The Future Disrupted:
New Technologies That Will Shape
Service Delivery in Speech-Language
Pathology & Audiology

Learning Objectives

At the end of this presentation, participants will be able to:

1. Discuss the disruptive role of technology in society;

2. Identify current technological trends that are shaping education and healthcare; and

3. Define ways in which technologies will impact diagnostic & treatment services in Speech-Language Pathology & Audiology.

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Digital Health

- **Digitial Health**: *the use of information technology/electronic communication tools, services, and processes to deliver healthcare services or to facilitate better health.*

- Current worth: $250 Billion in the United States -- with a projected growth of 10-25% growth annually

- Impacts:
  - Savings are substantial
  - Costs related to patient hospitalization are reduced by 50%
  - Overall cost of support for patients is reduced by 25%
  - Medical staff potentially reduced by 25%
 - Patient readmission into hospitals has been shown to be reduced by 40%

3

Aspects of Digital Disruption

- Mobile Health (mHealth)
- Apps – prevention and monitoring
- 3-D Printing
- Virtual Reality
- Augmentative Reality
- Social Media & Social Networking – Online Communities
- "Smart" Technologies: Smart Homes, Smart Cars/Self-driving Cars & the Internet of Things / Internet of Everything
- All of the disruption leads to BIG DATA & Blockchain Integration

4

Predictions of Lord Kelvin, President of the Royal Society, 1890-95
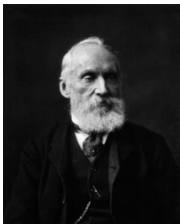
- *"Radio has no future"*
- *"Heavier than air flying machines are impossible"*
- *"X rays will prove to be a hoax"*

5

Why bother with the future?

"If you think that you can run an organization in the next 10 years as you've run it in the past 10 years, you're out of your mind."

James Quincey, CEO, Coca Cola

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Trends Shaping the Future of Care

Surgical and humanoid robots	Robots will become much **more integrated** into **surgical teams** as already established in the area of radiotherapy.
Genomics and truly personalized medicine	DNA analysis will become a standard step when **prescribing medicine** or **treatment**, to ensure it is **personalized** and **optimized** for that particular patient's metabolic background.
Body sensors	**Technology** is allowing us to **measure** critical **health parameters** in convenient and inexpensive ways.
Medical tricorders and portable diagnostics	**Diagnostic procedures** are shifting towards **devices** that are **portable** and able to be performed **from home.**

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Trends Shaping the Future of Care

Rehabilitation robotics	Rehabilitation robotics support an **effective and efficient** way to treat patients through a state-of-art **therapy**.
Therapeutic electrical stimulation	Use of **electrical energy** as a medical treatment
Gamifying health	Combining fun and games into healthcare can **motivate the patient** and **collect data** needed to make informed decisions on daily activities that contribute to one's health.

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Trends Shaping the Future of Care

Do-It-Yourself (DIY) biotechnology	Cheaper technology and a DIY spirit are generating a new generation of scientists and engineers who see no limitations in research. Community biology labs are popping up around the world - the resulting innovation in biotech has the potential for disruptive solutions that will further change the way medicine is practiced.
The 3D printing revolution	**3D printers** can **manufacture** medical equipment, prostheses, or even drugs.
Iron Man: powered exoskeletons and prosthetics	**Exoskeleton** suits have enabled partially-paralyzed individuals to walk again.

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Trends Shaping the Future of Care

|	
Empowered patients	The Internet has led to many people **researching their symptoms** and **diagnosing** and **treating themselves.**
Telemedicine & remote care	Home healthcare services and innovative technology will allow for **doctor-patient connectivity.**
Re–thinking the medical curriculum*	Medical schools will **prepare future physicians, SLPs, & AuDs** for a world full of **e-patients** and **technology.**

10
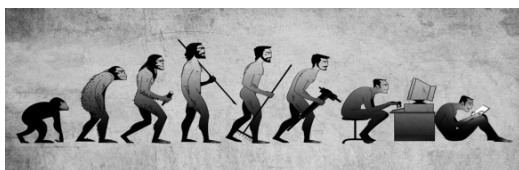
The Evolution of Technology & Disruption

11
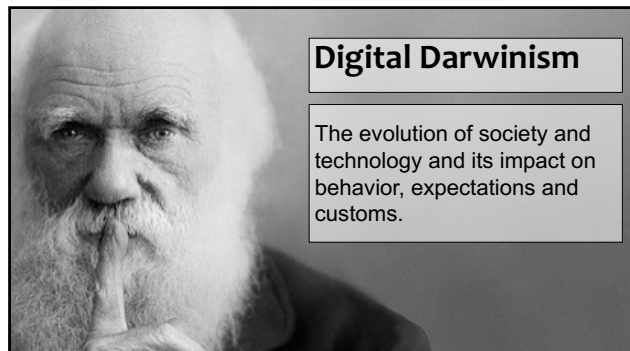
Digital Darwinism

The evolution of society and technology and its impact on behavior, expectations and customs.

