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IoT, Digital Footprints and Smart Homes

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CAS Spring Meeting

May 18, 2016

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In Our Daily Lives, we Increasingly Leave Behind Digital Footprints About:

We are only beginning to grasp the scientific, business administration and public policy implications of our digital footprints.

Internet of Things (IoT) – An Explosion of Data

"The Internet of Things is defined as a way for devices that are connected to the Internet to communicate and share information with other 'smart' devices in real time. In context, these sensors would leverage the capabilities of big data, analytics and even artificial intelligence to anticipate needs, solve problems and improve efficiency."

Jim Marous
Co-Publisher of The Financial Brand and the Digital Banking Report

The people and businesses we insure… homes, automobiles, manufacturing plants, products and more are all connected to the internet, and that connection grows every single day as device makers continue to innovate.

What is The Internet of Things

Technology	Definition	Examples
Sensors	A device that generates an electronic signal from a physical condition or event	The cost of an accelerometer has fallen to 40 cents from $2 in 2006.[2] Similar trends have made other types of sensors small, inexpensive, and robust enough to create information from everything from fetal heartbeats via conductive fabric in the mother's clothing to jet engines roaring at 35,000 feet.[3]
Networks	A mechanism for communicating an electronic signal	Wireless networking technologies can deliver bandwidths of 300 megabits per second (Mbps) to 1 gigabit per second (Gbps) with near-ubiquitous coverage.[4]
Standards	Commonly accepted prohibitions or prescriptions for action	Technical standards enable processing of data and allow for interoperability of aggregated data sets. In the near future, we could see mandates from industry consortia and/or standards bodies related to technical and regulatory IoT standards.
Augmented intelligence	Analytical tools that improve the ability to describe, predict, and exploit relationships among phenomena	Petabyte-sized (10^{15} bytes, or 1,000 terabytes) databases can now be searched and analyzed, even when populated with unstructured (for example, text or video) data sets.[5] Software that learns might substitute for human analysis and judgment in a few situations.
Augmented behavior	Technologies and techniques that improve compliance with prescribed action	***Machine-to-machine*** interfaces are removing reliably fallible human intervention into otherwise optimized processes. Insights into human cognitive biases are making prescriptions for action based on augmented intelligence more effective and reliable.[6]

Source: Deloitte analysis.

Graphic: Deloitte University Press | DUPress.com

Figure 4. Types of sensors with representative examples

Sensor types	Sensor description	Examples
Position	A position sensor measures the position of an object; the position measurement can be either in absolute terms (absolute position sensor) or in relative terms (displacement sensor). Position sensors can be linear, angular, or multi-axis.	Potentiometer, inclinometer, proximity sensor
Occupancy and motion	Occupancy sensors detect the presence of people and animals in a surveillance area, while motion sensors detect movement of people and objects. The difference between the two is that occupancy sensors will generate a signal even when a person is stationary, while a motion sensor will not.	Electric eye, RADAR
Velocity and acceleration	Velocity (speed of motion) sensors may be linear or angular, indicating how fast an object moves along a straight line or how fast it rotates. Acceleration sensors measure changes in velocity.	Accelerometer, gyroscope
Force	Force sensors detect whether a physical force is applied and whether the magnitude of force is beyond a threshold.	Force gauge, viscometer, tactile sensor (touch sensor)
Pressure	Pressure sensors are related to force sensors and measure the force applied by liquids or gases. Pressure is measured in terms of force per unit area.	Barometer, bourdon gauge, piezometer
Flow	Flow sensors detect the rate of fluid flow. They measure the volume (mass flow) or rate (flow velocity) of fluid that has passed through a system in a given period of time.	Anemometer, mass flow sensor, water meter
Acoustic	Acoustic sensors measure sound levels and convert that information into digital or analog data signals.	Microphone, geophone, hydrophone
Humidity	Humidity sensors detect humidity (amount of water vapor) in the air or a mass. Humidity levels can be measured in various ways: absolute humidity, relative humidity, mass ratio, and so on.	Hygrometer, humistor, soil moisture sensor
Light	Light sensors detect the presence of light (visible or invisible).	Infrared sensor, photodetector, flame detector
Radiation	Radiation sensors detect radiations in the environment. Radiation can be sensed by scintillating or ionization detection.	Geiger–Müller counter, scintillator, neutron detector
Temperature	Temperature sensors measure the amount of heat or cold that is present in a system. They can be broadly of two types: contact and non-contact. Contact temperature sensors need to be in physical contact with the object being sensed. Non-contact sensors do not need physical contact, as they measure temperature through convection and radiation.	Thermometer, calorimeter, temperature gauge
Chemical	Chemical sensors measure the concentration of chemicals in a system. When subjected to a mix of chemicals, chemical sensors are typically selective for a target type of chemical (for example, a CO2 sensor senses only carbon dioxide).	Breathalyzer, olfactometer, smoke detector
Biosensors	Biosensors detect various biological elements such as organisms, tissues, cells, enzymes, antibodies, and nucleic acids.	Blood glucose biosensor, pulse oximetry, electrocardiograph

