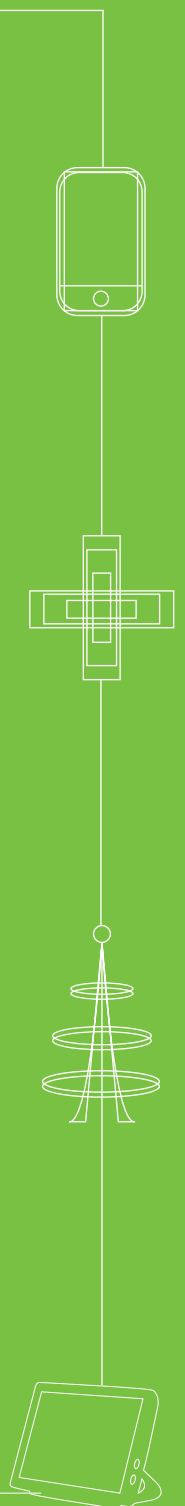


Boomers, Technology & Health: Consumers Taking Charge!

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MIT Enterprise Forum of the Northwest
Seattle-based MITEF NW is one of 27 chapters of the MIT Enterprise Forum in Cambridge, Mass., a global non-profit organization dedicated to the advancement of technology entrepreneurs. MITEF NW's mission is to inspire, connect, and educate our region's entrepreneurial and technology business community. For more information, please visit at www.mitwa.org.

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BOOMERS, TECHNOLOGY & HEALTH: CONSUMERS TAKING CHARGE!

FOREWORD

This research report is the result of more than 50 interviews with industry and research thought-leaders conducted between September and December 2010, in preparation for an MIT Enterprise Forum held in Seattle on January 19th, 2011. The initial hypothesis was that aging U.S. baby boomers would drive technology innovation across many areas. What we found is that boomers would have a substantial impact in one specific area: the adoption of tech-enabled health and wellness products for personal use.

This report presents key findings, as well as barriers, accelerators and opportunities, based on our interviews and secondary research.

Michael Gallelli

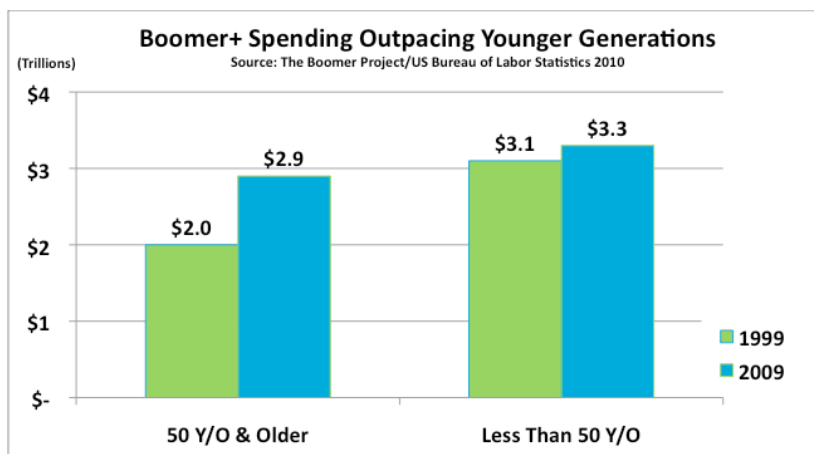
Event Team Lead & Report Lead Author

On behalf of the *Boomers, Technology and Health: Consumers Taking Charge!* Planning Team



FIVE KEY FINDINGS

1. Baby Boomers Will Play a Key Role in the Adoption of Personal Connected Health Products.



Boomers are unlike any previous midlife generation in terms of cohort size, spending power, and independent spirit.¹ They have been at the forefront of some of the most innovative, creative, and groundbreaking undertakings of the last 40 years.

As technology consumers, they are enthusiastic adopters, especially “when the value of doing so is readily apparent,”² explains Richard Adler of the Institute for the Future. By one estimate, they lead all generations in technology spending, including online purchases.³ They are also one of the fastest-growing segments of social networking users.⁴ Many plan to work beyond typical retirement years due to financial need or

1 “Big-Spending Boomers Bends Rules of Marketing,” *USATODAY.com*, <http://usat.ly/h1nAZx> (16 November 2010).

2 Richard Adler, MITEF NW interview, Seattle, Washington, November 2010.

3 “Big-Spending Boomers Bends Rules of Marketing,” *USATODAY.com*, <http://www.usatoday.com> (16 November 2010).

4 *Older Adults & Social Media*, Pew Internet & American Life Project, August 2010.

by choice, or will lead active lives in retirement as volunteers, small business entrepreneurs, and travelers.⁵

Boomer health attitudes mirror other generations' big appetite for using online health sites for treatment information and options.⁶ They are more vocal than others in their rejection of wasteful costs due to healthcare system inefficiencies, the lack of individual accountability, and *defensive medicine's* unnecessary treatments.⁷

Boomers view tech-enabled health products as a way to foster control and ongoing independence for themselves, especially in light of the rise in incidence in chronic disease with aging, and their desire to reduce costs.⁸ Nearly 56% of boomers show a high willingness to use in-home health monitoring devices in tandem with the care of their primary physician.⁹

BOOMER FACTS:

- Nearly 78 million were born between 1946 and 1964.
- The oldest of the generation will turn 65 years of age in 2011.
- One third is online.
- 68% of younger boomers and 51% of older boomers use home broadband to go online
- 59% have been caregivers to aging relatives for at least three years.

Source: U.S. Census Bureau, Pew Internet, Humana

Health management is not just a personal matter. As the so-called *Sandwich Generation*, boomers are also influencers, decision-makers, and caretakers for their aging parents who want to age in place in their own homes, and their boomerang children whose precarious financial situations have made it harder to cut the cord.¹⁰

As John Sherry, Director of User Experience Design for Intel Corp. states, "a number of economic, generational, and societal factors combine to make boomers likely early users of remote health monitoring and management products."¹¹

2. Personal Connected Health is a Component and Enabler of a Paradigm Shift to Patient-centric Approach.

The shift toward consumers assuming a greater role in the management of their own health information and conditions – from *the discipline in the center* to *the patient in the center* – has already begun, with a big chunk of that effort being locally driven by Group Health's *medical home* initiative.¹² The objective of the Medical Home, says James Ralston, M.D. of Group Health Research Institute, "is to promote stronger relationships with patients, address individual care needs more comprehensively, and provide time to coordinate care. Engaging patients between office visits through online services and phone calls has been a key part of its early success."¹³ According to Marc Pierson, M.D., a local leader in creating patient centric programs as V.P. Clinical Information & Quality for the Bellingham PeaceHealth not-for-profit medical institution, "this approach calls for an emphasis on patient-managed data, accessible and shareable with and among a network of care providers through a range of devices and communication/networking tools."¹⁴ Over time, patients them

5 "For Boomers, Recession is Redefining Retirement," *USATODAY.com*, <http://usat.ly/2FAGUV> (June 19, 2009).