Digital Disruption and Health Care

- Disrupt
  - To throw into confusion or disorder
  - To break apart or alter significantly
  - To disturb or upset
- Disruptive Innovation
- Digital Disruption

Digital Disruption and Health Care

Disruptive Innovation: creates a new market and value network, disrupting existing networks eventually displacing established leaders and alliances.
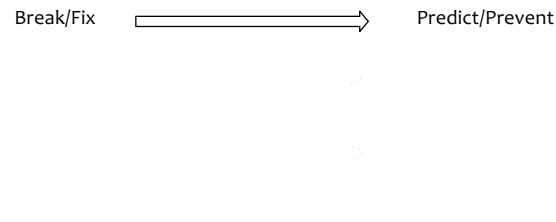**Examples:**

Disruption	Legacy Business
• Personal Computer (PC)	• Typewriter
• Smartphone	• PC's/Cell phones, Landline Telephones
• Ultrasound, CT, MRI	• X Ray Imaging
• Amazon	• Bricks & Mortar Retail / Malls
• Wikipedia	• Encyclopedias (print)
• Digital photography	• Photographic film
• UBER / LYFT	• Taxis

Digital Disruption and Health Care

Future of Healthcare:

Break/Fix ⟶ Predict/Prevent

Digital Disruption and Health Care

Future of Healthcare:

- Personalized Medicine
  will lead to
- Precision Medicine

Risk Assessment: Genetic testing to reveal predisposition to disease

Diagnosis: Accurate disease diagnosis enabling individualized treatment strategy

Prevention: Behavior/Lifestyle/Treatment intervention to prevent disease

Treatment: Improved outcomes through targeted treatments and reduced side effects

Detection: Early detection of disease at the molecular level

Management: Active monitoring of treatment response and disease progression

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Precision Medicine

WHY NOW?

The **time is right** because of:

- Sequencing of the human genome
- Improved technologies for biomedical analysis
- New tools for using large datasets

Super-Convergence & Reboot

Accelerating Digital Technology — Super-Convergence — Reboot

Wireless Sensors & Devices
Mobile Connectivity
Social Networking
Internet
Imaging
Data Universe
Health Information Systems

PREVENTION
PREDICTION
MANAGEMENT
DIAGNOSIS
DISEASE

Based on the work of Dr. Eric Topol, author of "The Creative Destruction of Medicine: How the Digital Revolution Will Create Better Health Care"

1970 1980 1990 2000 2010 2020

Digital Disruption and Health Care

Future of Healthcare:

Precision Medicine is a healthcare model that proposes significant personalization

of decisions with preventive strategies, diagnosis and treatment tailored around

the:

- Genetics
- Biology
- Environment, and
- Lifestyle of the individual patient, enabled by connected health and the digital world.
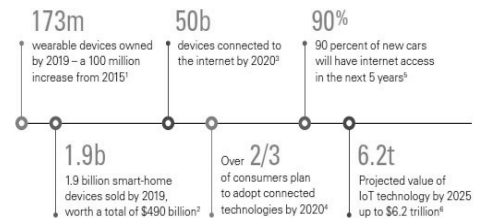
Digital Disruption and Health Care

The new healthcare ecosystem will fundamentally change the way technology is used for care delivery.

EXAMPLE TRENDS:

- "Internet of Things" (Ubiquitous sensing, monitoring and connection)
- "Internet of Me", Wearable Technology, Quantified Self
- "Apps"
- Telehealth
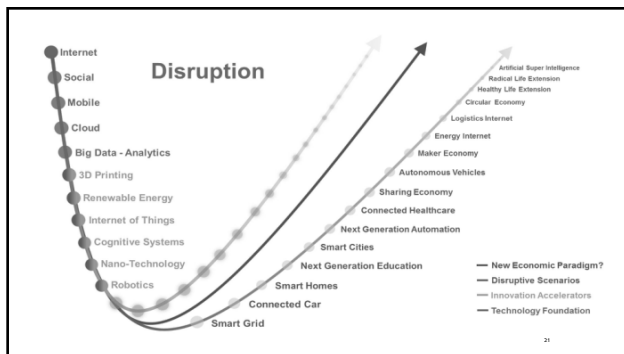
Technology Trends
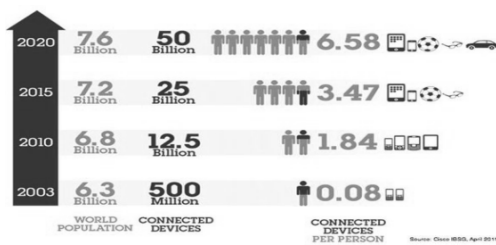
Technology Trends
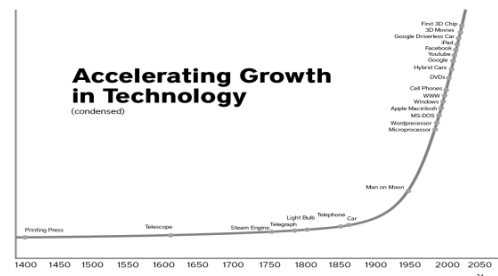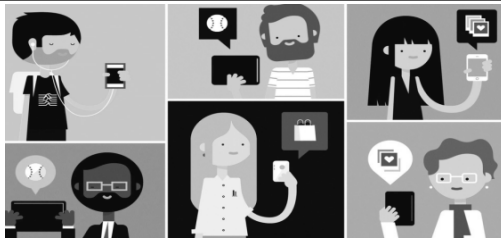
Technology Trends

Technology Use
Generational Trends

Technology Trends: Generational

Five Generations Working Side by Side in 2020

Each generation brings its own view of the world, which creates both opportunities and threats to businesses. This demands Generational Intelligence!
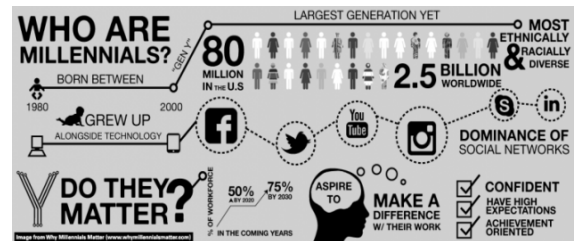
Technology Trends: Generational
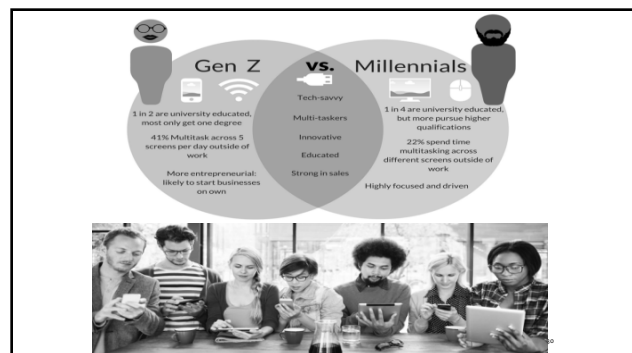

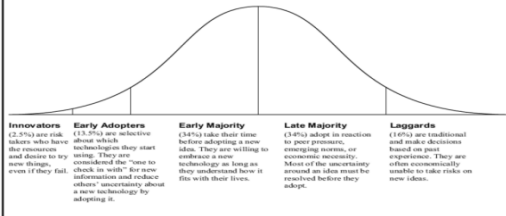## Technology Trends: Millennials

Ages: 16-25

Adopting New Technology

The Technology Adoption Curve
As captured by Everett Rogers in his book Diffusion of Innovations, people tend to adopt new technologies at varying rates. Their relative speed of adoption can be plotted as a normal distribution, with the primary differentiator being individuals' psychological disposition to new ideas.

Innovators (2.5%) are risk takers who have the resources and desire to try new things, even if they fail.

Early Adopters (13.5%) are selective about which technologies they start using. They are considered the "one to check in with" for new information and reduce others' uncertainty about a new technology by adopting it.

Early Majority (34%) take their time before adopting a new idea. They are willing to embrace a new technology as long as they understand how it fits with their lives.

Late Majority (34%) adopt in reaction to peer pressure, emerging norms, or economic necessity. Most of the uncertainty around an idea must be resolved before they adopt.

Laggards (16%) are traditional and make decisions based on past experience. They are often economically unable to take risks on new ideas.