Sources: Jacob Fraden, *Handbook of Modern Sensors: Physics, Designs, and Applications*, fourth edition (Springer: April 2010); Goran Rakocevic, "Overview of sensors for wireless sensor networks," *Internet Journals*, 2004.

Source: http://dupress.com/articles/iot-primer-iot-technologies-applications/

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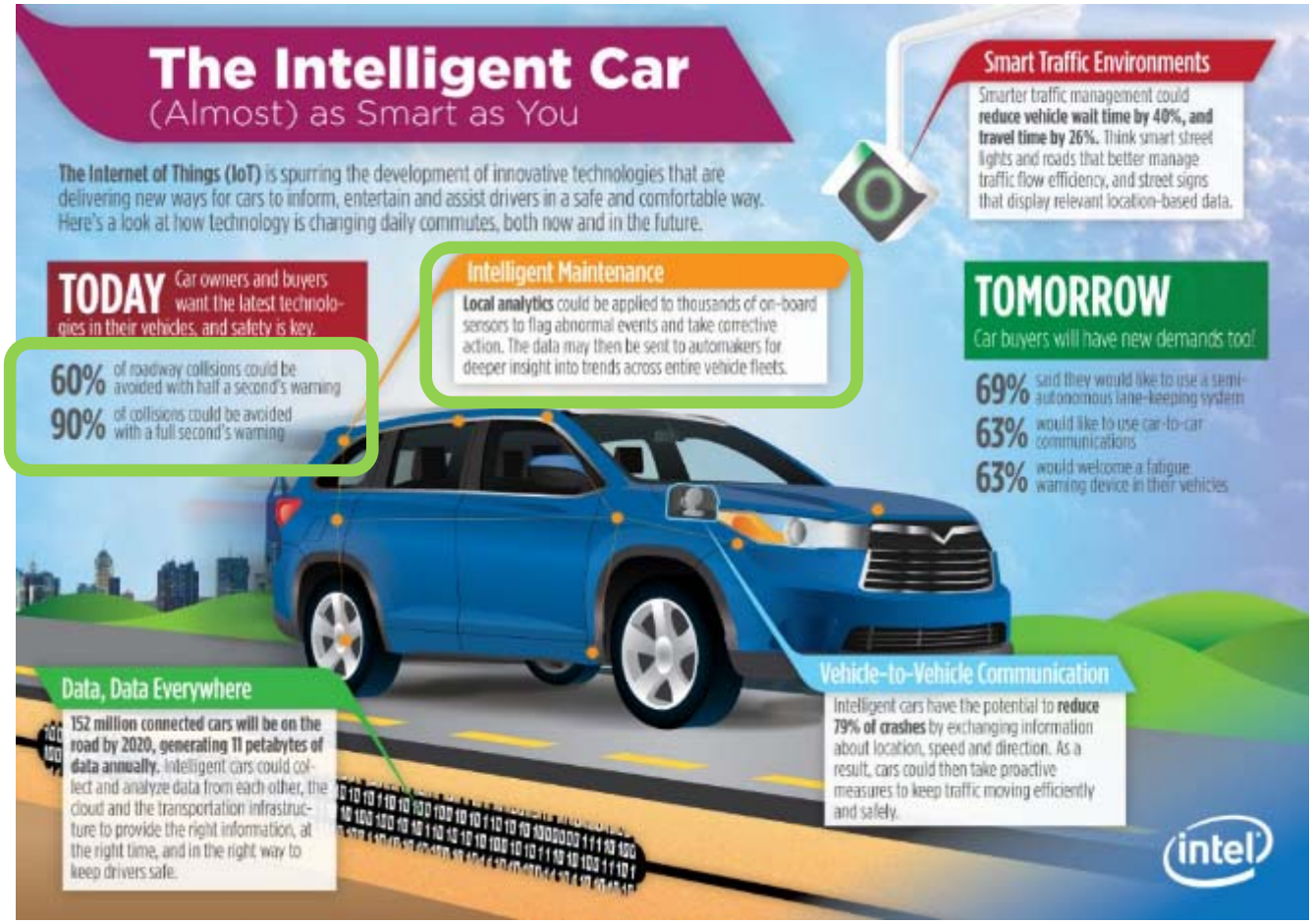
The Smart Car