6 *Generations 2010*, Pew Internet & American Life Project, December 2010.

7 *2010 Survey of Health Care Consumers: Key Findings, Strategic Implications*, Deloitte Center for Health Solutions, May 2010.

8 *Ibid.*

9 *Ibid.*

10 Laurie Orlov, MITEF NW interview, Seattle, Washington, September 2010.

11 John Sherry, MITEF NW interview, Seattle, Washington, October 2010.

12 "Group Health's Move to the Medical Homes: For Doctors, It's Often a Hard Journey," *Health Affairs*, May 2010.

13 James Ralston, M.D., MITEF NW interview, Seattle, Washington, October 2010.

14 Marc Pierson, MITEF NW interview, Seattle, Washington, October 2010.

PERSONAL CONNECTED HEALTH

Person-centric approach to health and wellness using devices that allow for tracking, communicating, and managing health and wellness data, information and activity outside of traditional care venues. Sharing information and data within a network of care providers, family members and other care and support providers for preventative, promotive and curative objectives is a fundamental component.

Source: Continua Health Alliance

selves will potentially determine more of the composition of professional and lay stakeholders in their own health and wellness management plans, as well as choosing their own remote and mobile devices. While this shift will not be age-specific, it stands to reason that with 67% of boomers having one or more chronic diseases¹⁵, while wanting to reduce costs and in-person doctor visits¹⁶, they will be proponents of this paradigm shift.

3. The Imminent Explosion of Personal Health Data Will Create Opportunities for Entrepreneurial Problem-solvers.

The historically slow mainstream adoption of personal health monitoring devices and services¹⁷ is about to accelerate due to the growth of all things mobile and wireless. For entrepreneurs, the opportunities lie between the edges of the established healthcare industry and consumer web and mobile technology.

The evolution from single-purpose, wearable health monitoring devices, such as Fitbit, to smartphone-based applications is well underway. The iTunes AppStore and Google Apps Marketplace offer hundreds of free and paid applications to monitor everything from exercise workouts to more health-critical biometric data. Recent estimates show 200 million health applications in use by global consumers.¹⁸ This area's growth has prompted the FDA to investigate whether some applications veer into regulated medicine.¹⁹

Data will also become available from behind walled-garden repositories, and with it further opportunity and new challenges. Robert Bosch Healthcare President Derek Newell points to the "blue button" initiative, jointly run by Veteran Affairs (VA) and Center for Medicare and Medicaid Services (CMS) to give downloadable health data access to veteran and Medicare beneficiaries. "A game changer, it will highlight the potential value of personal health records beyond the small percentage of those using them, and will also quickly turn up the heat on information privacy and security issues," said Newell.²⁰

Whether data are coming from in-home sensors, mobile devices, online repositories, or genetic analysis, integrating and visualizing it will be a major effort. The next steps in "making the data validly predictive, actionable, and intervention-worthy,"²¹ says Diane Cook, Electrical Engineering and Computer Science Professor at Washington State University, will be the major opportunity and challenge for entrepreneurs, consumers, and care providers alike.

15 2010 Survey of Health Care Consumers: Key Findings, Strategic Implications, Deloitte Center for Health Solutions, May 2010.

16 Ibid.

17 Laurie Orlov, MITEF NW interview, Seattle, Washington, September 2010.

18 "Report: 70 Percent Want Access to mHealth," *MobiHealthNews.com*, <http://bit.ly/fgLqTv> (17 December 2010).

19 "FDA, FCC Discuss Medical Smartphone Apps as Industry Adjusts to Regulatory Culture," *FierceMobileHealthcare.com*, <http://bit.ly/c2hWQD> (27 July 2010).

20 Derek Newell, MITEF NW interview, Seattle, Washington, November 2010.

21 Diane Cook, MITEF NW interview, Seattle, Washington, November 2010.

4. Lasting Behavioral Change Requires Incentives and Social Support Mechanisms.

In health management, technology enablers are an easy part of the solution, and one where there is already considerable effort. For example, the FCC's National Broadband Plan (NBP), under which \$1.8 billion was granted in August 2010, will address underserved markets where high-speed web access is an issue.²²

However, access and devices will only go so far. The biggest obstacle to better health management, and therefore lower cost, is primarily one of personal behavior and accountability, not one of technology access or functionality. "Chronic diseases are the most common and costly of all health problems, but they are also the most preventable through modification of health-damaging behaviors."²³

While some forward-thinking insurance companies, employers, and corporations have instituted wellness programs for subscribers and employees²⁴, the U.S. healthcare system on the whole is not set up to provide tools to help consumers address, measure, and change unhealthy behavior, regardless of age and health condition. This is where Web 2.0 elements such as social network-driven education, encouragement and reinforcement can play an important role, says Jen McCabe, Founder of Contagion Health and GetUpandMove.Me, "along with meaningful financial and social incentives tied to healthy activity, behavior coaching and even game mechanics to make the entire process not only something producing results, but also engaging and fun."²⁵ "We're smarter today about the science of decision-making and the impacts of extended social circles", adds Henry Albrecht, CEO of Limeade, "and we can marry these insights with the power of social networking and other technologies to create very powerful change-motivating health and wellness programs."²⁶

5. The Northwest Has the Ingredients for the Creation of a Personal Connected Health Business Ecosystem.

The groundswell of corporate, venture and institutional connected health activity indicates potential for more than just discreet initiatives. Given the broad range of talent in the Pacific Northwest (PNW) – technical, business, research, policy and entrepreneurial creation, and investment talent – several interviewees suggested that the PNW contains the makings of a robust ecosystem in connected health.²⁷