What are you?

The Pencil Metaphor
Adapted from: http://www.teachers.ash.org.au/indy/pencil/pencil.htm

The Hangers-On
Hangers-on know all the right lingo, attend all the seminars, but just don't actually do anything.

The Erasers
These people endeavour to undo much, if not all of the work done by the leaders.

The Ferrules
These people hang on tightly to what they know. They keep a strong grip on their traditional teaching practices and feel that there is not a place for the technology in their classroom.

The Wood
These people would use the technology if someone would just give them the gear, set it up, train them and keep it running. All they need is help from some sharp person and they would be doing it too.
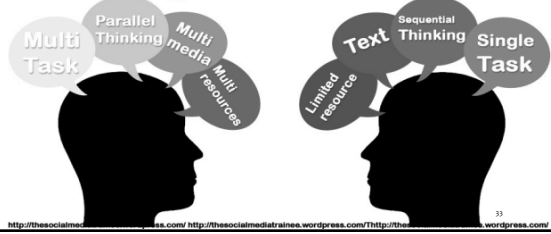
The Sharp Ones
These are the people who see what the early adopters have done, willingly grab the best of it, learn from the mistakes of others and do great stuff with their students.

The Leaders
These people are the first to take on the technology, the early adopters who usually document and enthusiastically share what they have tried, warts and all.

Digital Native Digital Immigrants

Multi Task · Parallel Thinking · Multi media · Multi resources

Text · Sequential Thinking · Single Task · Limited resource

http://thesocialmediatrainee.wordpress.com/

Shifting Expectations of Healthcare

Patients Use Digital Health Devices, Want Them Connected to Care

64% Patients say that they use a digital device (including mobile apps) to manage their health.

71% Patients believe it would be helpful for their doctor to have access to this information as part of their medical history.
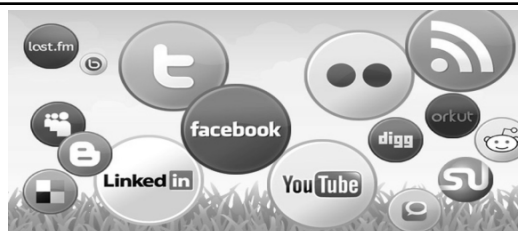
Shifting Expectations of Healthcare

CONSUMERS CHANGING THE HEALTHCARE LANDSCAPE

Rising Consumer Expectations Amazon, Zappos, Facebook, Apple, et al are redefining service, speed and ease-of-use

Continual Connectivity Adoption of digital channels is driving demand for choice and connectedness

Organizational Velocity Wins Tech lowers barriers to entry and increases speed; slow response invites disruption

Abundance of Consumer Data Requires competency in turning complex data into business insight

Social Media & Social Networking

Social Media & Social Networking

Social Media & Social Networking

Social Media & Social Networking

Social Media & Social Networking

Social Media

Forms of electronic communication through which users create online communities to share information, ideas, personal messages, videos, and other content.

Social Networking

The use of a dedicated website, virtual platform, or online community to communicate directly with other members of the site, by posting messages, photos, videos, or sharing information.

Going viral…

43

Going viral…

44

Nyle DiMarco

Nyle DiMarco
May 25 at 6:42am · Facebook Mentions · **0**

I CANT BELIEVE ITU WE WON! WE WON THE MIRROR BALL!!! The first DEAF WINNER!

This is for 70 million of Deaf people in the world! This is for all the Deaf kids suffering language deprivation. Only 2% of 70 million of Deaf people have access to education in sign language. More than 75% of parents don't sign to their Deaf kids. Winning this is a HUGE step to ending LANGUAGE DEPRIVATION of millions.

Thank you all for your continuing support. It means A LOT

#DWTS #NDF #LEADK #deaf

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A Dad's Tattoo

Find us on: facebook®

- Alexander Graham Bell Association for the Deaf & Hard of Hearing
- Hearing Loss Association of America
- Global Foundation for Children with Hearing Loss
- Kids with Hearing Loss
- Overcoming Our Children's Hearing Loss
- Outcomes of Children with Hearing Loss
- Action on Hearing Loss
- Hearing Loss Resource Center

