DIGITAL TRANSFORMATION
THE INTERNET OF THINGS

Austin has over 25 years of experience in Information Technology, holding roles in operations, engineering, architecture and consulting. Austin has worked with clients in state and local government, financial services, telecommunications, manufacturing, retail and healthcare. His broad experience across not only verticals, but technologies, allows him to advise clients on their transformation and apply the use of technology to enhance their businesses.

BIO

AUSTIN GRESHAM
Senior Consultant, IT Transformation

AREAS OF EXPERTISE
• Transformation
• Cloud Computing
• DevOps
• Big Data/Analytics
• Architecture
• Engineering
• Virtualization
• Security
• Infrastructure

A FUNDAMENTAL SHIFT
in the mindset of how
COMPANIES DELIVER VALUE
to their customers.
WHY DIGITAL? WHY NOW?

The Four Industrial Revolutions

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<th>1760</th>
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WHO'S TRANSFORMING? ARE WE BEHIND?

Digital Initiative — Progress by Industry

DIGITAL REVOLUTION IN HEALTHCARE

What is driving Digital Transformation in Healthcare?

1. Digital User Experience (Telehealth)
2. Artificial Intelligence and Big Data
3. Mobility and Cloud Access
4. Wearables and IoT
5. Empowered Consumers
WHAT IS IOT?

IoT is the "Internet of Things" - the interconnection of computing devices embedded in everyday objects, enabling them to send and receive data.

Wearables

Industrial

Smart Home

IOT BENEFITS

IoT blurs the lines between the physical and the digital worlds...

IOT PREDICTIONS

By 2020, more than half of all new major business systems and processes will incorporate some element of IoT - Gartner

By 2021, IoT spending will reach $6 Trillion - Business Insider

Retail, Healthcare and Supply Chain will see the biggest growth – Forbes

IoT will drive new value propositions and new business models – Network World

IoT Security will be the #1 priority in the enterprise – Network World

IoT will drive Network, Storage and Edge Computing initiatives - Everyone
IOT FLOW OF DATA - CONCEPTUAL

Data flows from the sensors (the "Things") on the left, to the right.

The Edge

Connectivity (Communication & Devices)
Data Accumulation (Storage)
Applications (Reporting, Analytics, Control)
Collaboration & Processes (Enabling People & Business Processes)

Physical Devices & Controllers ("Things" in IoT)
Edge Communications (Data Elements, Analysis & Transformation)

WHAT CAN BE DONE WITH IOT?

The value in IoT is achieved through analytics and applications. Sensors receive data from the outside world (i.e., temperature, GPS, motion, video) and send that to a central aggregator (storage). At this point, it's just a bucket of data…

Applications and Analytics come into play to enable the user to "do something" with that data:

- Turn on lights when someone enters a room
- Turn lights off when no one is occupying a room
- Find the closest stretcher to an Operating Room based on location
- Alert security to an unidentified person in a restricted area

REAL WORLD EXAMPLES
Retail Example: Kroger

Grocery margins are low (1-3%); reducing operational cost is critical to the grocery business.

- Shelf Edge
- Scan-Bag-Go
- IoT – FAST (Food at Safe Temperatures)

Life Sciences Example: Merck

Alexa “Hackathon”
Partnered with AWS to offer a $250,000 prize purse

“Sugarpod”

http://www.alexadiabeteschallenge.com/winner-sugarpod-webpage/

Life Sciences Example: Hip Replacement

Hip Replacement Surgery
Most common complication during the surgery is the necrosis of bone tissue caused by drilling.
IoT enabled drill is one solution...
EXAMPLE IOT USE CASES FOR HEALTHCARE

Mission: Provide the best possible care to patients and their families while controlling costs.

In pursuit of this mission, IoT technologies have been used in the following ways:

1) Asset management and tracking
2) Medical device integration
3) Telemedicine and remote data collection
4) Family management and alerting
5) EMR location integration
6) Climate control and lighting automation
7) Patient safety
8) Automated lockdown
9) Newborn tracking
10) Wearable device integration
11) Location-based alerting

WAYFINDING

GETTING CUSTOMERS WHERE THEY WANT TO GO

Smart Parking Navigation  
Home to Location  
Blue-Dot Campus Navigation
IoT can be used to supplement patient treatment through remote monitoring and communication, and to keep track of patients as they move through a healthcare facility.

**ASSET MANAGEMENT AND TRACKING**

**ENVIRONMENTAL CONTROL**

- Smart Lighting
- Smart HVAC
- Use Case: 40%+ Savings on power costs
- Use Case: Actively use lighting and climate to positively impact health care outcomes

Light impacts human health in 4 ways:
- Enabling performance of visual tasks
- Controlling the body's circadian system
- Affecting mood and perception
- Facilitating direct absorption for critical chemical reactions within the body (Bishop, Hunter, & Howard, 2002; Velth & McColl, 1986).

