Future of Digital Healthcare

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MALAYSIAN COMMUNICATIONS AND MULTIMEDIA COMMISSION

MCMC is the industry developer and regulator for the converged communications and multimedia sector which covers telecoms, broadcasters and ISPs, postal and courier services, digital certification authorities

➤ A statutory corporation

- Established by the Malaysian Communications and Multimedia Commission Act 1998

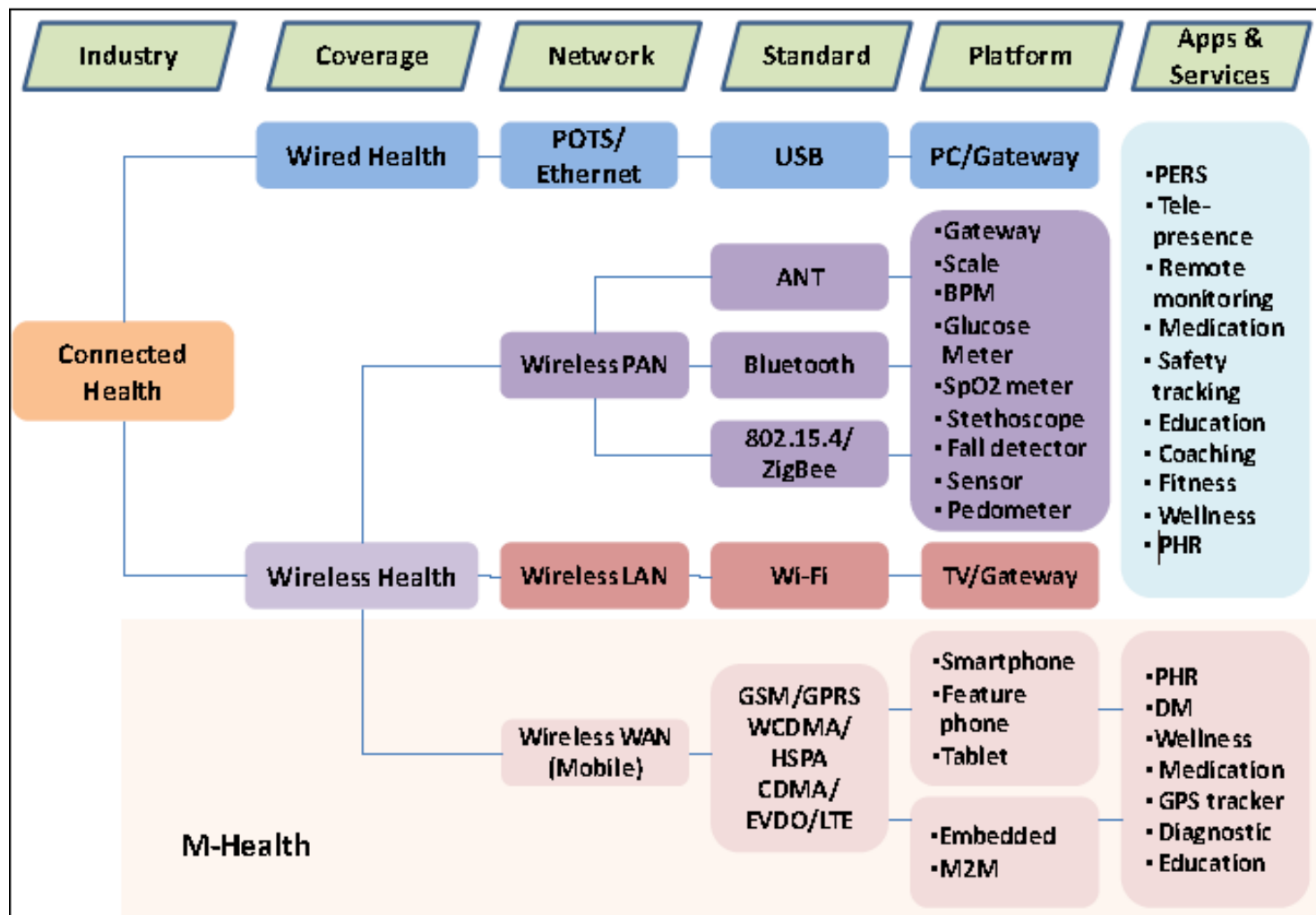- Effective from 1 November 1998
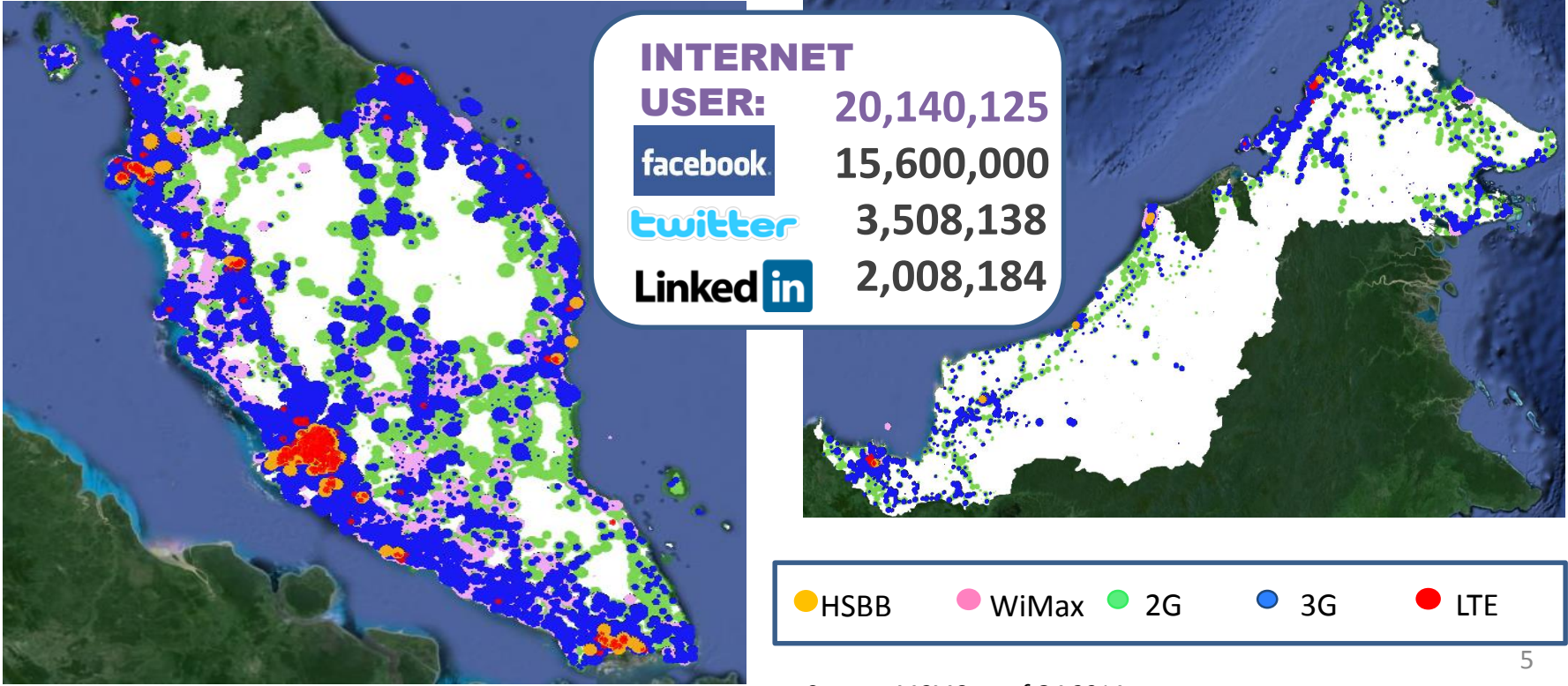
Lets define Digital Health…

Figure 1 M-Health, Wireless Health, and Connected Health

3 Things I like to share with you today

1. The Malaysian ICT Landscape
2. The Digital Healthcare Landscape
3. The Future of Digital Healthcare

OVERVIEW – MALAYSIA: Service coverage facilitates connected living - providing a good setting for the adoption of Digital Services by the masses in social and business

70.2% Household Broadband Penetration	**9.7 million** Total Broadband Subscriptions **6.7 million** Wireless broadband subscriptions	**3 million** Fixed Broadband Subscriptions	**45 million** Cellular Subscriptions **(148.5%)**	**18 million** 3G Mobile subscriptions	**31.8%** LTE Coverage at Populated Area
	20.95(USD)/ 41.52 (PPP) Fixed Broadband Tariffs	**22.1** International Internet bandwidth, (kb/s per user)	**96.8%** Cellular Coverage at Populated Areas	**83.7%** 3G Coverage at Populated Areas	**35% FTTx** Household coverage **78% ADSL** Population coverage