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Find us on: facebook®

- Center for Family Involvement – Deafness or Hearing Loss
- Heroes with Hearing Loss
- Support Success for Children with Hearing Loss
- Families with Hearing Working Together
- Hearing First
- Hearing Health Foundation
- Beginnings for Parents of Children who are Deaf or Hard of Hearing
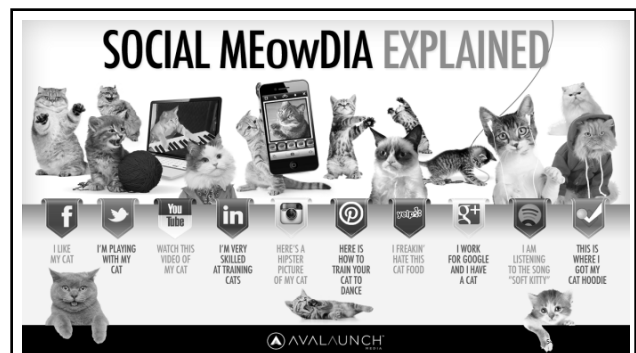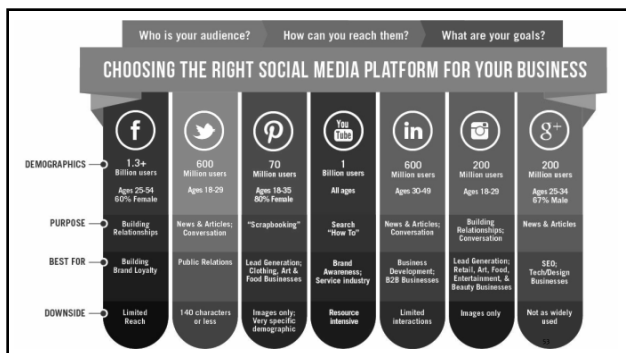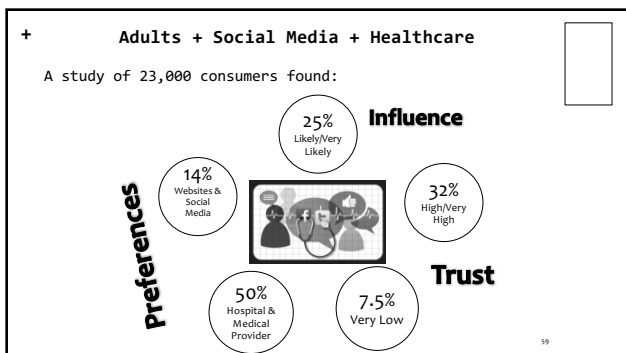- Voice for Hearing Impaired Children
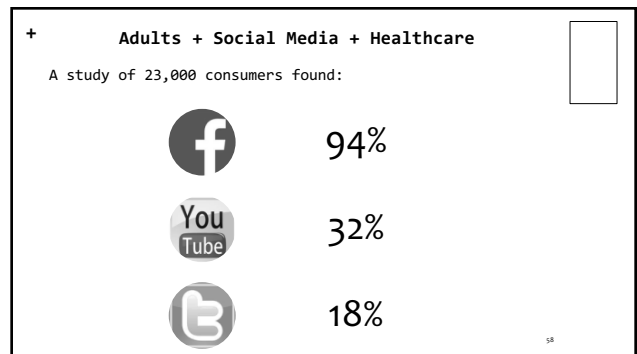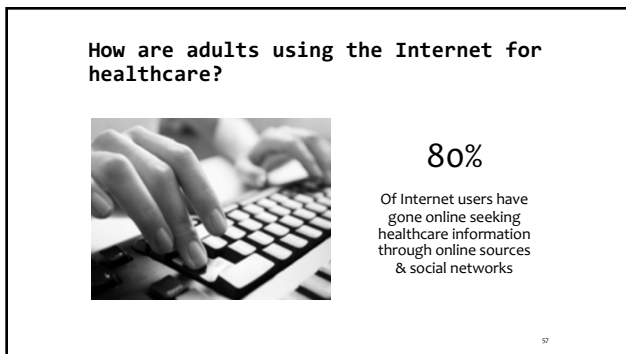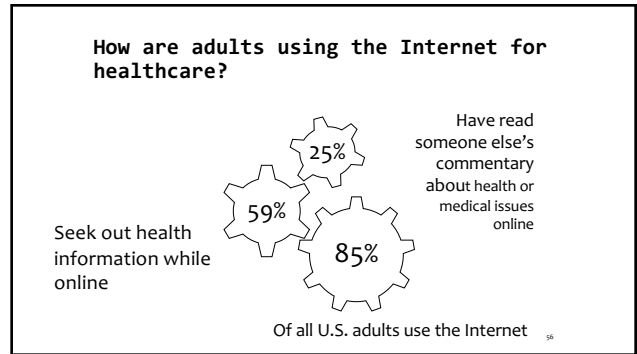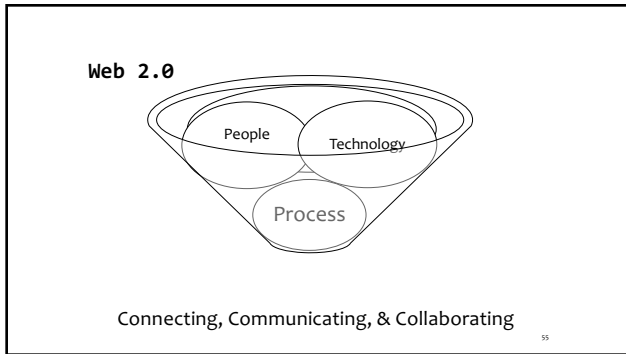
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It's About People…