**MEDICAL DEVICE INTEGRATION**

Internet of (Medical) Things (IoMT), mobile and wearable devices are increasingly connected, working together to create a cohesive medical report accessible anywhere by your healthcare provider.
START WITH A COMMON TAXONOMY WHEN TALKING TO PEERS

- **Digitizing**
  - Turning paper-based information into electronic form

- **Digitalization**
  - The use of digital technologies to change a business model and provide new revenue and opportunities

- **Digital Business**
  - The creation of new business designs by blurring the digital and physical worlds

When talking to your business peers, you have to speak in a language they understand: It’s not Internet of Things; it’s "How do we engage with our customers to drive their second or third purchase?"

IOT FAILURES... WHAT NOT TO DO

- View IoT, or any technology, as your salvation
- Start with the technology and not the business
- Investing too heavily, not associating to value
- Neglect your Core in favor of the "new shiny object"
- Make IoT an IT project, not a business project

Internet of Things

A Use Case for Aging Services
Maple Knoll Communities, Inc.

Andy Craig, MS
VP of Technical Operations

Andy has over 20 years of experience in technology leadership roles. Prior to his entry into healthcare & senior living in 2007, he held technology leadership roles at Fortune 500 companies in the industries of banking, finance, and insurance. A native Cincinnatian, he is a Carl H. Lindner Honors-PLUS Scholar and sits on advisory boards for Fortinet, a Fortune 100 Fastest Growing Company, and The University of Cincinnati, a R1 research university.

Who We Are

Maple Knoll Communities is a non-profit senior care provider impacting the lives of over 3,500 older adults throughout the Greater Cincinnati area and over 30,000 WMKV listeners worldwide.

We have a 170 year history of providing a continuum of services to support seniors in varying levels of care.

We remain dedicated to helping each person achieve, with dignity, the proper balance between independence and assistance.
Maple Knoll Village

- Nearly 1,000 older adults reside on our Springdale campus in Independent Living, Assisted Living, and Skilled Nursing
- 54 acre campus in Springdale
- 142 Villas
- 135 Apartments
- 63 Assisted Living Apartments
- 145-Bed Skilled Nursing facility and Rehabilitation Center
- Sprawling gardens and beautiful landscape unmatched in the area
- Maple Knoll holds a 5-Star rating of quality indicators
- Our outreach programs and services also continue to serve older adults in the community

Formal Affiliation with The University of Cincinnati

- Affiliation Vision Statement: We will shape the future of healthcare and promote the best lifestyle possible for older adults.
- Affiliation Mission Statement: Create a nationally recognized interdisciplinary learning partnership for students, faculty, practitioners, employees, and researchers that strives to enhance the quality of care and services for older adults. We will further the missions of the University of Cincinnati and Maple Knoll Communities by fostering a sustainable program of innovation, research, and practice.
The Silver Tsunami

- There are roughly 75 million baby boomers soon to be reaching retirement age.
- Over the next two decades 10,000 people per day will turn age 65.

Population of Physicians

- The United States will face a shortage of between 40,800 and 104,900 physicians by 2030, according to a new study commissioned by the American Association of Medical Colleges.
- Released March 14, 2017, the study found that the number of new primary care physicians and other medical specialists are not keeping pace with demands of growing and aging population.

Transformative decade:
- Slower overall population growth
- Population will age considerably
- Population will become more racially and ethnically diverse

*The aging of baby boomers means that within just a couple decades, older people are projected to outnumber children for the first time in U.S. history.* - Jonathan Vespa, a demographer with the U.S. Census Bureau.
The Healthcare Gap

Current State at MKV

• Last decades spent investing in core infrastructure
• Focus on enterprise Wi-Fi to blanket coverage indoors and outside
• Wi-Fi sensors implemented
  • Pendants with location tracking (nearest AP)
  • Motion sensors in IL for daily well being check
  • Other sensors based on needs:
    • Door sensors (entry & refrigerator)
    • Toilet sensors
• Current sensors use their own proprietary reporting platform
• No integration with EMR or other systems

Our Future State
IoT to Reduce Hospitalizations

"The older you are, the worse the hospital is for you. A lot of the stuff we do in medicine does more harm than good. And sometimes with the care of older people, less is more."

Ken Covinsky, a physician and researcher at the University of California, San Francisco division of geriatrics.