INTERNET USER: 20,140,125

facebook 15,600,000

twitter 3,508,138

Linked in 2,008,184
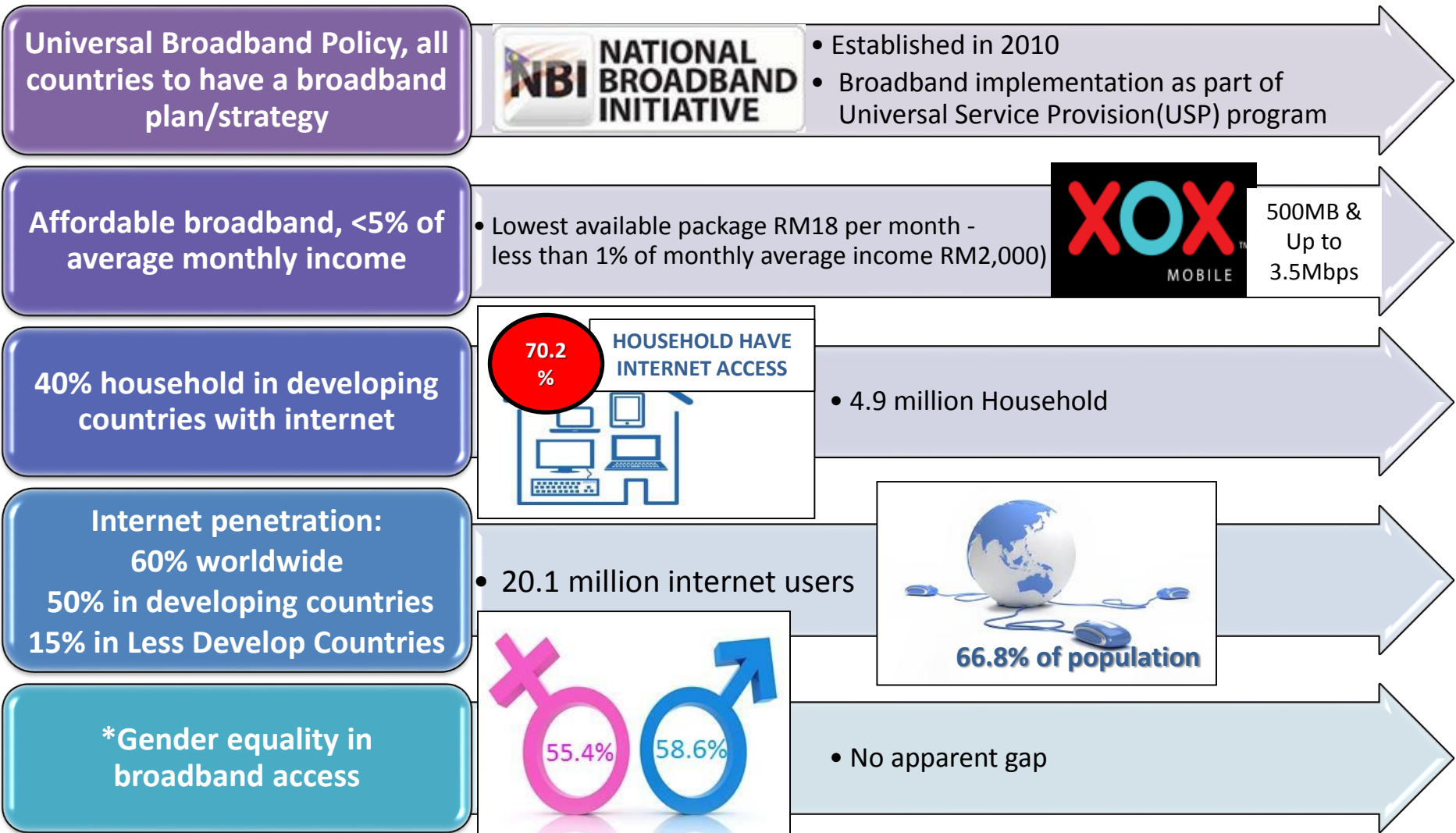
●HSBB ● WiMax ● 2G ● 3G ● LTE

Source : MCMC, as of Q4 2014

Leveraging the benefits of high penetration of affordable broadband access. **Think digital in the things we do!** All BROADBAND COMMISSION FOR DIGITAL DEVELOPMENT – TARGETS have been met/surpassed.

MCMC

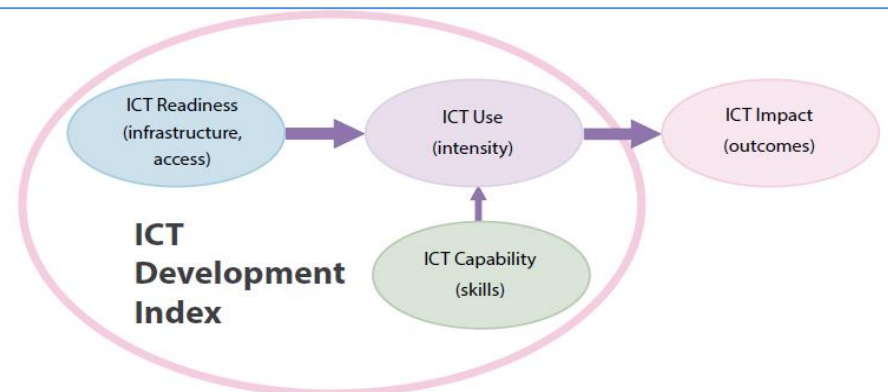| BROADBAND COMMISSION TARGET BY 2015	MALAYSIA ACHIEVEMENTS
Universal Broadband Policy, all countries to have a broadband plan/strategy	**NBI NATIONAL BROADBAND INITIATIVE** • Established in 2010 • Broadband implementation as part of Universal Service Provision(USP) program
Affordable broadband, <5% of average monthly income	• Lowest available package RM18 per month - less than 1% of monthly average income RM2,000) **XOX MOBILE** 500MB & Up to 3.5Mbps
40% household in developing countries with internet	**70.2%** HOUSEHOLD HAVE INTERNET ACCESS • 4.9 million Household
Internet penetration: 60% worldwide 50% in developing countries 15% in Less Develop Countries	• 20.1 million internet users **66.8% of population**
*Gender equality in broadband access	55.4% 58.6% • No apparent gap

*new target endorsed by the Broadband Commission for Digital Development (set up by ITU-UNESCO) by a new Working Group on Gender

Towards a Smart Digital Nation in 2020, Malaysia to benefit from opportunities arising from these challenges

- Infrastructure deployment to tackle quality and speed requirements

- Innovative digital service offerings leveraging on connectivity, convergence and ensuring value proposition and affordability

- Driving data usage and services through digital lifestyle content development (open data, apps, Internet-of-Things, games, data analytics, online TV, mobile health (wearables), connected transport, etc)

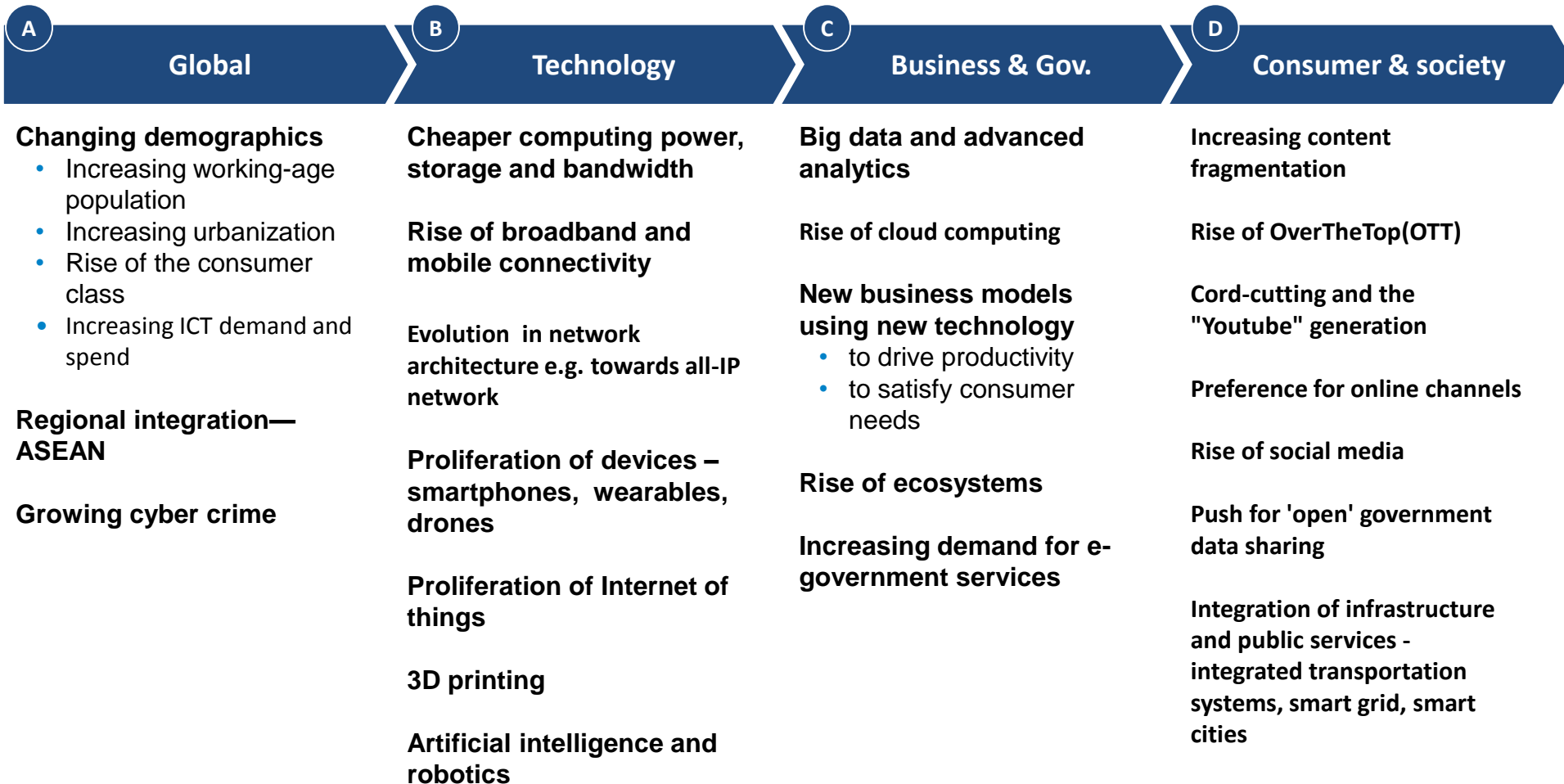- Ensuring safety and security in the digital economy