"At its heart, digital media is about people. It is about *relationships*. It is about communication. A social media presence is about *educating, engaging* and *growing your audience, improving outcomes, and compliance…*"
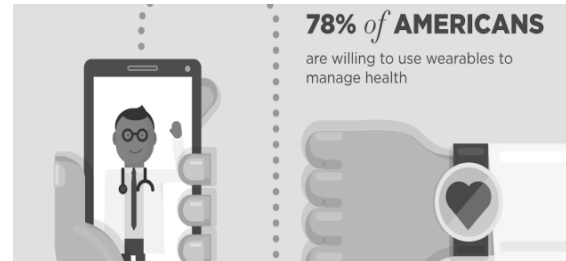
--- H. Luks, MD
Mayo Clinic

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Web 2.0

People

Technology

Process

Connecting, Communicating, & Collaborating

55

How are adults using the Internet for healthcare?

25%

Have read someone else's commentary about health or medical issues online

59%

85%

Seek out health information while online

Of all U.S. adults use the Internet

56

How are adults using the Internet for healthcare?

80%

Of Internet users have gone online seeking healthcare information through online sources & social networks

57

+ **Adults + Social Media + Healthcare**

A study of 23,000 consumers found:

94%

32%

18%

58

+ **Adults + Social Media + Healthcare**

A study of 23,000 consumers found:

25%
Likely/Very Likely
Influence

14%
Websites & Social Media

32%
High/Very High

Preferences

Trust

50%
Hospital & Medical Provider

7.5%
Very Low

59

How are you leveraging social media and social networking as a speech-language pathologist or audiologist?

Mobile Health (mHealth)
The Quantified Self

Mobile Health (mHealth)

78% of AMERICANS
are willing to use wearables to manage health

Wearables, mHealth, & the Quantified Self

A MUCH More Diversified Market Than Investors Realize

CREDIT SUISSE   Source: Company Website, iFlowreader, Credit Suisse Estimates,   Produced by John Piper Slide 6

Mobile Health (mHealth): Will Transform Health Care

25% Physicians using mobile technology to provide patient care

>100,000 health & fitness apps…and growing!

93% physicians believe that mobile health apps can improve patients' health

Top 10 health apps generate up to 4 million free & 300k paid downloads per day

By 2017, mobile health revenue will reach $26 billion

Internet of Things: Healthcare

Four Categories of Networked Medical Devices

1 Consumer products for health monitoring:
These devices -- such as FitBit, Nike FuelBand, or Withings -- generally communicate using BlueTooth to nearby personal mobile devices.

2 Wearable, external medical devices:
This category includes portable insulin pumps which often use proprietary wireless protocols to communicate.

3 Internally embedded medical devices:
Pacemakers and other medical devices are implanted in the patient but communicate wirelessly, either with proprietary wireless protocols or Bluetooth.

4 Stationary medical devices:
These devices, such as hospital-based chemotherapy dispensing stations or homecare cardio-monitoring for bed-ridden patients, often use more traditional wireless networks, such as WiFi networks in hospitals or patients homes.


mHealth = Community-Based Interventions

Using smartphones, tablets or laptops to connect in meaningful situations/contexts – *just in time learning, contextual learning & coaching*

mHealth: Quantified Self

- Handheld & wearable devices will allow us to have our own personal "health" dashboard.
- Individuals with hearing loss will be able to monitor their hearing technology's response to sound, spoken language, or their environment – *in real time.*
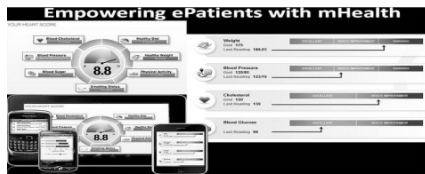
The LENA System™

