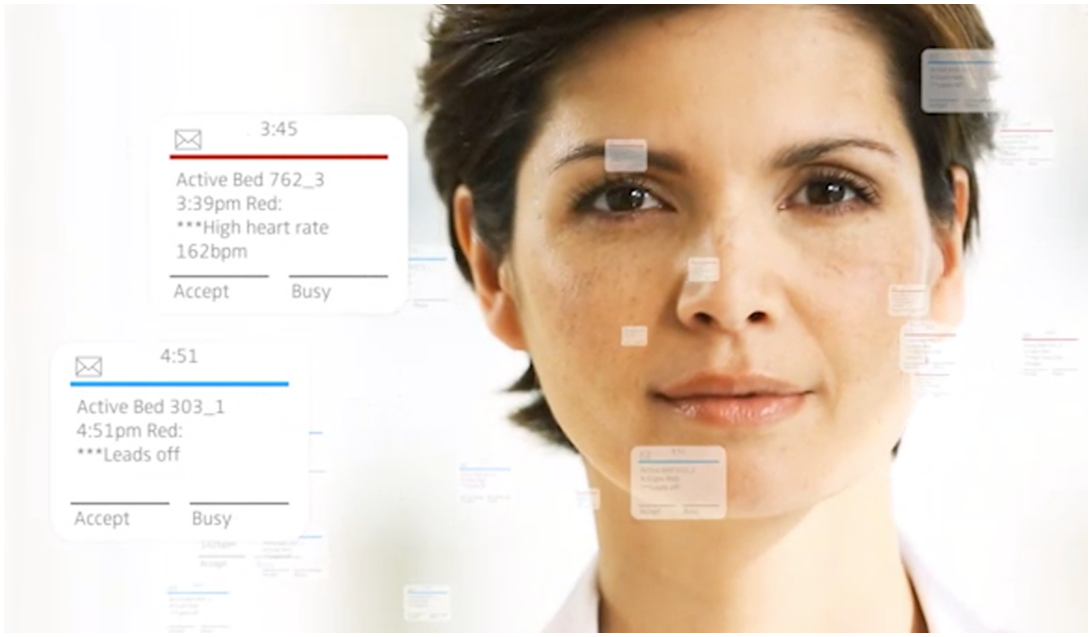
Planning Process – Functional Intent

PT Monitor | Middleware | Handset



Vehicles of Information Delivery

- Drawings
- Specifications
- Medical Equipment List

Nothing we have conveys functional intent

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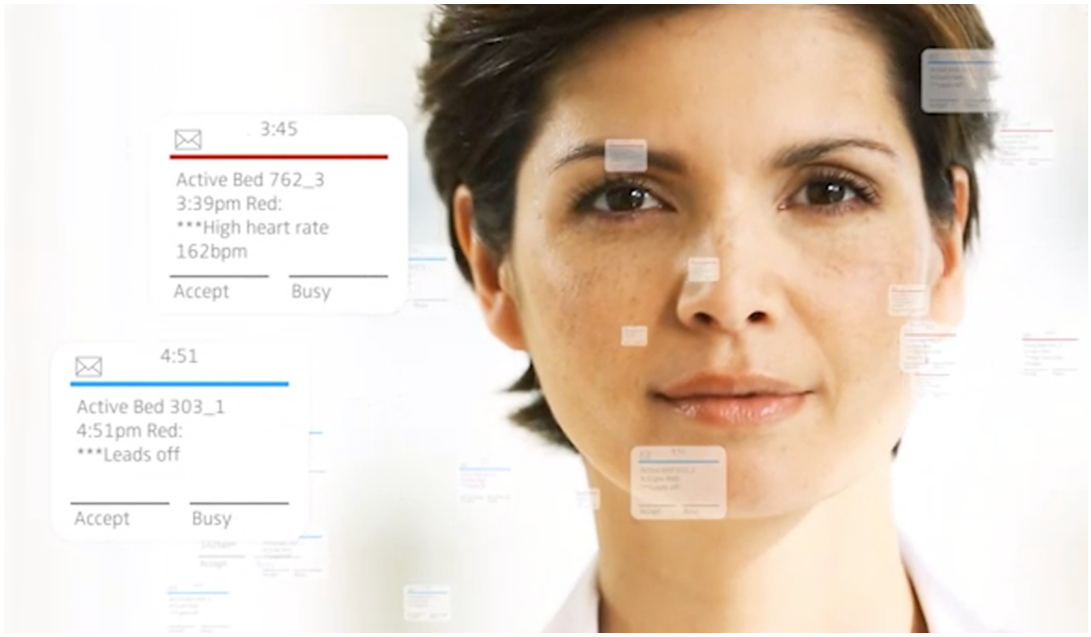
Planning Process – Functional Intent



Functional Intent Guideline

- Frames a complete process
- Identifies roles and requirements
- Increase procurement accuracy
- Clarifies install/config expectations
- Measures implementation success

What does this mean for your practice?

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Implementing Change

- Our current approach is incomplete
- Technology is rapidly blurring traditional lines of scope and responsibility
- A clear IT vision must be established
- Bring the IT Team to the table early in visioning process
- A much more holistic approach to technology design and budgeting is needed
- New tools and deliverables should be implemented to address the reality of technology deployment

A truly ”smart” hospital is comprised of thoughtfully interoperable technologies designed to enable experiences defined in a clear vision and not simply a building that contains smart things..

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Time for Questions and Comments

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The survey closes Friday, February 14th at 12:30am ET.

For questions, please email knowledgecommunities@aia.org

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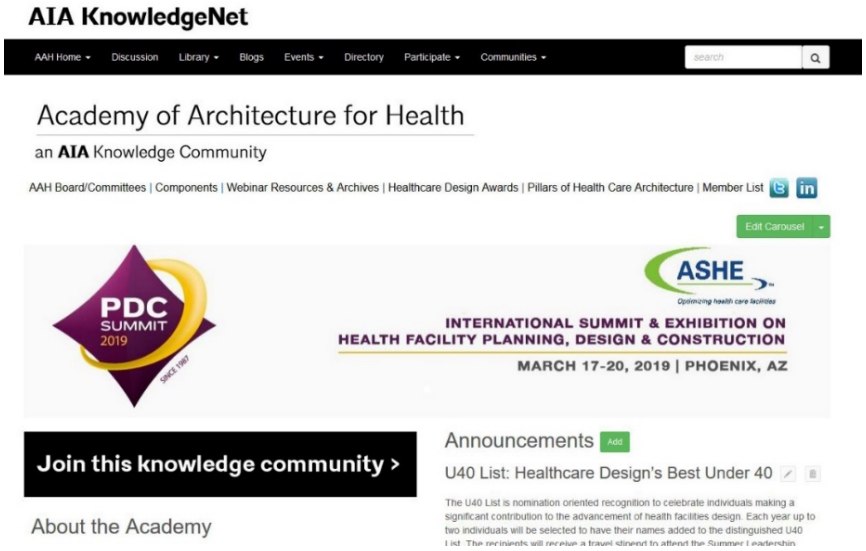

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Upcoming Webinars

Date	Series	Topic
3/10/2020	Healthcare Essentials	Exam, Procedure, and Operating Rooms: Planning advice based on the FGI Guidelines
4/14/2020	Healthcare Essentials	The Big 5: Healthcare Design Strategies for an Adaptable Future
5/12/2020	Beyond the Basics	BHU trends and/or Mental Health EDs

Dates & topics are subject to change