Three stages in the evolution towards an information society

ICT Readiness (infrastructure, access) → ICT Use (intensity) → ICT Impact (outcomes)

ICT Development Index

ICT Capability (skills)

Source: ITU, Measuring the Information Society Report 2014

*IDI Ranking: 2011 – 56, 2012-66, 2013-71

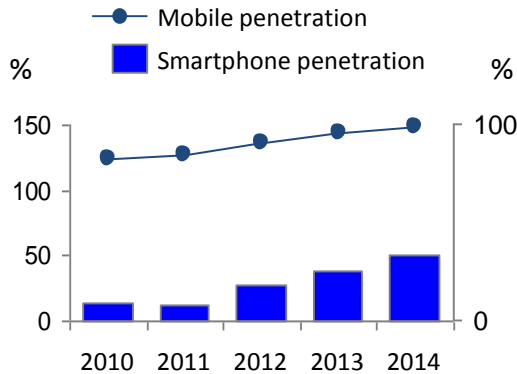# Key trends in the communications and multimedia (C&M) sector

A Global	**B** Technology	**C** Business & Gov.	**D** Consumer & society
Changing demographics	**Cheaper computing power, storage and bandwidth**	**Big data and advanced analytics**	**Increasing content fragmentation**
• Increasing working-age population	**Rise of broadband and mobile connectivity**	**Rise of cloud computing**	**Rise of OverTheTop(OTT)**
• Increasing urbanization		**New business models using new technology**	**Cord-cutting and the "Youtube" generation**
• Rise of the consumer class	**Evolution in network architecture e.g. towards all-IP network**	• to drive productivity	**Preference for online channels**
• Increasing ICT demand and spend		• to satisfy consumer needs	**Rise of social media**
Regional integration— ASEAN	**Proliferation of devices – smartphones, wearables, drones**	**Rise of ecosystems**	**Push for 'open' government data sharing**
Growing cyber crime	**Proliferation of Internet of things**	**Increasing demand for e-government services**	**Integration of infrastructure and public services - integrated transportation systems, smart grid, smart cities**
	3D printing		
	Artificial intelligence and robotics		

Key C&M trends are being felt in Malaysia
Selected examples; non-exhaustive

Growth in mobile / wireless penetration and traffic

- Mobile penetration
- Smartphone penetration

Telcos building new business outside of the core

Telekom Malaysia moving into New Media as well as ICT

Mobile operators building new businesses e.g.
- eCommerce (Celcom ePlanet)
- M2M (Digi fleet logistics)

Decline in voice and SMS revenues

US M

Voice   Data   Mssg.   Apps

Public & private sector efforts to exploit ICT & digital

Multiple projects under Digital Malaysia masterplan to increase the digital economy's contribution to GDP from 13% to 17%

MAMPU mandated to drive e-transformation of public sector

Smart City / Smart town pilots
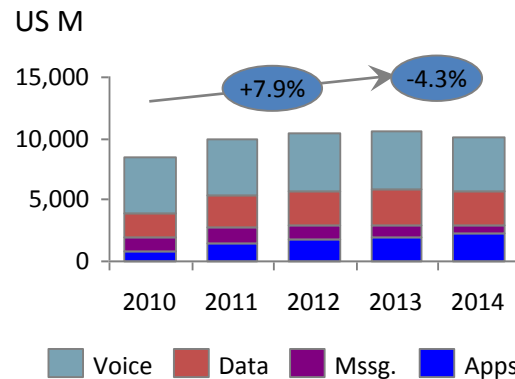
Rise in online video and OTT attack on TV

38% of Malaysians watch daily
- #3 in the world in downloaded / streamed content

TV adex has been resilient to date but under more pressure

Players building own OTT; local / regional offers emerging (e.g. Tonton, Astro-on-the go, iFlix, Hooq)

Rise in social media abuses and cyber attacks

Exponential social media growth
- > 15M active Facebook users

Doubling of complaints handled by MCMC on abuse of social media in past 5 years

Number of cyber attack incidents has increased significantly

2. Digital Healthcare Landscape:
Trends, Innovation, Impact and Challenges

The global e-healthcare market/sector has started taking shape...delivering social benefits as well as garner expected revenue of US B in years to come

Data Points

- For 2010: the US digital health industry generated $1.7billion in product and service revenue
- The chronic care monitoring market account for 60% ($1.03B)of revenues, Senior Aging in Place($652M) and Wellness & Fitness ($34M).
- By 2015, its estimated that the digital health industry will grow in a $5.7B market.

U.S. Digital Health Market Revenues (2010-2015)

Millions of Dollars

Year	Value
2010	$1,715
2011	$2,355
2012	$3,089
2013	$4,223
2014	$5,155
2015	$5,742
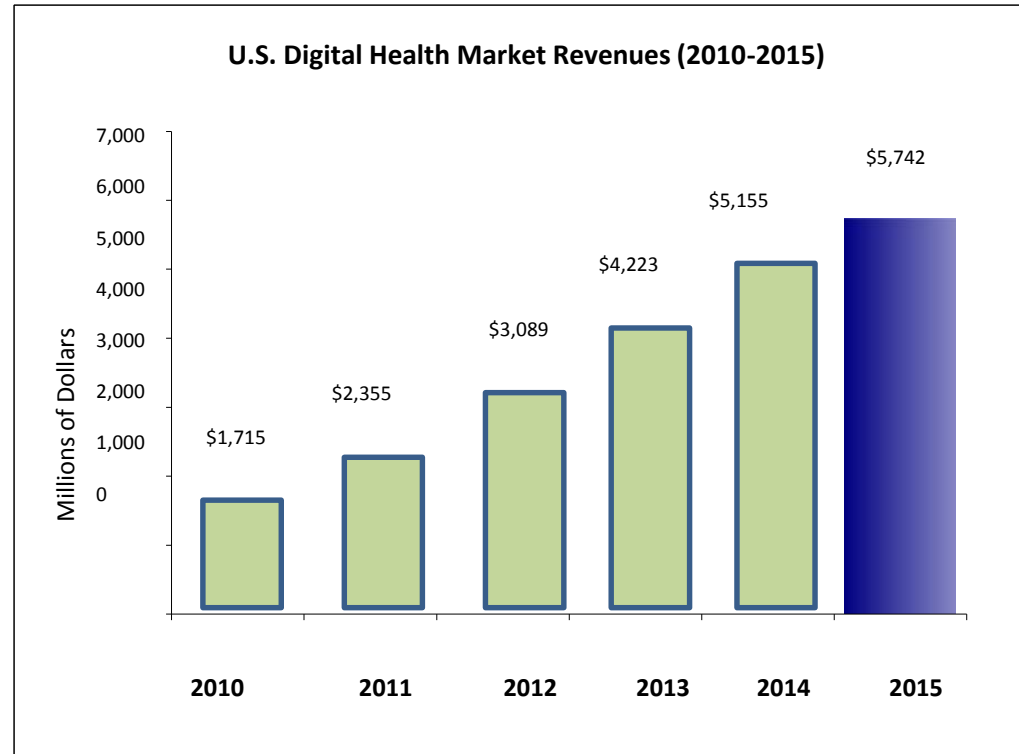
Note: Source from Parks Associates, US data reference used as it reflects a more mature market

One of the key drivers of adoption is the proliferation of mobile technology which fundamentally has altered how people communicate with one another and how they manage their personal lives,

Drivers:

•Aging Population and long life expectancy

•Shortage of physicians and nurses

•Improvement in communication infra and technology
•Rapid adoption of smartphones