- Backup sensors
- Forward-collision warning
- Backup cameras
- Lane departure warning systems
- Blind spot warning
- Automatic braking
- ABS
- Electronic stability control
- Front air bags
- Side air bags
- Night vision
- Adaptive cruise control
- Adaptive head lights
- Automatic braking
- Automated parking
- Automated collision notification
- Tire pressure monitoring
- Traction control systems
- Intelligent maintenance
- WAZE trip rerouting



Source:http://www.bing.com/images/search?q=picture+of+iot+in+cars&view=detailv2&&id=31308DA55EF851D5621A156394850357BB1F0049&selectedIndex=0&ccid=WCZu4fZB&simid=607988600632118296&thid=OIP.M58266ee1f641d9f07c9dc5c5e7af5f7do0&ajaxhist=0

Smart Home Tech Solutions Everywhere

House Beautiful

The Amazing List: 75 Smart Home Tech Solutions

The newest devices and apps.

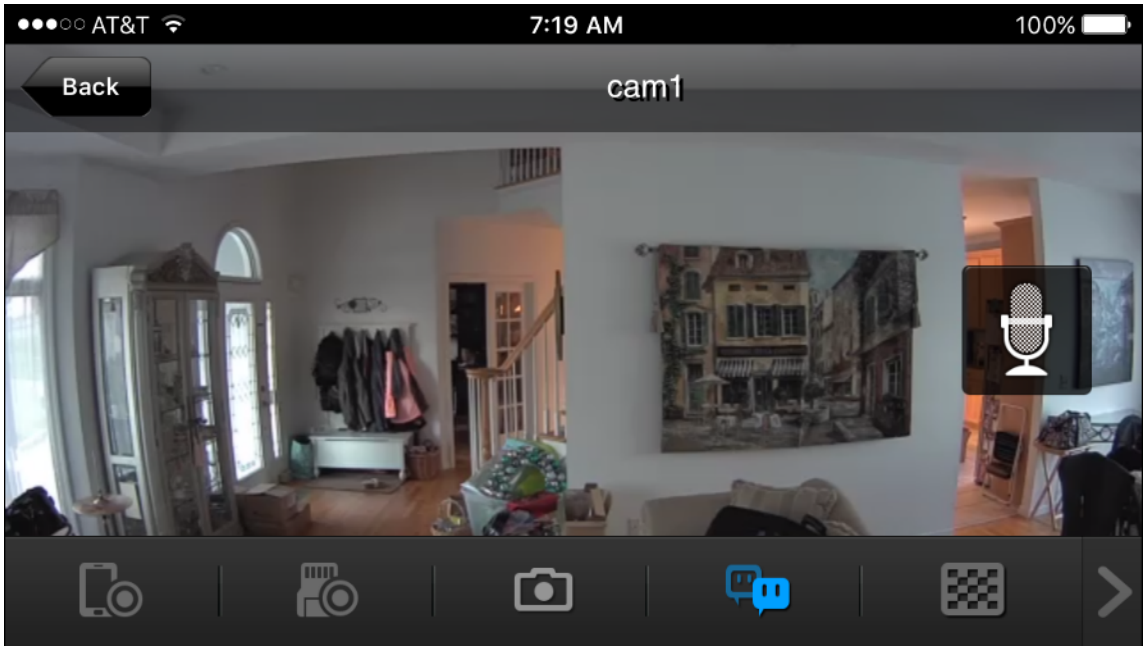
The 3rd gen Nest Learning Thermostat does. It learns what temperature you like and builds a schedule around yours. Since 2011, the Nest Thermostat has saved over 4 billion kWh of energy in millions of homes worldwide.*We calculated total savings numbers by estimating how much energy all our customers would have used if they hadn't bought a Nest Thermostat and just left their old thermostats at a constant temperature. And independent studies showed that it saved people an average of 10-12% on heating bills and 15% on cooling bills. So in under two years, it can pay for itself.