• Older patients become weaker from a hospital stay and are less able to resume daily routines.
• Older patients leave the hospital with a greater level of disability:
  • One Third of those are 70+
  • Half of those are 85+
• Patients return home unable to care for themselves:
  • Helplessness has a profound psychological effect.
  • Needing help with ADLs is a psychological hurdle for seniors.

https://www.pbs.org/newshour/health/elderly-patients-hospital-stays-often-worsen-disabilities

IoT to Reduce Hospitalizations

• Hospital stays for the elderly:
  • Disrupt routines and feel a loss of control
  • Create and/or remind patients of isolation
  • Create burden on healthcare workers
  • Negatively impacts the immune system
  • Longer, harder road to recovery

https://www.caringseniorservice.com/blog/the-psychological-effect-of-a-hospital-stay-on-seniors

IoT to Reduce Hospitalizations

Hospital Risks For Older Patients

• Delirium occurs in 1/3 of hospitalized patients over the age of 65 and in more than 70 percent of older patients in Intensive Care Units. Reasons for this include serious illness, exposure to new medications, disruption of normal routines and sleep disturbance. Family members are often the first to notice changes that might indicate delirium.

• If an older adult cannot reposition himself, he is at risk for pressure ulcers (bed sores). Pressure ulcers affect 1 million adults annually.

• Older patients may have multiple medical issues, requiring several specialists to be involved in his case. This can be confusing and difficult to coordinate care for any patient.

• New medications may be introduced, which can lead to side effects. Older patients may already be taking multiple medications, which can lead to adverse effects.
IoT to Reduce Hospitalizations
Hospital Risks For Older Patients

- Older adults are at risk for falls, especially if they are sedated or disoriented. Among older adults, falls are the leading cause of injury and deaths.
- Older adults can be at risk for malnutrition. Studies cite that 58 percent of patients 65 and older have problems eating. The nutritional status of older patients has been reported to diminish in hospitals. This can slow recovery.
- The spread of infectious diseases such as MRSA and pneumonia are rampant in hospitals. The reason pneumonia acquired in the hospital is more severe may be due to the more aggressive infecting organisms, making it harder to treat.

IoT: Activities of Daily Living

- Eating
- Bathing
- Dressing
- Transferring
- Toileting
- Walking or moving around
According to an AARP survey, more than 85% of respondents older than 65 plan on living in their homes for the next five to 10 years. BUT Two in 10 aged 70 and older say they can't/find it difficult to live independently without assistance.
As we age, our vision can decline from impairments such as macular degeneration, cataracts, and glaucoma. Research estimates that as much as 40 percent of senior living falls occur in the evening or at night when there is a lack of light.

Proper illumination can prevent falls resulting in serious injuries. Amazon Alexa can power on and off lights with just a voice or sensors can be turned on as soon as a resident gets out of bed, reducing the risk of a fall and putting the resident at ease.

- Lighting can affect emotions and mood. They can provide a sense of security and put people at ease.
- Shadows and dark spaces can emit a sense of uncertainty and uneasiness.
- Shadows can be interpreted as obstacles and increase the risk of missteps.
Calling For Help

Amazon Alexa provides more options when calling for help. Residents will be able to rely less on their emergency pendant and telephone, and will be able to use their voice to call for help. This will result in faster response time and potentially less serious injuries.

Medication Reminders

As we age, more medications may be needed to keep us healthy. Amazon Alexa can have Skills set to remind residents to take their medications. Skills are applications that give Alexa more abilities. This lowers the risk of serious consequences resulting from forgetting to take medications.

Social Interactions

Depression affects about 6 million Americans ages 65 and older. Social isolation and a lack of a supportive social network are a couple causes of depression in seniors. Those who are socially isolated more likely to be pessimistic about their future, have a higher risk of long-term illnesses and are more likely need long-term care. Devices such as Amazon Echo Show allow residents to see their friends and family without needing to leave the comfort of their home. Phone calls can also be made by asking Alexa to call your family and friends.
Telèhealth

To keep in good health, doctors need to stay up to date with their patients' vitals. Telehealth allows health care professionals to monitor their patients remotely while allowing the patient to stay in the comfort of their home.

Examples of health monitors are: weight scale, blood pressure monitor, pulse oximeter, glucose monitor.

Monitoring programs keep residents healthy and independent longer. This reduces the number of hospitalizations, readmissions and length of stay in a hospital.

Desired Outcomes

- Caregiver Dashboard that aggregates data across sensor platforms
- Reduced ED Admissions & Re-Admissions
- Increased length-of-stay in IL
- Create a model that can be replicated at other facilities

"Limits exist only in the mind..."
Caregiver Dashboard: Intervention Required

ServUs Lab + Resource Center

Starting Point: Smart Apartment