•Industry has achieved consensus that healthcare IT can transform care delivery system
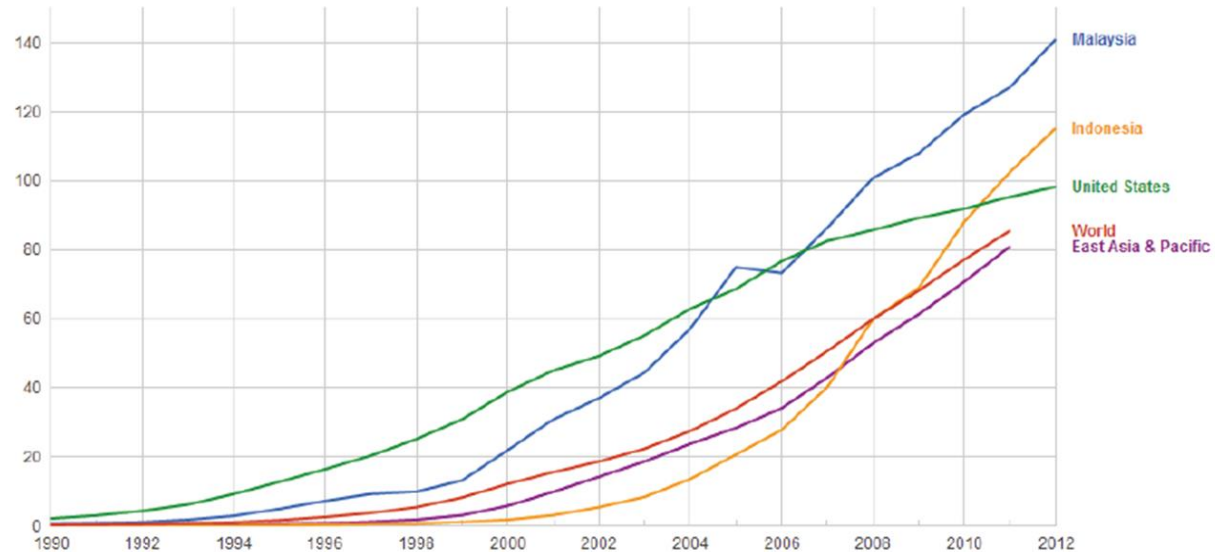
Source: The World Bank (2012)

…Which in turn impacts how doctors will interact with patients…

88% of physicians want patients to track their health

What physicians want patients to track

Category	Percentage
Weight	65%
Vital Signs	57%
Calories	36%
Sleep Patterns	35%
Cardiac Rhythm	28%

And how patients modify health behaviors, whereby consumers role in healthcare is evolving.

FROM

- A Sense of Dependency
- Deferring to Doctor
- Clinician Centric
- Isolated Data

TO

- A Sense of Accountability
- Taking charge of your health
- Consumer centric
- Making informed insights

More information tools to achieve better health outcomes

Partner in their healthcare

Fewer hassles/more convenience

Customization

Access to knowledge bases

ICT drives innovation - Expect a changing landscape and opportunity to lead/win!

- Healthcare is no longer limited to the physician's office

- Ground breaking insights powered by BIG DATA analytics

- Improved patient experiences using mobile devices

- New medical devices, treatments & diagnostics

At the very basic, search has been a game changer
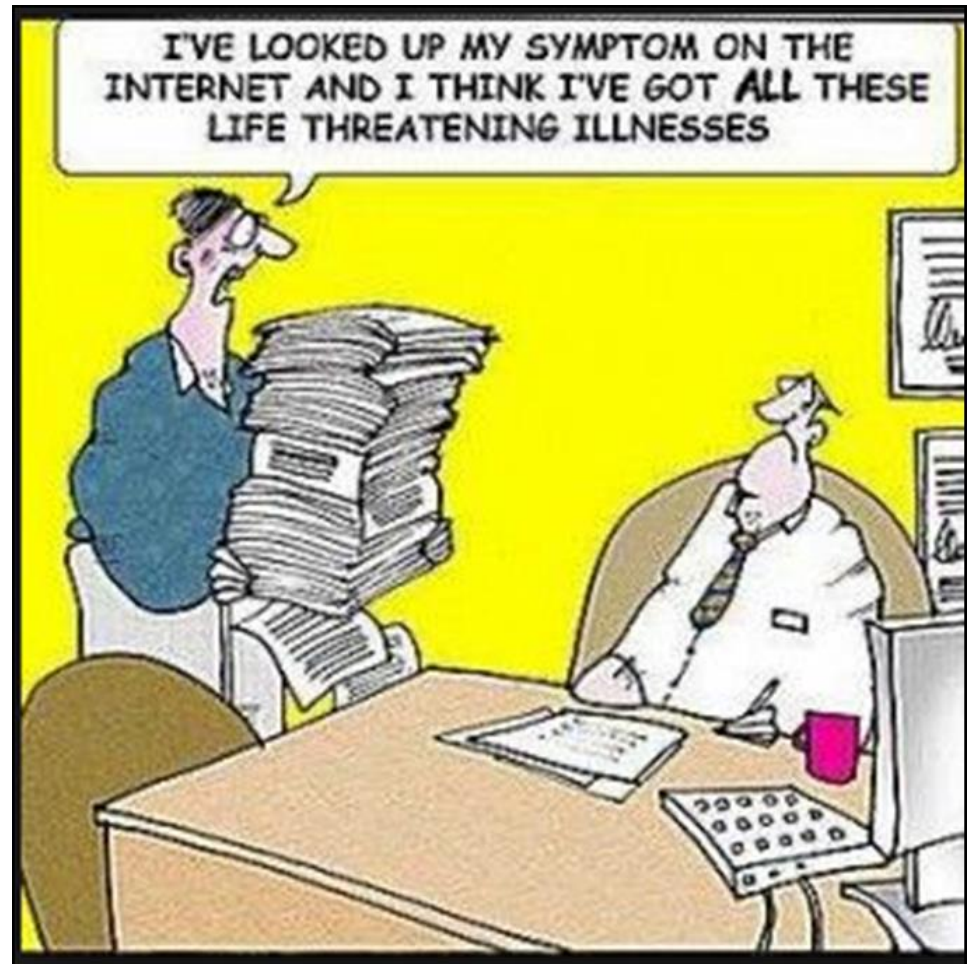
Not only is the frequency on the rise but key decisions are made online

+20% y/y

2009   2011   2013
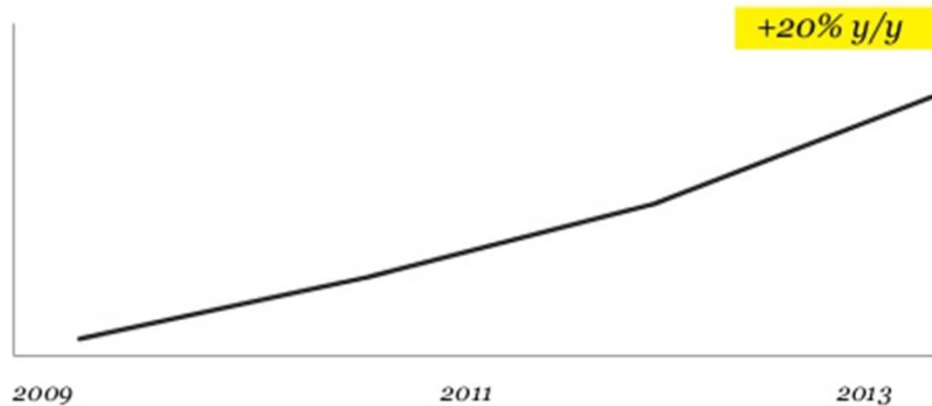
54% of online consumers say online information or tools have influenced their choice of healthcare providers, treatments, and services

79% percent of online patients diagnosed with a chronic condition within the past three months (Q3 2012) said the Internet influenced their health choices

Innovations and Disruptions in Digital Health offer new means to manage health and often disrupt traditional methods and markets

Mobile Diagnostics

What is it?

Mobile phones are enabling diagnostics, enabling patients to identify & manage health
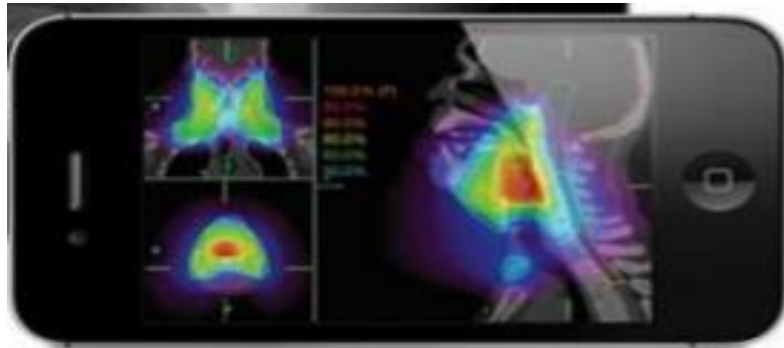
Pros
- Gives patients the tools they need to assess their health
- Brings health diagnostics to low income/poverty nations

Cons
Patients may use the tools in lieu of doctors, risking inaccurate diagnosis

Record ECGs

The AliveCor Heart Monitor, when used with the free AliveECG app, is a personalized, easy-to-use device that records accurate ECGs and heart rate anywhere, anytime at an affordable cost. Simply rest it on your fingers or chest to record an ECG in just 30 seconds. And know right away if atrial fibrillation is detected.


The iBGStar is a blood glucose meter that seamlessly connects to the Apple iPhone and iPod touch for the flexibility to manage your diabetes whenever, wherever. The iBGStar Diabetes Manager App helps you keep track of blood glucose, carbs intake and insulin dose,

Netra-G is a device created by EyeNetra that attaches to a smartphone and enables patients to perform their own eye test by measuring the refractive error of the eye – essentially replacing the autorefractor.

Individuals can then use those measurements to purchase glasses and contact lenses.