Seattle-based A Place for Mom (APFM) is the nation's largest placement service for adult children seeking aging parent care options.²⁸ APFM refers customers to senior care companies, such as Emeritus, Merrill Gardens, and One Eighty's Leisure Care, who along with four others based in the Northwest are seven of the largest in the country.²⁹

On a different note, Nintendo innovatively put console-based physical and cognitive fitness on the map with its novel remote controller and Wii Fit and Brain Age video games.³⁰ Online games from Big Fish Games are a big hit with older players seeking brain exercise and interpersonal connection, in addition to just having a good time.³¹ The same will likely be said of Microsoft's new Kinect system in a year's time. While cognitive fitness is not a key market for these companies, it is interesting to note the potential transferable skills competency in the region for a market forecasted to reach \$1 billion in five years.³²

22 "Broadband Grants Totaling \$1.8 Billion Announced," *NationalJournal.com*, <http://bit.ly/dra0By> (18 August 2010).

23 *Chronic Diseases: The Power to Prevent, The Call to Control*, National Center for Chronic Disease Prevention and Health Promotion, 2009.

24 "Limeade CEO Henry Albrecht On Why Healthy, Happy Employees Are the Key Ingredient to a Thriving Business," *Xconomy.com*, <http://bit.ly/fmJzXL> (27 October 2010).

25 Jen McCabe, MITEF NW interview, Seattle, Washington, November 2010.

26 Henry Albrecht, MITEF NW interview, Seattle, Washington, November 2010.

27 Various, MITEF NW interview, Seattle, Washington, November 2010.

28 "Senior-Care Placement Companies Scramble to Cash In," *SeattleTimes.com*, <http://bit.ly/fU8wOZ> (11 December 2010).

29 Jay Goldstein, MITEF NW interview, Seattle, Washington, November 2010.

30 "Popularity of Brain-Fitness Games Soaring, But Do They Really Work?" *TheStar.com*, <http://bit.ly/eeXY3O> (7 April 2009).

31 Jeremy Lewis, MITEF NW interview, Seattle, Washington, November 2010.

32 Alvaro Fernandez, MITEF NW interview, Seattle, Washington, November 2010.

A range of others focused on health and wellness are building and expanding on PNW-based expertise. With HealthVault, Microsoft has been a leading U.S. and global proponent of online medical records at the care provider and individual level. There is corporate wellness company, Limeade, personal health management venture, Medify and portable ultrasound start-up, Mobisante, to name others. Innovative sensor and robotic technology research is taking place at the University of Washington, Washington State University and Intel Labs Seattle. Commercially, new company, Hoaloha Robotics is working on bringing assistive robots to market. Patient-centric care program design and implementation continues to advance at industry leaders, Group Health and PeaceHealth. The Gates Foundation has been responsible for developing health policy and program work in underserved international and U.S. markets, goals fostered locally by the not-for-profit Washington Health Foundation.

A similar picture comes from Oregon, where Intel’s industry leading role in remote health monitoring through its Health Guide product will grow, with its recent joint-venture announcement with other industry leader, GE Healthcare. Portland is also home to OHSU’s Oregon Center for Aging & Technology (ORCATECH).

Together, Washington and Oregon are broadly representative of the nation as a whole, with about 26% of each state’s population in the 45-64 age group (vs. 25% nationally)³³, and with Oregon’s higher incidence of chronic disease offsetting Washington’s lower rate.³⁴ In other words, there are good reasons why solutions need to be developed in the Northwest, and few reasons why, once developed, they can’t be exported out of the region.

To move this forward, the MIT Enterprise Forum planning team recommends the formation of a public-private group to assess scope, composition and resource requirements for a personal connected health ecosystem in the PNW. This could be modeled on the Washington Clean Technology Alliance, whose advocacy for cleantech faces similar challenges of long investment time horizons, regulatory and legislative compliance, entrenched interests, consumer expectations, and the requirement for behavioral changes. The alternative? Individual companies and entrepreneurs tackling tiny sections of this complex and dynamic problem may not be sufficient to overtake concerted efforts aggressively pursued elsewhere, nor allow the region to fully benefit from the potential for job creation, cost savings, and wealth retention (medical tourism and expatriate retirement communities are growing businesses³⁵).



WHY NOW?

The need to reduce the strain on an already taxed formal and informal U.S. healthcare system has never been more profound. Upcoming demographic shifts will demand greater chronic care treatment and in turn exact a greater societal and economic burden.

Due to the aging of boomers and increasing longevity, the size of the 65+ population will double from 35 to 70 million from 2000 to 2030.³⁶ During the same time period, the number of 65+ as a percentage of total population will increase from 12 to 19%.³⁷ The domestic story is part of a global phenomenon, with numerous countries in a more accelerated state of aging.³⁸

33 *The Next Four Decades: The Older Population in the United States: 2010-2050*, U.S. Census Bureau, May 2010.

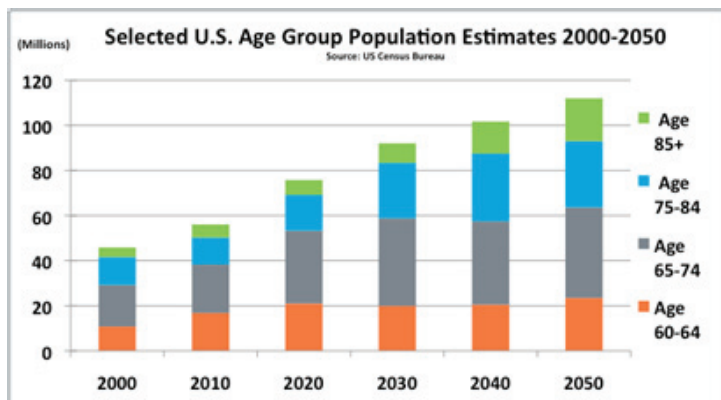
34 *An Unhealthy America: The Economic Burden of Chronic Disease*, Milken Institute, October 2007.

35 Ilene Little, MITEF NW interview, Seattle, Washington, October 2010.

36 *The Next Four Decades: The Older Population in the United States: 2010-2050*, U.S. Census Bureau, May 2010.