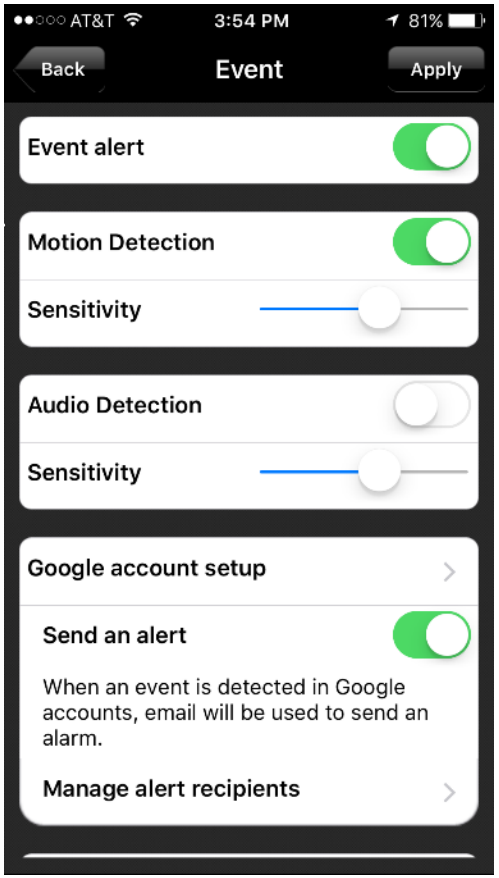
Amazon Echo

- Plays all your music from Prime Music, Spotify, Pandora, iHeartRadio, TuneIn, and more using just your voice
- Fills the room with immersive, 360º omni-directional audio
- Allows hands-free convenience with voice-control
- Hears you from across the room with far-field voice recognition, even while music is playing
- Answers questions, reads audiobooks and the news, reports traffic and weather, gives info on local businesses, provides sports scores and schedules, and more using the Alexa Voice Service
- **Controls lights, switches, and thermostats with compatible WeMo, Philips Hue, Samsung SmartThings, Wink, Insteon, and ecobee smart home devices**
- Always getting smarter and adding new features and skills--over 100 added since launch, including Domino's and Uber

Source : http://www.housebeautiful.com/shopping/home-gadgets/tips/g2050/smart-home-technology/
https://nest.com/thermostat/meet-nest-thermostat/?alt=5
http://www.amazon.com/Amazon-SK705DI-Echo/dp/B00X4WHP5E