20

M2M-Remote Patient Monitoring
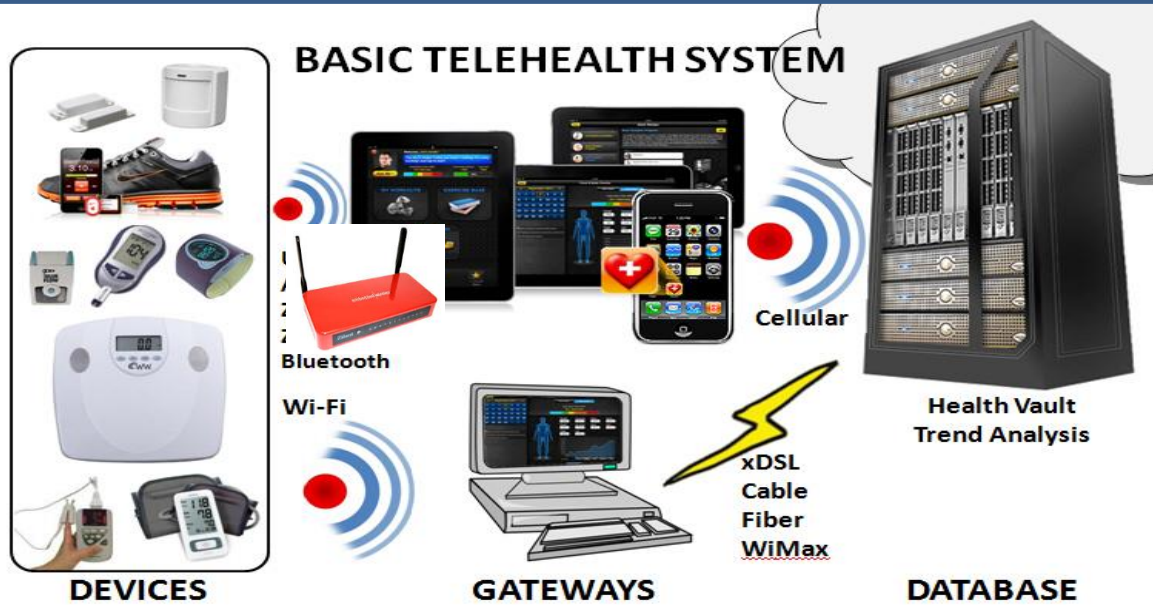
RPM solutions have been identified as an important early symptom management tool for patients considered at greatest risk for re-hospitalization,

The results of the Spyglass study revealed **84 percent of providers (US) are investing in remote patient monitoring solutions to support patients after hospital discharge, with 79 percent of providers using analytics and big data to support population health.**

Furthermore, the report shows these organization are interested in **BYOD options** for their clinicians and other mobile technologies to support chronically-ill patients.

The BIG question for these providers is determining **how to most effectively and reliably integrate this information in their clinical workflows.**

M2M: RFID IN HOSPITALS

With RFID tags affixed to various items such as wheelchairs, beds, cardiac monitors etc staff can very quickly locate an items.

BIOSENSOR TATTOOS

MC10 designed a microchip that can now be printed directly on the skin. The bond to the health sensor is formed with spray-on bandage material you might find in stores. It can detect things like the temperature of the wearer and hydration levels and can withstand activities like showering and swimming. The tiny mesh of circuits lasts on your skin for two weeks, until it's naturally exfoliated.

3D Printing

Model of a spine with a 3D-printed artificial axis in Beijing, where doctors this year claimed they successfully implanted one into the spine of a bone cancer patient for the first time. Photograph: Jason Lee/Reuters

What is it?
Process of layering materials-resin, glass, metals into objects defined by a digital model-False teeth, hip joints and replacement knees

- Enables rapid prototyping
- Opens the door for new research and opportunities in healthcare

Big Data

What is it?

Large scale data collection and analysis

Pros
- Patterns can provide insights about healthcare consumption, treatments..
- Help providers predict diseases and find new treatment

Cons
Consumers may feel it invades their privacy, worry about impact of information sharing with insurers etc.
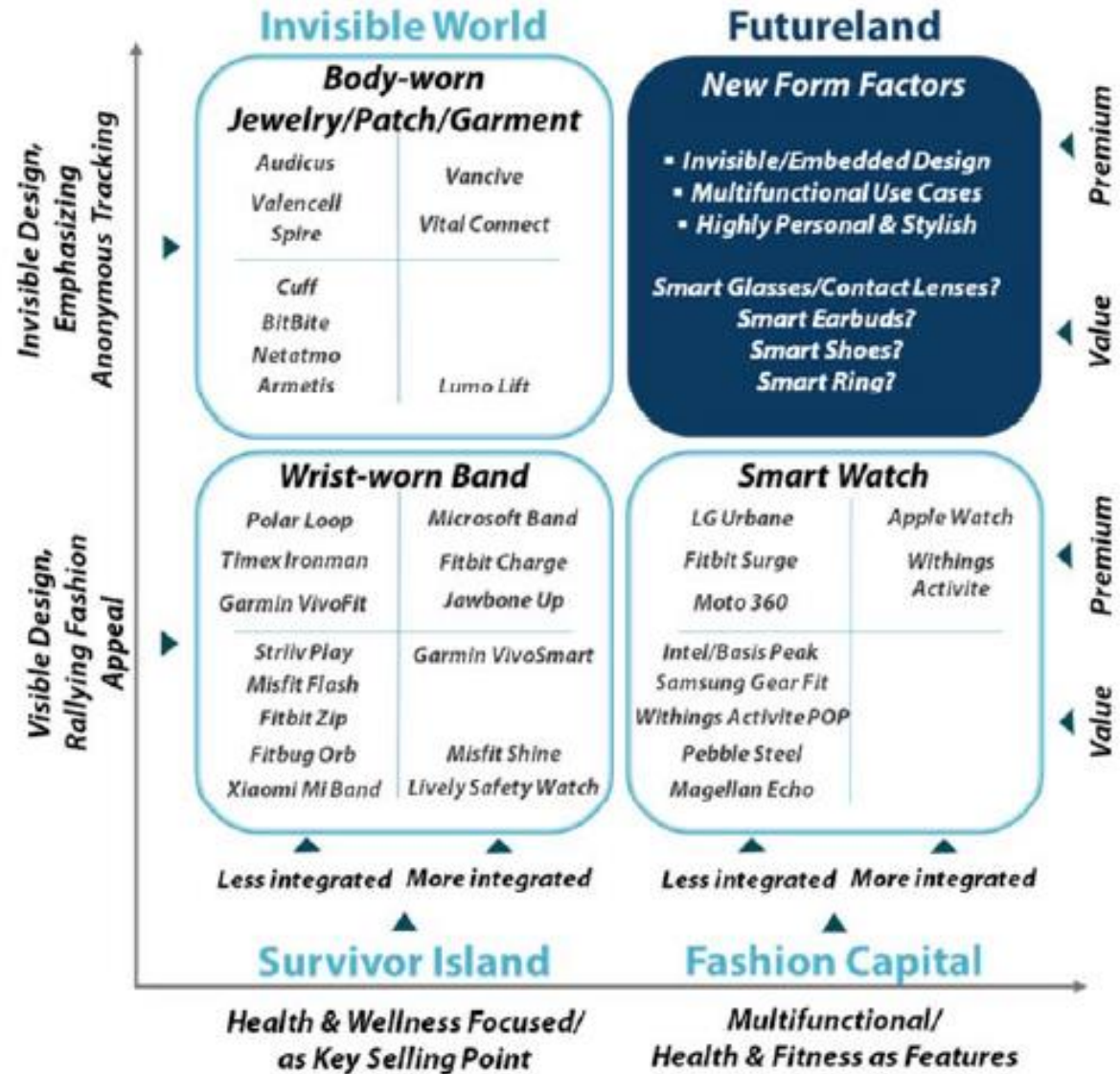
- A consumer oriented website that aggregates patient experiences from the internet and organizes them into usable insights for patients, physicians etc
- Crawls the web for health related content and has aggregated and analyzed 1.8 billion+ online post about over 26,000 medications and over 14,000 conditions from thousands of website.

Wearables & Embedded Devices

What is it?

A device that users wear to record personal information and transmit it/sync it for data management

Invisible World

Body-worn Jewelry/Patch/Garment

Audicus	Vancive
Valencell Spire	Vital Connect
Cuff BitBite Netatmo Armetis	Lumo Lift

Futureland

New Form Factors

- Invisible/Embedded Design
- Multifunctional Use Cases
- Highly Personal & Stylish

Smart Glasses/Contact Lenses?
Smart Earbuds?
Smart Shoes?
Smart Ring?

Wrist-worn Band

Polar Loop	Microsoft Band
Timex Ironman	Fitbit Charge
Garmin VivoFit	Jawbone Up
Strilv Play Misfit Flash Fitbit Zip Fitbug Orb Xiaomi Mi Band	Garmin VivoSmart Misfit Shine Lively Safety Watch

Smart Watch

LG Urbane	Apple Watch
Fitbit Surge	Withings Activite
Moto 360	
Intel/Basis Peak Samsung Gear Fit Withings Activite POP Pebble Steel Magellan Echo	

Invisible Design, Emphasizing Anonymous Tracking

Visible Design, Rallying Fashion Appeal

Premium — Value

Less integrated   More integrated   Less integrated   More integrated

Survivor Island   **Fashion Capital**

Health & Wellness Focused/ as Key Selling Point

Multifunctional/ Health & Fitness as Features

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CONNECTED FROM WITHIN

Novartis created "Smart Pills" that can wirelessly transmit data to a patch and from there to a smartphone or a doctor's computer. Sensors send a signal that is activated when the minerals interact with stomach acids. The signal is picked up by a microelectronic receiver worn by the patient. Information relayed directly to physicians and caregivers via text message, app or email. The pills are now FDA approved.