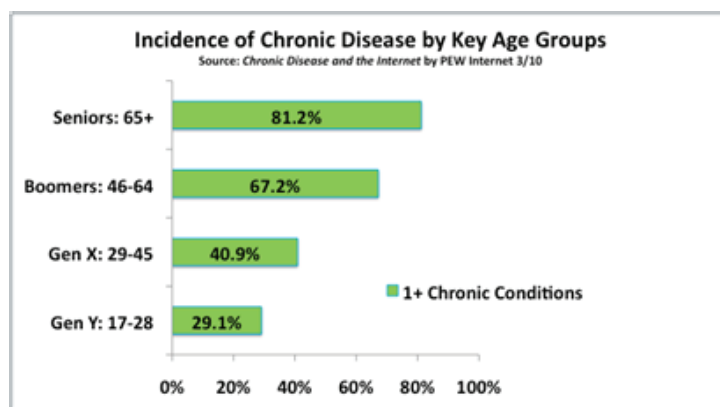
37 Ibid.

38 Ibid.



Chronic disease can strike at any age, but the incidence and multiplicity of conditions rise with aging. More than 50% of people over the age of 50 suffer from at least one chronic condition.³⁹ The underlying causes are related to lifestyle and personal choices, with poor nutrition, lack of physical activity, and tobacco use being the three most significant ones.⁴⁰ Chronic care accounts for two-thirds of healthcare costs.⁴¹ Moreover notes Amanda Twiss, President and CEO of OCS Inc., “about 80% of the costs are being driven by only 20% of the patients receiving it.”⁴²

Chronic disease exacts more than a physical toll on sufferers. Home care expenses, which Medicare typically covers at a rate of less than 75%, represent a major portion of out-of-pocket expenses for people over 65.⁴³ Prescription drug out-of-pocket expenses have risen to an estimated \$4,500 per year for the average Medicare beneficiary.⁴⁴ More than 34 million family members provide informal care to loved ones with the typical profile being a woman, 46 years of age.⁴⁵ The economic value of unpaid caregiving, assuming hours reimbursed at about \$10 per hour, is estimated at \$350 billion annually.⁴⁶ Boomers, who account for a large portion of caregivers, report across-the-board sacrifices on their own health, lifestyle activities, and savings.⁴⁷ According to the Milken Institute, the economic burden on the U.S. for the year 2003 was a combined expense of \$277 billion in treatment costs (for non-institutionalized patients) and \$1.1 trillion in lost workdays and reduced on-the-job productivity for both patients and employed caregivers.⁴⁸ By 2023, combined costs are forecasted to triple.⁴⁹



MARKETING TO BABY BOOMERS

There are important differences between boomers and other consumers often lost on younger generation technology product creators. While ease of learning and use is critical, boomers are also looking for products that offer real value

39 *Chronic Disease & The Internet*, Pew Internet & American Life Project, March 2010.
 40 *Chronic Diseases: The Power to Prevent, The Call to Control*, National Center for Chronic Disease Prevention and Health Promotion, 2009.
 41 Ibid.
 42 Amanda Twiss, MITEF NW interview, Seattle, Washington, October 2010.
 43 *Chronic Diseases: The Power to Prevent, The Call to Control*, National Center for Chronic Disease Prevention and Health Promotion, 2009.
 44 *Valuing the Invaluable: A New Look at the Economic Value of Family Caregiving*, AARP Public Policy Institute, June 2007.
 45 Ibid.
 46 Ibid.
 47 “Baby Boomers Put Own Health on Back Burner to Care for Parents, Other Loved Ones,” *MarketWatch.com*, <http://bit.ly/f8GqHX> (27 October 2010).
 48 *An Unhealthy America: The Economic Burden of Chronic Disease*, Milken Institute, October 2007.
 49 Ibid.

and enhancement to their lives and also help manage varied lifestyles.⁵⁰ Present them with products that are poorly or over-configured with features, and you'll have reluctant takers.⁵¹ Suggest a product that looks as if it's been created for an *older* neophyte user, and you'll have no takers.⁵² The most important insight, though, may be more conceptual. According to Michael Rogers of Practical Futurist, "boomers want to shape the technology they use, unlike younger generations who allow their lives to be shaped by it."⁵³

Within the cohort, two large segments emerge – 46-54 and 55-64 year-olds – whose life experiences are very different, especially when it comes to the role of technology. Younger boomers tend to behave more like older Gen X-ers, especially if email, web use, and mobile messaging figures heavily in their work and family communications.⁵⁴ Yet, no matter how tech-savvy they are, "boomers will still face the same age-related declines in motor, perceptual, and cognitive skills," says Wendy Rogers, Director of Georgia Tech Human Factors Lab.⁵⁵ Adds Rogers, who is also Co-author of *Designing For Older Users*, "this is when easy-to-set alternative input mechanisms, screen display customization, and reminder features become welcomed additions to the configuration."⁵⁶

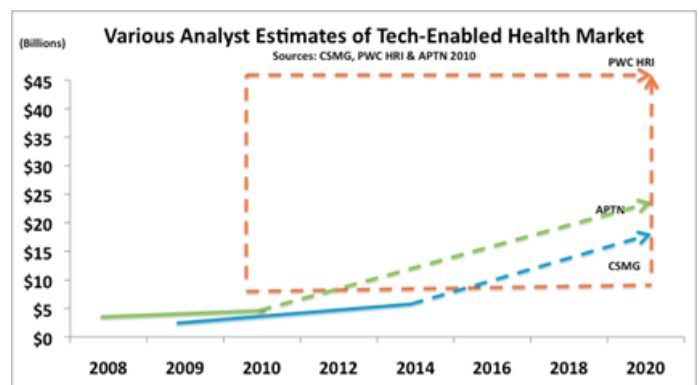
When it comes to building realistic use cases, one must look beyond age, gender, and socioeconomic status. Research demonstrates that multiple user attributes such as health status, attitudes about wellness and prevention, tech proficiency, and caretaker demands need to be considered.⁵⁷ For example, mid-boomer women are potential users and decision-makers of home health monitoring. They are more likely to be diagnosed with a chronic condition⁵⁸ or know someone who has been⁵⁹; more likely to be a caretaker of an aging parent⁶⁰; open to alternative treatments⁶¹; a participant in a wellness program⁶²; and an online health information user.⁶³



MARKET SIZE

The most significant variables in the potential size of the personal connected health market are who pays – insurance companies, CMS, physicians, consumers – how much, with what models and starting when. In the three forecasts shown on the right-hand graph, the first two (APTN and CSMG) assume a combination of payers; the last (PWC HRI) measures the market based on out-of-pocket consumer spending only.