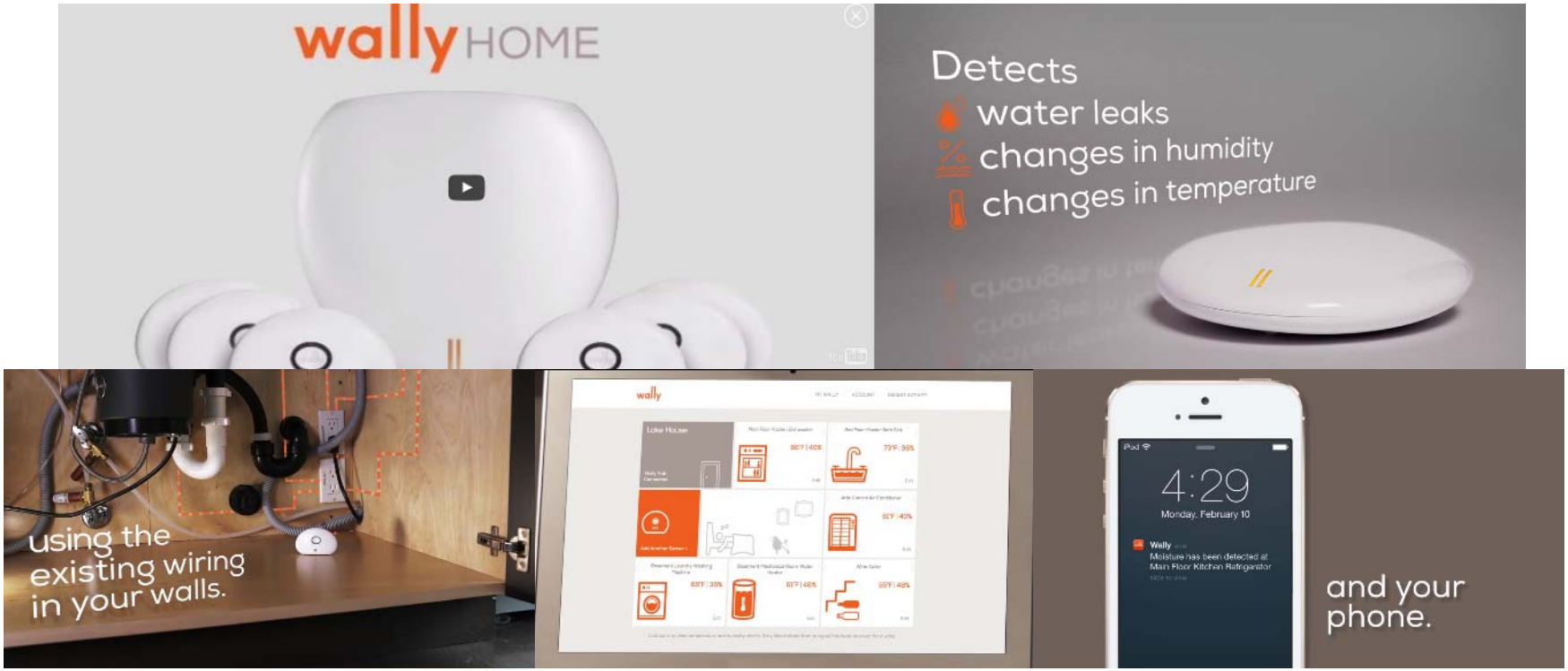
IoT Examples
Smart Buildings – Camera and Security





Source: Kevin Bingham's IPhone

IoT Examples
Smart Buildings – Humidity Sensors



Source: http://www.wallyhome.com/

Homeowners Insurance Considerations

- Impact on frequency, severity and premiums
  - PDA control and alerts at your fingertips
  - Camera and security systems
  - Smart sensors
  - Temperature control
  - Lights
  - Smart appliances
  - Fire Prevention
  - Home sharing
- New competitors from outside insurance
  - Will homes become safe enough that some tech savvy companies may be willing to insure everything but catastrophe risk?

Source: http://www.webn.com/onair/the-kiddchris-show-49404/police-arrive-as-burglars-are-caught-14590068/

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Generational Shifts and the Sharing Economy