Survey: 43 percent of smartphone users interested in AI-powered medical advisor

of 6,649 iOS and Android urban smartphone users in cities around the world.

The respondents from this survey, aged 15 to 69, are based in Istanbul, Johannesburg, London, Mexico City, Moscow, New York, Paris, San Francisco, São Paulo, Shanghai, Singapore, Sydney and Tokyo.

Consumers today enjoy improving their physical wellbeing, while monitoring and quantifying their progress using wearable devices," the report reads. "However, wearing these devices can be aesthethically unattractive and sometimes impractical, getting in the way of performing everyday tasks. Judging by consumer interest, the ***next generation of body-monitoring technology may not be worn, but may instead be found within the human body."***

Figure 3: Consumers who think using artificial intelligence (AI) would be a good idea

- AI search engine
- AI travel guide
- AI personal assistant
- AI teacher
- AI medical advisor
- AI financial advisor
- AI companion to talk to

73%
35%
41%
43%
44%
57%
64%
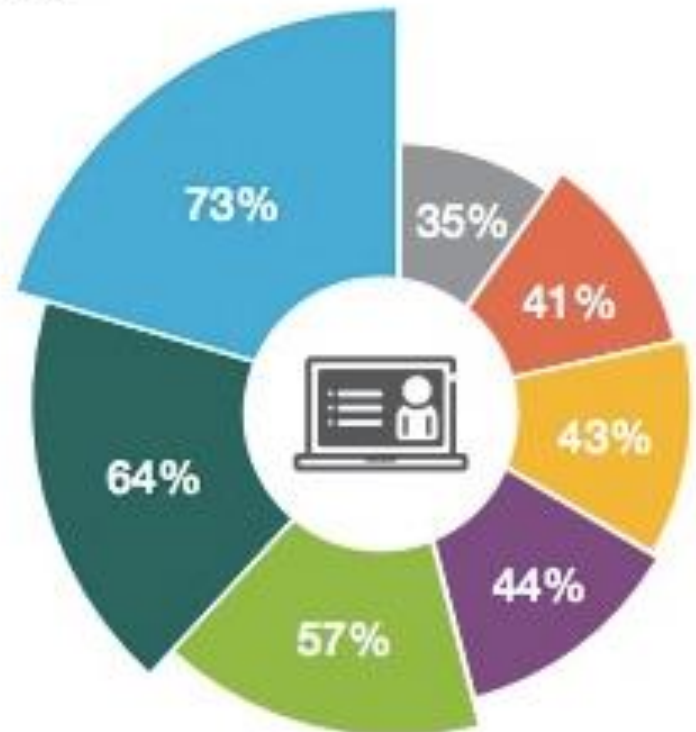
MCMC's Connected Healthcare Pilots with partners seeks to accelerate the adoption of advanced healthcare technology and next gen coomunication services

The impact on digital health on healthcare delivery model of the future are expected to be:

Focused on the patient as a consumer

- Personalized, Transparent, Convenient and On-Demand.
- Tomorrow's model will focus on customer experience and understanding patients in their everyday lives.
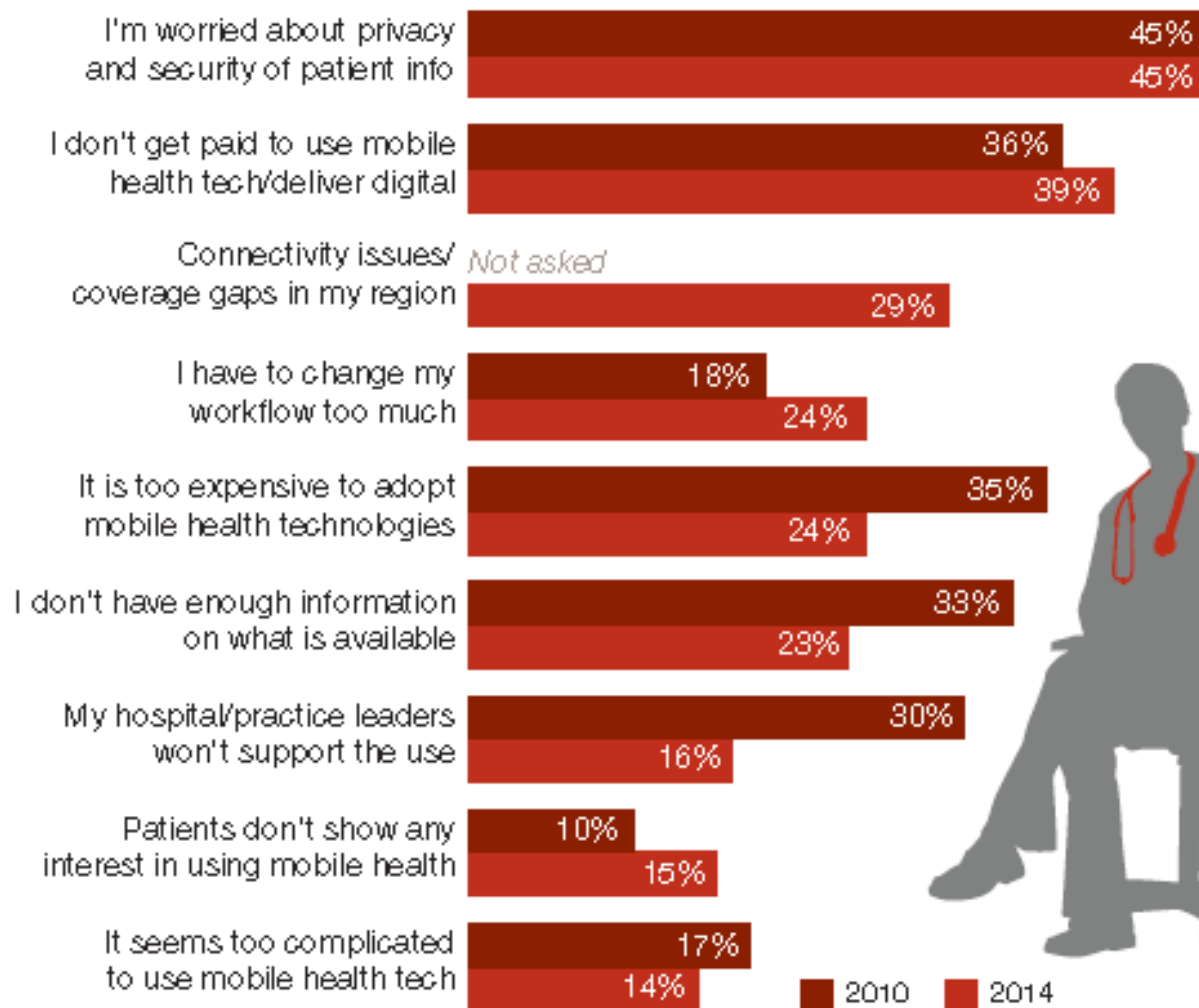
Predictive and Precise

- Analytics will enable caregivers to develop customized care plans for individuals, managing care and improving the health of the patient populations

Integrated and Transparent

- Health systems will migrate away from an environment of incentives built on charges, admissions, patient days **TO** one focuses on consistent delivery of evidence based care at the right time, right environment , using the right people. i.e Pay for Performance Care

While there is room for digital technology to make clinicians more efficient caregivers, however, Privacy and Payment concerns remain the top two barriers for provider adoption:
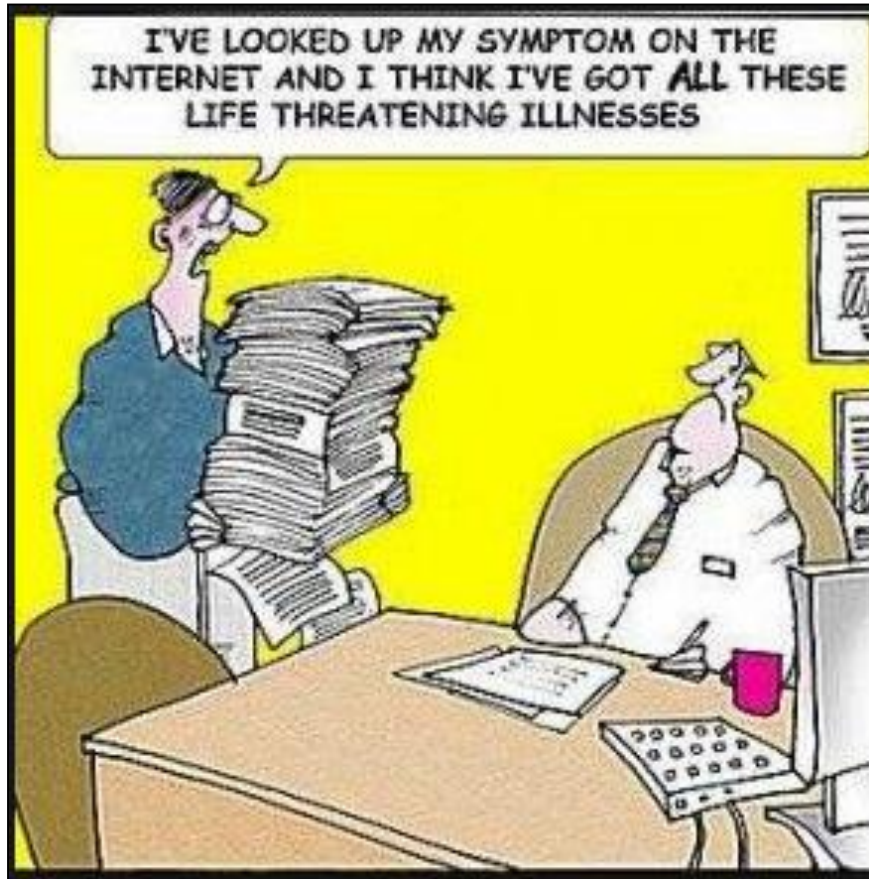