Laurie Orlov of *Aging in Place Technology Newsletter* (APTN) has forecasted upwards of \$20 billion in market



50 Richard Adler, MITEF NW interview, Seattle, Washington, October 2010.
 51 Chuck Nyren, MITEF NW interview, Seattle, Washington, October 2010.
 52 Michael Rogers, MITEF NW interview, Seattle, Washington, October 2010.
 53 Ibid.
 54 "Baby Boomers Put Own Health on Back Burner to Care for Parents, Other Loved Ones," *MarketWatch.com*, <http://bit.ly/f8GqHX>. (27 October 2010).
 55 Wendy Rogers, MITEF NW interview, Seattle, Washington, October 2010.
 56 Ibid.
 57 John Sherry, MITEF NW interview, Seattle, Washington, October 2010.
 58 *2010 Survey of Health Care Consumers: Key Findings, Strategic Implications*, Deloitte Center for Health Solutions, May 2010.
 59 *Chronic Disease & The Internet*, Pew Internet & American Life Project, March 2010.
 60 "Baby Boomers Put Own Health on Back Burner to Care for Parents, Other Loved Ones," *MarketWatch.com*, <http://bit.ly/f8GqHX>. (27 October 2010).
 61 *2010 Survey of Health Care Consumers: Key Findings, Strategic Implications*, Deloitte Center for Health Solutions, May 2010.
 62 Ibid.
 63 *Generations 2010*, Pew Internet & American Life Project, December 2010.

potential by 2020 based on the growth of four areas of tech-enabled services targeting independent aging.⁶⁴ In addition to safety and security and learning and contribution, Orlov delineates two additional areas – communication and health and wellness – which in combination, contain the market for connected health devices and services.

Within the mobile health sector specifically, market analyst firm CSMG forecasts \$4.6 billion by 2014 along with the potential for well over \$12 billion by 2020, assuming insurer reimbursement policies are extended into this sector. Included in its forecast are the following areas: monitoring; personal emergency response services (PERS); telemedicine (including fixed line); mobile medical equipment; mobile health information; RFID tracking; and health and fitness software.⁶⁵

Finally, a recent PriceWaterhouseCoopers Health Research Institute (PWC HRI) estimate for mobile health market calls for \$7.7 billion to \$43 billion annually, based on the range consumers indicated they would be willing to pay for monthly services on their mobile phones and through dedicated devices.⁶⁶



OPPORTUNITIES

“The hardware components exist; it’s not difficult to build such a platform,” say Tandy Trower, CEO of Hoaloha Robotics. “What people have lacked is the ability to envision what the right applications and user interface should be.”⁶⁷ Trower is referring to the field of robotics, specifically assistive robots for the aging and physically impaired, but may as well be generalizing about the state of tech-enabled health products. “Too often unsuccessful or slow-going initiatives are based on products in search of a market, are difficult to operate, or just too expensive,” says Laurie Orlov.⁶⁸ Shwetak Patel, Computer Science and Engineering Professor at the University of Washington, whose research and commercial work with sensor technology spans energy use as well as health monitoring, adds, “there is tremendous user and financial need to make products for the home and other residential spaces that are unobtrusive, simple, and operationally accurate and efficient.”⁶⁹

This in part explains industry excitement over smartphones and mHealth services in general. Artem Petakov, whose NYC-based start-up Work Smart Labs develops and markets mobile fitness applications such as CardioTrainer, points to the appeal of mobile, especially the Android for its “ease, speed and relatively low cost of application development and iteration, potential for applications to integrate with one another, and most importantly that it powers a device that tens of millions of consumers worldwide are already using.”⁷⁰

The opportunity in data analytics and management is already noted in Key Finding No. 3 above. Some other opportunities, outside of the heavily regulated diagnostic environment, are:

Medication adherence

Some \$290 billion are spent annually on avoidable medical expenses, not to mention increased risk of hospitalization and death because patients do not take medication in prescribed doses.⁷¹ The number of prescribed drugs tends to increase

64 *Technology for Aging in Place: 2010 Market Overview, Aging in Place Technology Watch*, July 2010.

65 *mHealth: Taking the Pulse*, CSMG Global, March 2010.

66 *Healthcare Unwired*, PriceWaterhouseCoopers Health Research Institute, September 2010.

67 Tandy Trower, MITEF NW interview, Seattle, Washington, October 2010.

68 Laurie Orlov, MITEF NW interview, Seattle, Washington, October 2010.

69 Shwetak Patel, MITEF NW interview, Seattle, Washington, October 2010.

70 Artem Petakov, MITEF NW interview, Seattle, Washington, October 2010.

71 “Poor Medication Adherence Costs \$290 Billion a Year,” *MobiHealthNews.com*, <http://bit.ly/fYGzDY> (15 August 2009).

with age, with an average person over 65 taking nine prescriptions.⁷² A number of players including pharmacies, pharmaceutical companies, mobile carriers, and start-ups are attempting to build initiatives and businesses in this market. Healthcare reform measures calling for accountable care organizations (ACOs) and hospital readmission penalties will put more focus in this area.

Remote Monitoring and Tracking

The in-residence device market has been building over the last few years through small company acquisitions by Intel, Philips, Bosch and GE, among others. But company heft and resources have not yielded stellar results, and by some accounts, there are fewer than 500,000 total installed devices.⁷³ Smaller companies marketing directly to consumers have had troubling building scale. But with medical personnel and senior care facility bed shortages as well as Alzheimer-afflicted patients staying at home longer along with solutions targeting wellness management, the monitoring and tracking opportunity is ripe for more focus in this area. Given the current low barriers to entry for smartphone applications, the door is open for entrepreneurs with mobile, open source, and social networking expertise.

Device and Application Integration

A different bet is to focus on becoming the vehicle for tying together disparate technologies and data streams. For the foreseeable future, consumers will be directed to different non-integrated applications by care providers.