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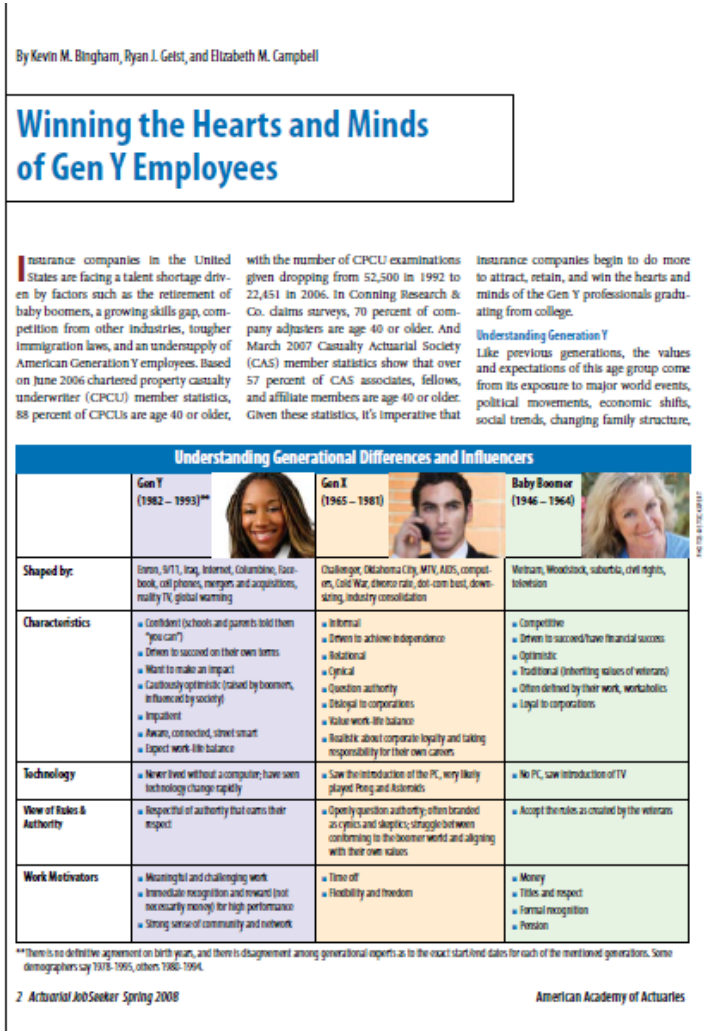
The Coming Generational Shift



By Kevin M. Bingham, Ryan J. Getst, and Elizabeth M. Campbell

Winning the Hearts and Minds of Gen Y Employees

Insurance companies in the United States are facing a talent shortage driven by factors such as the retirement of baby boomers, a growing skills gap, competition from other industries, tougher immigration laws, and an undersupply of American Generation Y employees. Based on June 2006 chartered property casualty underwriter (CPCU) member statistics, 88 percent of CPCUs are age 40 or older, with the number of CPCU examinations given dropping from 52,500 in 1992 to 22,451 in 2006. In Conning Research & Co. claims surveys, 70 percent of company adjusters are age 40 or older. And March 2007 Casualty Actuarial Society (CAS) member statistics show that over 57 percent of CAS associates, fellows, and affiliate members are age 40 or older. Given these statistics, it's imperative that insurance companies begin to do more to attract, retain, and win the hearts and minds of the Gen Y professionals graduating from college.

Understanding Generation Y

Like previous generations, the values and expectations of this age group come from its exposure to major world events, political movements, economic shifts, social trends, changing family structure,

Understanding Generational Differences and Influencers

	Gen Y (1982 – 1993)**	Gen X (1965 – 1981)	Baby Boomer (1946 – 1964)
Shaped by:	Enron, 9/11, Iraq, Internet, Columbine, Facebook, cell phones, mergers and acquisitions, reality TV, global warming	Challenger, Oklahoma City, MTV, AIDS, computers, Cold War, divorce rate, dot-com bust, downsizing, industry consolidation	Vietnam, Woodstock, suburbia, civil rights, television
Characteristics	▪ Confident (schools and parents told them "you can") ▪ Driven to succeed on their own terms ▪ Want to make an impact ▪ Cautiously optimistic (raised by boomers, influenced by society) ▪ Impatient ▪ Aware, connected, street smart ▪ Expect work-life balance	▪ Informal ▪ Driven to achieve independence ▪ Relational ▪ Cynical ▪ Question authority ▪ Disloyal to corporations ▪ Value work-life balance ▪ Realistic about corporate loyalty and taking responsibility for their own careers	▪ Competitive ▪ Driven to succeed/have financial success ▪ Optimistic ▪ Traditional (inheriting values of veterans) ▪ Often defined by their work, workaholics ▪ Loyal to corporations
Technology	▪ Never lived without a computer; have seen technology change rapidly	▪ Saw the introduction of the PC, very likely played Pong and Asteroids	▪ No PC, saw introduction of TV
View of Rules & Authority	▪ Respectful of authority that earns their respect	▪ Openly question authority; often branded as cynics and skeptics; struggle between conforming to the boomer world and aligning with their own values	▪ Accept the rules as created by the veterans
Work Motivators	▪ Meaningful and challenging work ▪ Immediate recognition and reward (not necessarily money) for high performance ▪ Strong sense of community and network	▪ Time off ▪ Flexibility and freedom	▪ Money ▪ Titles and respect ▪ Formal recognition ▪ Pension