Barrier	2010	2014
I'm worried about privacy and security of patient info	45%	45%
I don't get paid to use mobile health tech/deliver digital	36%	39%
Connectivity issues/coverage gaps in my region	Not asked	29%
I have to change my workflow too much	18%	24%
It is too expensive to adopt mobile health technologies	35%	24%
I don't have enough information on what is available	33%	23%
My hospital/practice leaders won't support the use	30%	16%
Patients don't show any interest in using mobile health	10%	15%
It seems too complicated to use mobile health tech	17%	14%

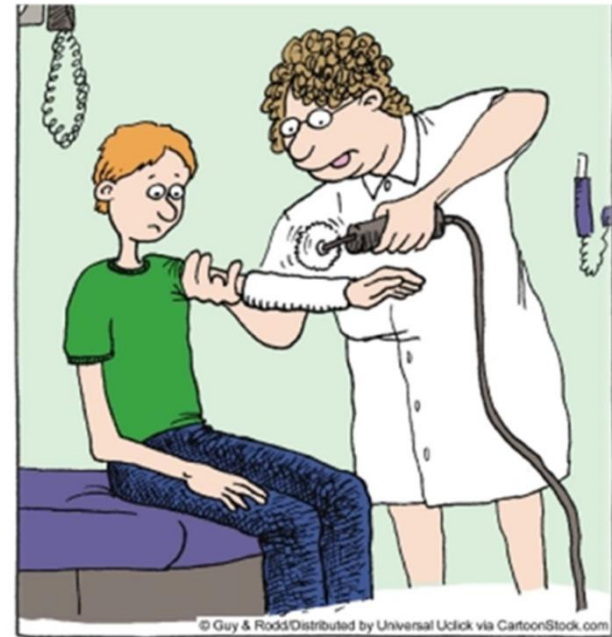A survey conducted by Health Research Institute (PWC) on 1,000 primary care physicians, specialist and extenders(nurse/assistant)
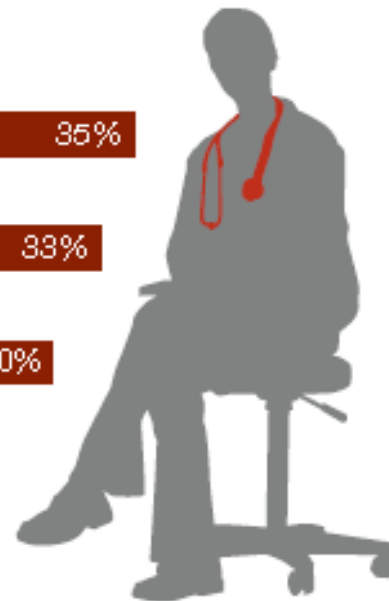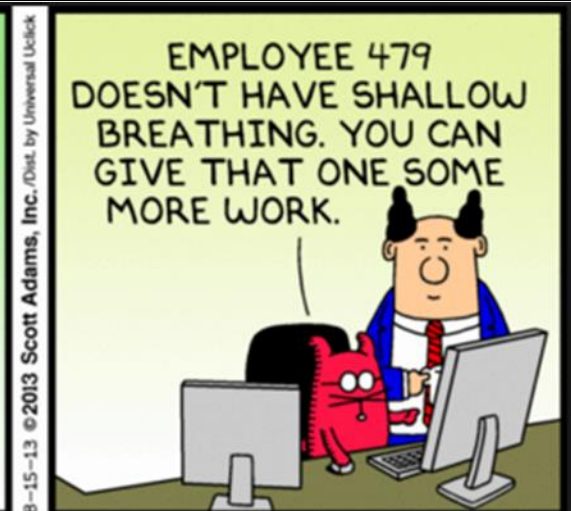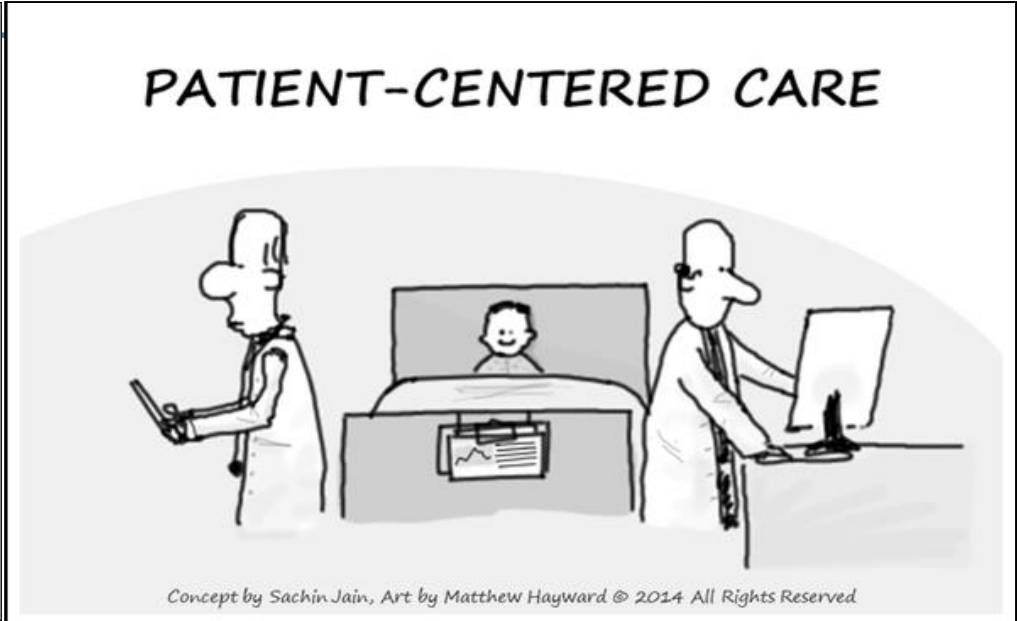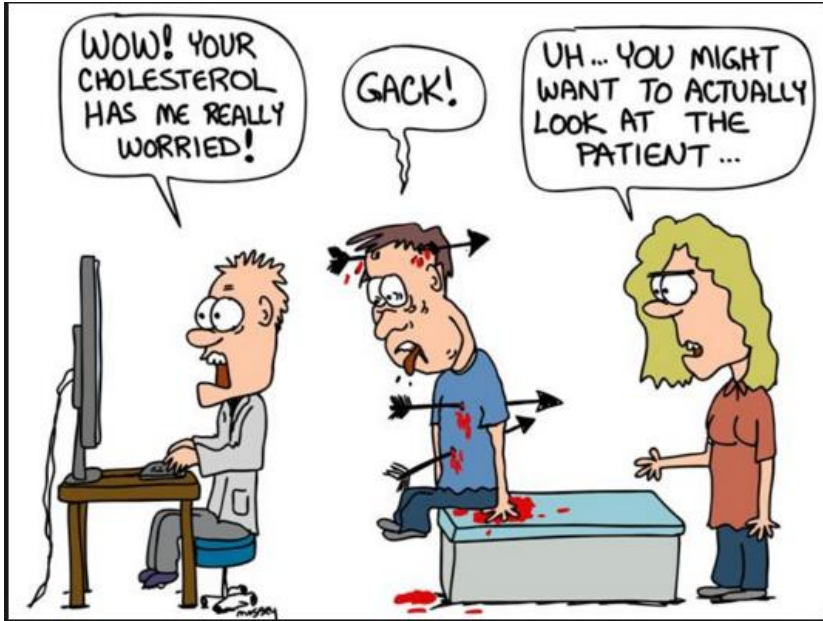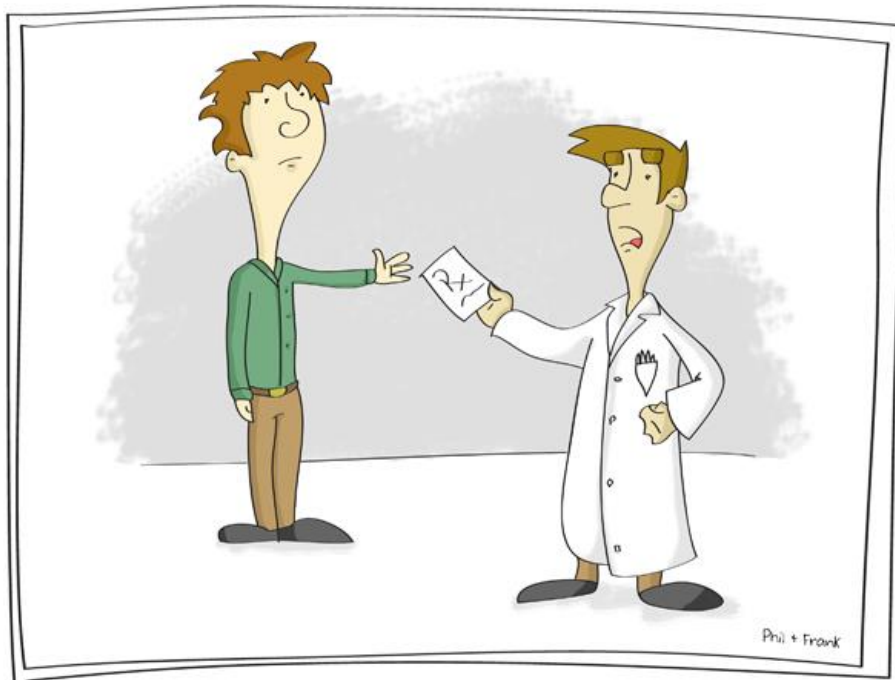
3. The Future