Social Health and Wellness Communities

Online *social health* communities for life-threatening conditions have emerged as both sites and applications in the last couple of years. In spite of consumer privacy concerns, the sharing of medical and other personal data has not kept niche sites such as PatientsLikeMe and DiabetesMine from rising in popularity when real value is being offered. For the greater population struggling with less serious conditions or wanting to incorporate wellness, there is opportunity to build products that incorporate things such as challenges, coaching, gaming, and other motivators. This is a new and potentially rich space, informs Clayton Lewis, Partner at venture capital firm Maveron, “where personalized health/wellness behavior, goals and communities can be designed, supported and monitored through web applications and mobile devices with like-minded peers and professionals for each individual.”⁷⁴

Robotics Software

Several interviews led to discussions about robotics in the not-too-distant future. Wendy Rogers of Georgia Tech is conducting research on how personal robots can assist home-based aging adults and their caregivers.⁷⁵ Trower of Hoaloha Robotics sees specific opportunities in application and user interface design. Other ideas focused on algorithms needed to control the nuanced movements and skills of a robot, such as self-learning and self-correcting.⁷⁶



NEAR- TO MID-TERM BARRIERS

Incumbent Healthcare System

At \$2.5 trillion and 17% of national gross domestic product (GDP)⁷⁷, the U.S. healthcare industry is massive, fragmented, and slow-moving. An entrenched fee-for-service model and the lack of cost transparency are major impediments to cost reduction, integrated and outcome-based care, as well as overall industry change. With healthcare reform on the horizon

72 Ernest Hood, MITEF NW interview, Seattle, Washington, October 2010.
73 Eric Dishman, Video Interview by Matthew Holt, The Healthcare Blog, <http://bit.ly/fSIBZg> (4 November 2010).
74 Clayton Lewis, MITEF NW interview, Seattle, Washington, October 2010.
75 Wendy Rogers, MITEF NW interview, Seattle, Washington, October 2010.
76 Various, MITEF NW interview, Seattle, Washington, October - November 2010.
77 “Broadband Grant to Create IT, Telehealth Jobs,” *HealthcareITNews.com*, <http://bit.ly/9BKUch> (7 July 2010).

in the form of the Patient Protection and Affordable Care Act (PPACA), Satesh Chutani, CEO of Mobisante, is anticipating regulatory changes, reform-based investment, and consumer dynamics (see Accelerators section below) to “create gradual ruptures in the system that innovative entrepreneurs can step into and own.”⁷⁸ On a contrary note, don’t expect systemic changes to happen quickly, advises healthcare consultant and CEO of Collaborell, Berry Brunk, “reform will occur gradually, reimbursement models will take time to evolve, and established players will experience growing pains while transitioning to more consumer-focused orientations.”⁷⁹ There is also the no small matter of 30 million new health-care users coming online due to reform measures.

Regulatory Environment

In the highly regulated healthcare industry, it can take years and major investment before new diagnostic products and devices receive market approval (if they ever do). With the advent of mobile health applications such as the popular iStethoscope, new joint FDA and FCC regulatory scrutiny has begun. Says Wayne Wager, Co-founder of the angel investment group WINGS, “entrepreneurs and investors, especially those coming from software or other lightly regulated sectors, need to be especially cognizant of the healthcare regulatory landscape as they conceive market and product strategies for new businesses.”⁸⁰ On the other hand, once granted, regulatory guidance or certification can be a boost as physicians and other healthcare professionals often look to it for information on how to incorporate new products into their practices.

With the FDA potentially getting involved in the already heavily regulated telecommunications industry, U.S. mobile carriers have elected for the time being to play more of a back-end enabler role for health applications. With some exceptions as noted below, the carriers mainly provide connectivity and billing interfaces to third-party developers and aggregators offering mobile applications and wireless embedded devices for health tracking and management. The question of whether applications fall within the diagnostic realm or outside of it will determine which players can afford to participate, as well as the speed at which the market grows.

Business Model Uncertainties - Who Pays?

Under long-standing payer models, consumer expectation is that insurance picks up the tab for medical testing and treatment costs. Until payers embrace covering remote or mobile monitoring costs, in whole or part, new businesses will be asking care providers and/or end users to directly bear the fees for new products and services.

The question as to which model will scale successfully in the consumer/retail market was one issue addressed by Serena Foong of PriceWaterhouseCoopers’ Health Research Institute (PWC HRI). Forty percent of surveyed consumers indicated willingness to pay for a mobile monitoring device and monthly service fee that could send health information directly to their physician.⁸¹ Most consumers preferred to pay no more than \$10 per month for the data service and no more than \$75 for a device.⁸² More recent research indicates willingness to pay for similar services to be as high as 70% among global consumers.⁸³ In the meanwhile, the low- or no-payment threshold seems borne out by most mobile health application providers utilizing free downloads, advertising, and free to paid upsell tactics (*freemium* model) to build an early market for their products.

With regard to the marketing and distribution for in-home monitoring devices, Best Buy is piloting a direct-to-consumer model for Internet-connected products in half of its stores⁸⁴, and device OEMs continue to target focus on physician groups and the product benefits of treatment cost savings and operational efficiency.⁸⁵

78 Satesh Chutani, MITEF NW interview, Seattle, Washington, October 2010.

79 Berry Brunk, MITEF NW interview, Seattle, Washington, October 2010.

80 Wayne Wager, MITEF NW interview, Seattle, Washington, November 2010.

81 *Healthcare Unwired*, PriceWaterhouseCoopers Health Research Institute, September 2010.

82 Ibid.

83 “Report: 70 Percent Want Access to mHealth,” *MobiHealthNews.com*, <http://bit.ly/fgLqTv> (17 December 2010).

84 “500 Best Buy Stores to Get mHealth Devices,” *MobiHealthNews.com*, <http://bit.ly/cUrQB9> (24 August 2010).