- Recording
  - Compact digital unit records full day of parent/baby talk & environmental sounds
- Processing
  - Software translates recordings into data
  - Audio can be deleted or retained
  - Installs on multiple desktops or laptops for flexibility
- Online data management
  - Account verification, data storage, reporting, program administration tools, parent communication & more
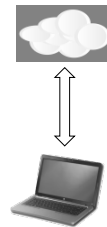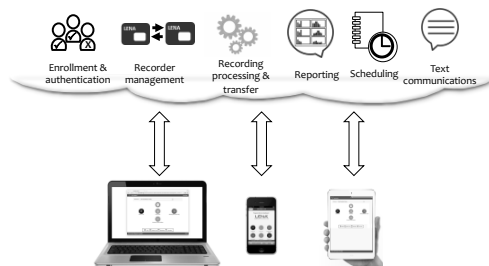 - 24/7 secure access from any device

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What's New?

- System improvements
  - More flexible, efficient recording processing
  - Online management of data & programs
  - Automated text reminders
  - Support for multiple approaches to closing opportunity gaps
- Basic model refinements
  - Process improvements to minimize failed recordings
  - Streamlined child report for at-a-glance summary feedback

---

New Recording Processor

- Loads on any number of desktops or laptops
- Connects online for user authentication, data storage, reporting, etc.
- Flexible options for processing recordings:
  - Immediate (real time)
  - Deferred (collected in field, processed later)
  - Transmitted to other computer for processing
  - Cloud processing

Online Functions

Enrollment & authentication   Recorder management   Recording processing & transfer   Reporting   Scheduling   Text communications
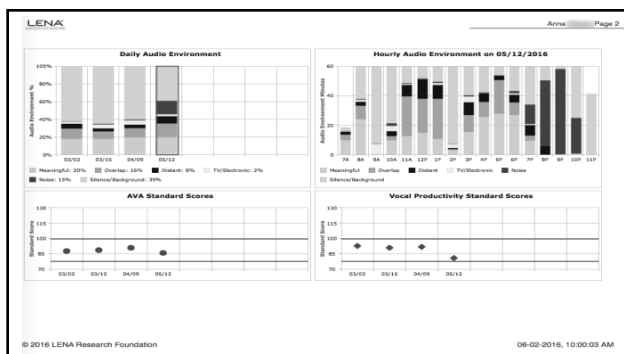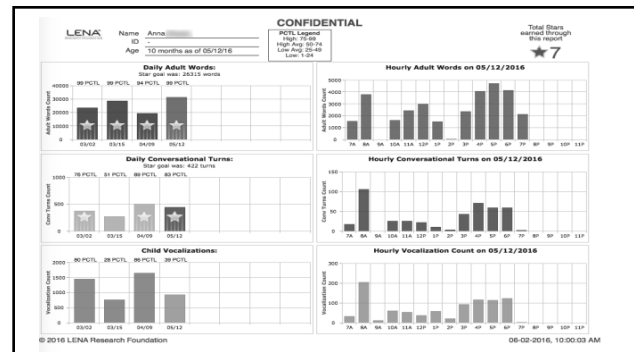

Items

- Number of Adult Words
- Conversational Turns
- Child Vocalizations
- Audio Environment
  - Meaningful
  - Distant*
  - Overlap*
  - Noise
  - TV/Electronic
  - Silence/Background

Speech Scores

- AVA Standard Score
  - Complexity of child's speech

- Vocal Productivity Standard Score
  - Duration of child's utterances
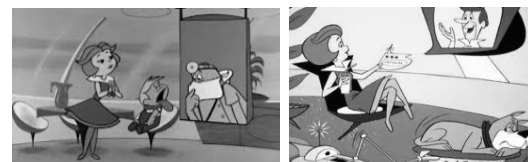

Using the LENA Recording Device

How Do You Envision Using…

- Let's engage in some creative brainstorming about Speech-Language Pathology and Audiology.

Smart Homes
The Internet of Things   or
The Internet of Everything

The Internet of Things

The Internet Of Everything

Source: BI Intelligence Estimates

Internet of Things: Healthcare

The Healthcare Internet of Things (IoT) Market Map

Created By CB INSIGHTS

Smart Phones to Smart Houses

- Caregiver alerts, alarms
- Voice prompts
- Smart beds to monitor sleep cycles, other health related conditions
- Vital sign monitoring
- Auditory access/background noise
- Televisions with built-in Internet access & webcam ~ "Telepractice" ready

How Do You Envision Using…

- Let's engage in some creative brainstorming about Speech-Language Pathology and Audiology.