The future of Digital Healthcare could be this…

But lets hope its NOT this.....

And certainly NOT THIS

"If you can't afford this drug, there's tons of sites on the Internet that will sell you a counterfeit version for half price."
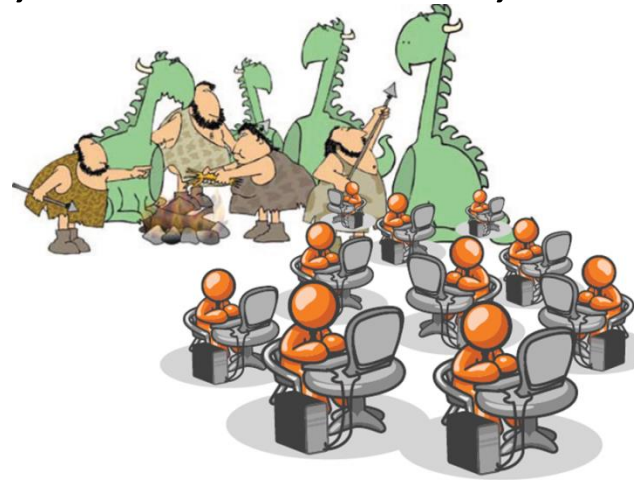
"Your previous provider refused to share your electronic medical records, but not to worry—I was able to obtain all of your information online."

ICT drives innovation - digital empowerment will impact many aspects of our lives?
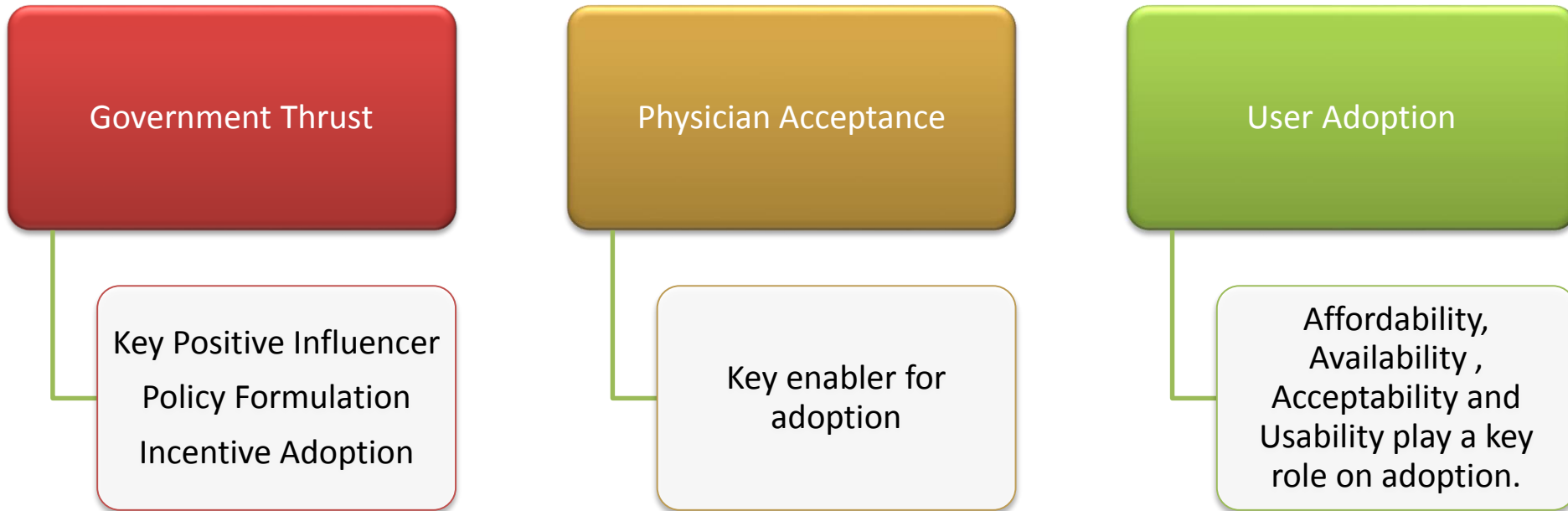
- Greatly changed the way we work, shop, search for information, communicate, and meet people.

- Help firms/businesses to create and innovate new products and expand to new markets.

- Enable governments to provide better services more cheaply.

The key in enabling this continuum of care lies with the Ecosystem Players

➢ Concerted effort from Government, Healthcare Providers and Stakeholders is required to enable e-health to scale up to its potential.
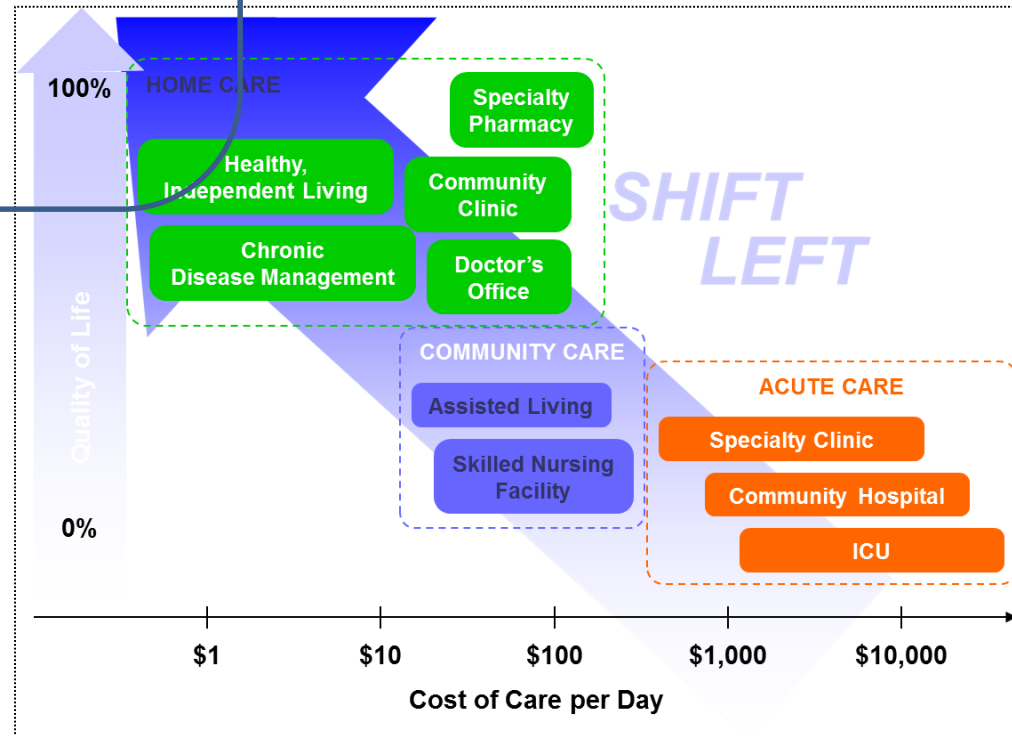
Government Thrust

Key Positive Influencer

Policy Formulation

Incentive Adoption

Physician Acceptance

Key enabler for adoption

User Adoption

Affordability, Availability , Acceptability and Usability play a key role on adoption.

The Impact

- **QUALITY OF CARE**
- **QUALITY OF LIFE**
- **EARLY INTERVENTION**
- **PROMOTE SELF CARE**

- **HOSPITAL ADMISSIONS**
- **HOSPITAL STAYS**
- **ER VISITS**
- **HOSPITAL CHARGES**
- **ER CHARGES**
- **BED DAYS**

Thank you

Malini Ramalingam
Director, MCMC.

SHIFT LEFT

100%

HOME CARE

Specialty Pharmacy

Healthy, Independent Living

Community Clinic

Chronic Disease Management

Doctor's Office

COMMUNITY CARE

Assisted Living

Skilled Nursing Facility

ACUTE CARE

Specialty Clinic

Community Hospital

ICU

0%

Quality of Life

$1 $10 $100 $1,000 $10,000

Cost of Care per Day