85 Derek Newell, MITEF NW interview, Seattle, Washington, November 2010.

Accuracy of Data Sources and Predictive Technology

Co-founder and CTO of Medify, Jay Bartot is a believer in data analytics and the notion that “applying in-depth analysis to high frequency and complex [health-related] data will lead to information that consumers can use.”⁸⁶ Disparate and siloed data sources from payer and informatics databases, though, can take time to integrate and analyze, much less be integrated with new sources of biometric, location, and activity information coming from personal devices. Risks come from data that are ridden with false positives and false negatives, and collection systems that cannot sufficiently distinguish among multiple people or other living things in the same environment. Bill Pettit, CEO of Merrill Gardens, points out that “the accuracy of monitoring data has a way to go before concerns about cost-effectiveness and liability, and the ability of systems to be reliably predictive will be eased among buyers at the care facility level.”⁸⁷

Device and Application Interoperability

There is no dispute that standards and interoperability are typically needed for technology markets to grow, notwithstanding a single company winning a commanding leadership position. But today, no individual company wields dominant market power in personal connected health. Efforts by Continua Health Alliance, for instance, to foster ecosystem-type behavior among device and software makers has made progress, but for now proprietary and disparate technologies and platforms rule. The first generations of installed devices and applications do not easily integrate with each other.

Will standards emerge or will a large company such as Intel, GE, Philips, or Bosch convert years-long, multi-million dollar investments and early market experience into a leading position? Or will a new player emerge from the mobile space where open operating systems, powerful portable devices, and application-rich experiences are growing in popularity?

Privacy and Security Concerns

With any new market requiring the availability and dissemination of personal information, there are undoubtedly concerns about privacy and security that can impact the willingness to use, and pace of adoption. Among boomers surveyed in a recent Deloitte Health study, two-thirds of the sample expressed concerns about having health records online.⁸⁸ Mitigating this will require companies to demonstrate reliable data security as well as product benefits that outweigh these concerns. Companies such as Microsoft believe that a key factor for success in this space is to put the consumer at the center. According to Peter Neupert, Corporate Vice President of Microsoft’s Health Solutions Group, HealthVault was designed and built “to put the consumer in complete control of the data, at the finest granular element, but that allows for the sharing of that very data, under the control of the consumer, with any application that’s connected to the HealthVault”.⁸⁹

Independent studies have shown that once consumers start using personal health records, privacy concerns diminish substantially.⁹⁰



NEAR- TO MID-TERM ACCELERATORS

Growth of Mobile

The biggest accelerator of personal connected health is the growing computing power and use of high-speed mobile

86 Jay Bartot, MITEF NW interview, Seattle, Washington, October 2010.
 87 Bill Pettit, MITEF NW interview, Seattle, Washington, November 2010.
 88 2010 Survey of Health Care Consumers: Key Findings, Strategic Implications, Deloitte Center for Health Solutions, May 2010.
 89 Peter Neupert: Microsoft HealthVault Launch Transcript, Microsoft.com, <http://bit.ly/eRUDdA> (4 October 2007).
 90 “Consumers and Health Information Technology: A National Survey,” California Healthcare Foundation, April 2010.

devices and applications. Today smartphones account for more than 40% of all new phone purchases and represent 28% of the mobile phone user base.⁹¹ Boomers are a fast-growing segment of adopters, having risen to one-third of those using advanced mobile phones, including smartphones and touch-screens before the end of 2009.⁹² “With the portability and versatility of a smartphone within easy reach, why would I need any other device to monitor and track health data?” asked several industry executives from the January 19th event interview panel.⁹³

Carriers, already positioned as connectivity and billing partners in the growing mobile health (mHealth) arena, are also exploring different ways in which to grow the connected health area as one of their most important verticals. Witness the recent deal by second-largest U.S. carrier AT&T™ to offer WellDoc’s FDA-approved, mobile phone-based diabetes management to a select group of its employees as a first step to potential commercialization of health applications and devices. According to *MobiHealthNews*, “the AT&T-WellDoc deal brings new scale to mHealth that had heretofore not existed in the U.S.”⁹⁴

Investment in Health IT by Government and Private Sector

Over the next five years, the federal government will pump as much as \$20 billion into the healthcare sector to incent adoption of electronic medical records (EHRs) by private and non-profit medical communities.⁹⁵ The adoption and usage of EHRs and their eventual integration with personal health records (PHRs) is viewed as a critical step in putting meaningful health data in consumer hands.⁹⁶ Further investment will come through the VA and CSM in trialing and potentially launching remote health management programs for veterans and Medicare beneficiaries, respectively. Locally, the state of Washington has granted \$1.7 million to three pilot projects to establish consumer-managed health record banks beginning in 2009.⁹⁷

Microsoft HealthVault and Google Health have made major direct and ecosystem development investments in proprietary web-based services and back-end platforms for aggregating health records for physician and consumer review. One year after their \$250 million strategic alliance in 2009, GE and Intel created a joint-venture to go after what both companies have sized as a combined European and North American market worth more than \$3 billion for telehealth and independent living products.⁹⁸

Venture capital dollars have increasingly flowed into both healthcare services and mobile health, with the former being one of the few areas of investment to grow more than 10 times year-over-year in the third quarter of 2010.⁹⁹ According to Enrique Godreau, Manager Director at Voyager Capital, “there are growing opportunities to help already taxed care providers manage and apply an ever-increasing amount of valuable data as well as help consumers to be more proactive in connecting the information dots on their own.”¹⁰⁰

Social Networking Tools and Levers

With social networking’s rapid infiltration of mainstream culture, boomers have not been sitting on the sidelines. Today, 47% of Internet users between 50 and 64 years of age use social networking sites, a number that nearly doubled from April 2009 to May 2010.¹⁰¹ Moreover, women aged 55 years and older are the fastest-growing demographic segment on Facebook in the U.S.¹⁰² The use of social networking tools to go beyond just (re)connecting with family and friends is already underway and gaining momentum. Sites such as PatientsLikeMe and DiabetesMine use online social hubs to

91 “Mobile Snapshot: Smartphones Now 28% of U.S. Cellphone Market” *Blog.Nielsen.com*, <http://bit.ly/d7O7KE> (2 November 2010).

92 *Boomers and Mobile Usage*, *eMarketer.com*, March 2010.

93 Various, MITEF NW interview, Seattle, Washington, November 2010.

94 “Why the AT&T WellDoc Deal Matters,” *MobiHealthNews.com*, <http://bit.ly/eneAb1> (13 November 2010).

95 “Electronic Medical Records Powered by Billions in Stimulus Dollars,” *MedCityNews.com*, <http://bit.ly/aUxE9U> (26 April 2010).

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97 “State Starts Health Records Bank Pilots,” *HealthDataManagement.com*, <http://bit.ly/elW33K> (17 March 2009).