Virtual Reality

Virtual Reality

How Do You Envision Using…

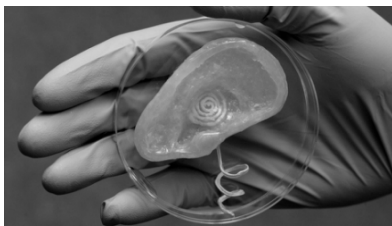- Let's engage in some creative brainstorming about Speech-Language Pathology and Audiology.

3-D Printing

3-D Printing & BioPrinting

3-D printing represents a shift in the medical manufacturing industry because the relatively low cost and small size of printers promises to make the technology widely accessible, allowing doctors and researchers to create personalized devices for patients.
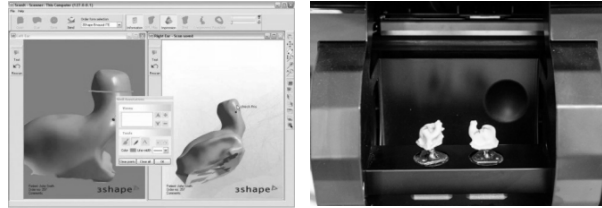

3-D Printing for Cleft Palate Repair

3-D Printing of Earmolds

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How Do You Envision Using…

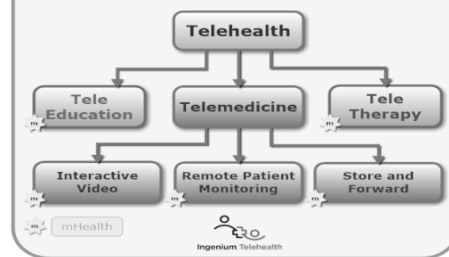• Let's engage in some creative brainstorming about Speech-Language Pathology and Audiology.

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Telehealth

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A Telehealth Taxonomy

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Telehealth

7 OF 10 PATIENTS WOULD PREFER VIRTUAL CARE IF GIVEN THE OPTION

$4.25B SPENT WEEKLY ON DIRECT & INDIRECT WORK COMP COSTS

140K PHYSICIAN SHORTAGE BY 2025

ONLY 18% OF TODAY'S WORKERS' COMP CLAIMS ARE REPORTED IN REAL TIME

70% OF ALL HEALTHCARE VISITS COULD HAVE BEEN DONE VIRTUALLY ACCORDING TO AMA

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Telehealth = Telepractice

Benefits of telehealth

Convenient Deliver behavioral health services from your home, office or when traveling

Simple Use your private computer with a camera and high-speed internet

Opportunity for extra income Offer additional and/or non-standard appointment hours

Open access to more patients Treat members who live in rural areas or with mobility issues

Secure and private HIPAA-compliant platform

Reduce no-shows/ cancellations No member travel time required

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Telepractice In Action

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Blockchain: More Integration & Sharing of Data

Connected Car Example

- Schedule maintenance based on car health
- Weather station on wheels
- Share incident data (location, speed, video) with authorities
- Send road conditions to maintenance authorities
- Adapt car performance based on road condition and weather
- Adapt car behavior based on adjacent cars' history
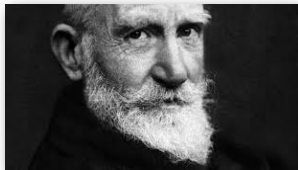- Configure car based on driving patterns
- Way more…
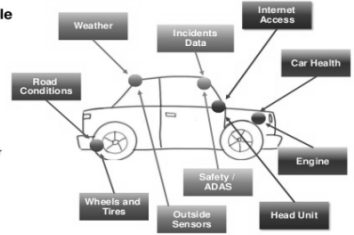
Red Bend Software

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Why bother with the future?

"The future belongs to the unreasonable ones, the ones who look forward not backward, who are certain only of uncertainty, and who have the ability and the confidence to think completely differently."

– George Bernard Shaw

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Final Thoughts

- Technological innovation & disruption is inevitable.
- These changes create endless opportunities for those practitioners who use their imaginations to shape service delivery.
- This is not a technological issue but rather how we prepare ourselves for what is happening around us.

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The point is not to predict the future but to prepare for it and to shape it.