**There is no definitive agreement on birth years, and there is disagreement among generational experts as to the exact start/end dates for each of the mentioned generations. Some demographers say 1978-1995, others 1980-1994.

2 Actuarial JobSeeker Spring 2008 American Academy of Actuaries

- Younger Gen Y/Millennial and Gen Z aged insurance consumers are changing the insurance landscape
  - More comfortable leveraging alternative travel
  - Less likely to own multiple cars (if any)
  - More likely to rent
  - More likely to switch jobs
  - More likely to work from home due to company hoteling trends and improving online meeting technology
  - Tech-savvy
  - Waiting longer to have children
  - Children will likely wait longer to get their licenses

Source: www.contingencies.org/supplements/jobSeeker08.pdf

The Sharing Economy

Bike Share

Washington D.C.

New York

Boston

Hubway

Philly

Bike Share
CITY OF PHILADELPHIA
LIFE LIBERTY AND YOU™

Car Share

10 Best Car Sharing Programs in USA

Posted by Michael Coates in Autonomous Cars, Clean Fleet Articles, Electric Cars, Electric Vehicles, Gas Misers, Hybrid Cars, News, Plug-In Hybrids, Top 10 Jan, 07 2016 6 Comments

ZIPCAR UBER LYFT ENTERPRISE CAR SHARE HERZ ON DEMAND CAR2GO
CITY CARSHARE DRIVENOW RELAYRIDES VRIDE GETAROUND

"Car sharing allows households to own only one car, instead of two or three, or for some to forgo car ownership completely, using variations of car sharing and services to pick a vehicle or ride for a given task and location."

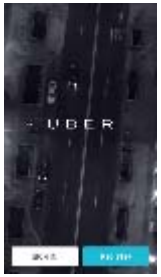
Home Share

AIRBNB – Sharing of vacation rentals, homes, apartments & rooms
Over 1.5M listings in 34,000 cities and 190 countries

FLIPKEY HOMEAWAY VACATIONRENTALS VRBO

Source: Internet, http://www.cleanfleetreport.com/best-car-sharing/ , https://en.wikipedia.org/wiki/Airbnb

Auto Insurance Considerations



A Self-Stopping Car Accident | Driverless car hit reporter

A Self-Stopping Car Accident | Driverless car hit reporter

- Impact on frequency, severity and premiums
  - Advanced analytics and “The Last Mile”
  - User based insurance (UBI) programs
  - UBI real-time risk management
  - Less miles driven as people work from home more
  - Smart car technology
  - Alternative travel (e.g., Uber, Zipcar, GetAround)
  - Bike sharing programs (e.g., NYC, D.C., etc.)
  - Driverless cars?
  - Distracted driving
  - Marijuana laws and the opioid/heroin epidemic

Source: Pictures from YouTube videos, Kevin Bingham’s IPhone

Speaker Bio

Kevin M. Bingham, ACAS, MAAA
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- Co-chairperson, Casualty Actuarial Society's Innovation Council
- Leader of Deloitte Consulting's MPL practice and claim predictive modeling practice
- Past chairperson, Casualty Practice Council Medical Professional Liability (MPL) Subcommittee
- Official spokesperson for the American Academy of Actuaries in Washington
- Advisory board member and chairman of the annual MPL ExecuSummit
- Speaker, trainer and regular contributor to Contingencies Magazine, Inside Medical Liability Magazine, Claims Magazine and other publications on industry issues
  - To date, Mr. Bingham has published over 70 articles/papers and has spoken at more than 100 conferences/seminars/webinars

  - Author of the 155 page children book titled "How to Raise an Everyday Hero: Quotes for Bedtime and Beyond."