98 “GE Intel Form Health-Care Joint Venture,” *The Wall Street Journal Online*, <http://on.wsj.com/aW47dW>.

99 *Q3 2010 U.S. MoneyTree Report*, *PriceWaterhouseCoopers*, October 2010.

100 Enrique Godreau, MITEF NW interview, Seattle, Washington, November 2010.

101 *Older Adults & Social Media*, *Pew Internet & American Life Project*, August 2010.

102 “Fastest Growing Demographic on Facebook: Women Over 55,” *InsideFacebook.com*, <http://bit.ly/aDS8HV> (2 February 2009).

share information and empower fellow patients with helpful disease management support. Recent studies have demonstrated the ability of social networks to successfully impact healthy behavior through clustered ties of *health buddies* with shared interests.¹⁰³ There is certainly a case building that the application of social networking features could speed up online personal health record adoption, which today stands at an anemic 10% usage.¹⁰⁴

Increasing Focus on Care, Wellness and Prevention Programs

The combination of personal, societal, regulatory, and economic factors has and will continue to drive both bottoms-up and top-down exploration of the utilization of care and health options, alternative care, and wellness and prevention programs. Seeking out health information is the third most popular web activity across all generations of web users.¹⁰⁵ Twenty percent of consumers chose to forgo a doctor’s visit – whether for cost concerns, perceived non-urgent condition, or to explore alternative therapies.¹⁰⁶ Sales of nutritional supplements grew by more than half from 2007 to 2009.¹⁰⁷ More than half of all organic food sales now occur at mass-market retailers.¹⁰⁸ Recently, federal and regional governments have focused on health, e.g. the use and labeling of trans fats and specifying caloric value of foods on restaurant menus.¹⁰⁹

Both patients and care providers are exploring different ways to improve how they use their time. Forty percent of physicians said they could eliminate as much as 30% of office visits through the use of mobile health technologies such as remote monitoring, email, or text messaging with patients.¹¹⁰

Economic pressures as well as corporate values instantiation are driving companies to create programs that make their employees healthier, more productive, and contain growing healthcare costs.¹¹¹ Microsoft as well as REI, which uses Limeade for its programs, were singled out by President Obama in 2009 for offering exemplary cost reduction and health-promoting alternative care, prevention, and wellness programs.¹¹²



CLOSING THOUGHTS

With the first boomers turning 65 in 2011, the stage will be set for redefining what it means to age in the U.S., in both lifestyle and workstyle. Cost and opportunity implications are wide ranging across a variety of stakeholders – government agencies, insurers, care providers, tax payers, caretakers, product developers, researchers, businesses, entrepreneurs, investors, retailers, and marketers, and of course the aging themselves. Shift toward patient-centric care, adoption and incorporation of mobile and social technologies, and increased health awareness will lead to a personalization of health and wellness solutions. This will occur across all age groups, though boomers as both caretakers and users will drive a major portion.

As with any market paradigm shift, there is a potential for downsides and unintended consequences. Network and data security issues may lead to inappropriate use of personal data. Information from ongoing monitoring could lead to less favorable insurance coverage and rates. The most vulnerable would be placed at further risk during network outages.

103 “Social Networks Influence Health Behaviors,” MarketWatch.com, <http://bit.ly/f8GgHX> (27 October 2010).
 104 *The Mobile Personal Health Record: Technology-Enabled Self-Care*, Deloitte Center for Health Solutions, September 2010.
 105 *Generations 2010*, Pew Internet & American Life Project, December 2010.
 106 *2010 Survey of Health Care Consumers: Key Findings, Strategic Implications*, Deloitte Center for Health Solutions, May 2010.
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 108 Organic Trade Association, OTA.com, <http://bit.ly/bls0d>.
 109 “New York Bans Most Trans Fats in Restaurants,” NYTimes.com, <http://nyti.ms/gLLBQB> (6 December 2006).
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 111 “REI, Microsoft Meet with Obama on Healthcare,” SeattleTimes.com, <http://bit.ly/19zgE5> (12 May 2009).
 112 Ibid.

Technology disparities among consumers may lead to increases in already unequal care in rural settings and among lower socioeconomic groups. However, personal connected health also has the potential to reduce costs, ease strain on care providers, encourage self-care and better health, and allow for aging independently and in place. Furthermore, it could promote and retain economic value through job creation and wealth retention.

This is not a market that will develop quickly nor without bumps along the way. Economic, industry and technology impediments will have to be addressed and mitigated or resolved. It will be critical for innovators to understand consumer needs and wants by involving end users, caretakers, and care providers in product and interface design while raising and promoting the security, ease, and value of sharing personal information. But the businesses that start carving out a competitive market position now will be participating in the growth of game-changing market with the potential for substantial financial and life-sustaining benefits.



GLOSSARY OF KEY TERMS

Aging in place: Ability to live in one's home for as long as confidently and comfortably possible rather than relocating to care-assisted housing or facilities.

Chronic disease: A disease that is long-lasting or recurrent; seven of the most common chronic diseases are cancer, diabetes, hypertension, stroke, heart disease, pulmonary conditions, and mental disorders.

EHR: Electronic health record is an electronic record of patient health information managed by the care provider.

Mobile health: Also known as mHealth, it is a subset of telehealth, delivery of health-related services and information via mobile communication devices.

PERS: Personal emergency response system is a device or wearable "help" button that when activated, connects user's phone to a professionally staffed response center.

PHR: Personal health record is an electronic resource of person health data managed by the consumer.

PPACA: The Patient Protection and Affordable Care Act is a federal statute signed into law in March 2010. It contains health-related provisions phased out over several years, including prohibiting coverage or claims for pre-existing conditions, expanding Medicaid eligibility, subsidizing insurance premiums, and providing incentives to businesses to provide health care benefits.

RFID: Radio-frequency identification is a technology that uses communication via radio waves to exchange data between a reader and an electronic tag attached to an object, for the purpose of identification and tracking.

Telehealth: Delivery of health-related services and information via telecommunications technologies; expansion of telemedicine to include preventive and promotive aspects as well as curative.

Telemedicine: Application of clinical medicine where medical information is transferred through interactive audiovisual media for the purpose of consulting, and remote medical procedures or examinations.

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