USC Marshall School of Business

PACIFIC TELECOMMUNICATIONS COUNCIL

The Value Proposition of E-Health: A Comparative Look at the U.S. and Singapore

Pacific Telecommunications Council
Annual Conference
Honolulu, Hawaii
January 19, 2020

Francis Pereira, Ph.D.
Associate Professor
Data Sciences and Operations Department

USC Marshall School of Business

Global Health-Challenges

- The annual health care expenditures in the United State totaled some $3.6 trillion dollars at the end of 2018 (17.9% of GDP)
- Health care expenditures for developed economies range from 8% to 15% with 74% financed from public sources
- Global shortage of clinical staff
- Increase in life expectancy and rapid growth of elderly population. Each additional year of life increases health care costs by 3%.
- Potential to engender better and more extensive access to health care at lower costs.

Addressing the Digital Divide

USC Marshall School of Business

Focus of Paper

What is the value proposition of e-Health and can e-Health alleviate the health care problem?

Are there obstacles and challenges to adoption?

From a “VISOR” Business Model approach, what can be done? Are there lessons from Singapore?

-Health

Definition

Telemedicine: Use of telecommunications and computer technologies with medical expertise to facilitate health-care delivery.

E-Health: Incorporates remote sensing, collaborative patient care and access to electronic libraries and medical databases.

USC Marshall School of Business

VISOR Framework

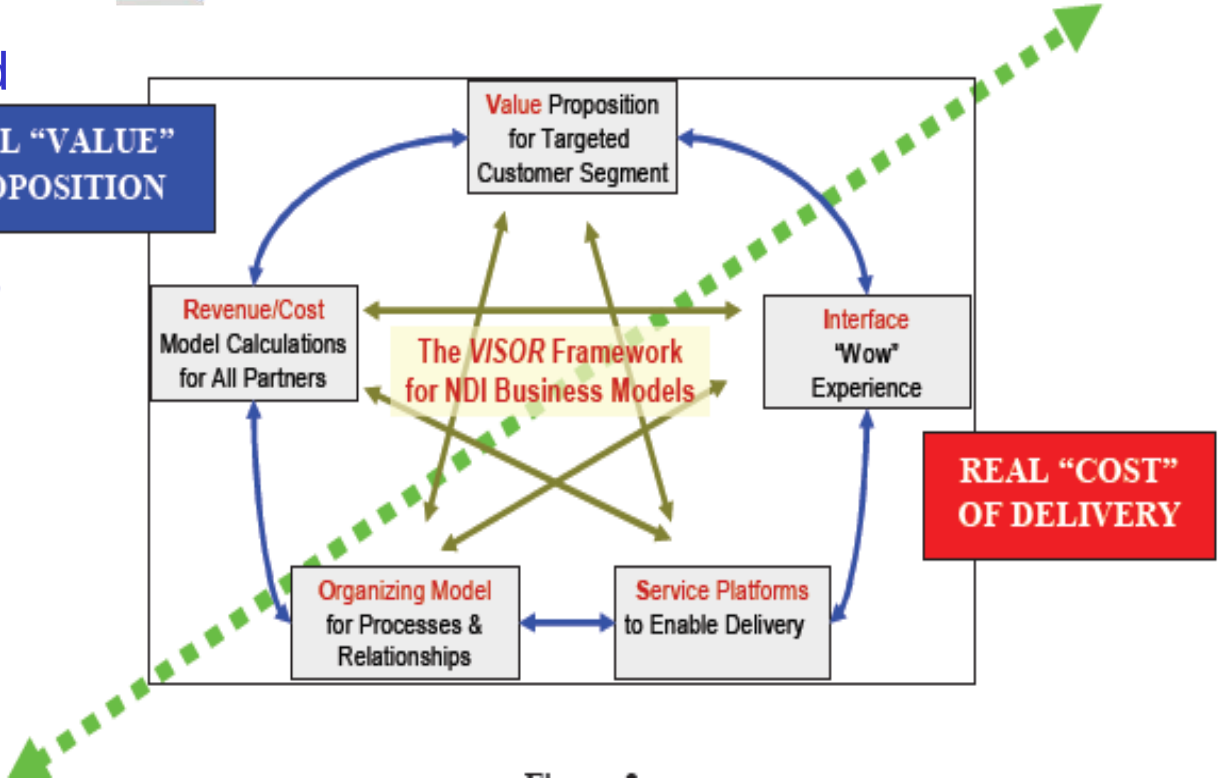
Necessary but Not Sufficient

- Little systematic conception and agreement exists on what a business model is.
- Important to articulate and define the elements of a business model

(i) attain " common language and framework"

(ii) framework to assess the viability of new business propositions

(iii) understand the multiple elements that have to be in place for a successful business model.



USC Marshall School of Business

VISOR Framework

Value Proposition

The value proposition addresses why particular customer segments would value an enterprise's products and services and be willing to pay a price for them. Captures sum total of all the benefits the customer derives from the product or service

Descriptor	Explanation	Method of Assessment
Compelling	The extent to which a product or service vividly addresses a need for the customer	Likelihood of consumption or acquisition
Cohort	The number of customers in a particular market segment, who view the product or service as addressing or providing a need	Size of market niche
Complementarity	The extent to which the product or service accentuates or improves a product or service that a customer currently owns or uses	The number of other existing products or services that are interdependent in their consumption
Co-Creatibility	The extent to which customers can add or alter features of the digital products or service	The number of variations that could be generated by customers

USC Marshall School of Business

VISOR Framework

Interface

The interface is the interaction (interconnection) between the customer experience and the service platform. It includes both hardware and software. It is the link between the qualitative and experiential nature of the value proposition and the physical infrastructure that delivers it

Descriptor	Explanation	Method of Assessment
Functionality	The range of types of interactions of the interface and its ease of use	Ability to access range of service platforms, and supports multiplicity of tasks
Form Factor	The aesthetics of the interface	Customer perception
Fluidity	Provides the customer with flexibility, intimacy, personalization, and control	Ease and extent of customization
Forgiveness	The ability of the interface to automatically undo any user error	Extent of error correction and adaptiveness

USC Marshall School of Business

VISOR Framework

Service-Platform

IT platforms that enable, shape, and support the business processes and relationships that are needed to deliver the products and services, as well as improve the value proposition

Descriptor	Explanation	Method of Assessment
Architecture	The topology of the hardware and software that enables the service	Closed/Proprietary or Open standards
Agnosticity	Whether the platform supports different operating systems	Depends on type of technology environment or the need for external APIs
Acquisition	Addresses the question of whether to build, or piggy-back on existing technology infrastructures.	Availability of existing platforms able to deliver product or services
Access	Defines the community which would be able to access the service	Continuum from walled garden, to totally open

USC Marshall School of Business

VISOR Framework

Organizing Model

Describes how an enterprise or a set of partners will organize business processes, value chains, and partner relationships to effectively and efficiently deliver products and services. In the new digital eco-system, the enterprise can partner with complementors, competitors, customers and even the community

Descriptor	Explanation	Method of Assessment
Processes	The design of the core business processes that are necessary to deliver and support the digital product or service.	Determination of the effectiveness of key business processes such as new product introduction, order management, customer support, etc.
Partnerships	Quality of business relationships with go-to-market partners for service	Partnerships can be assessed in terms of formality, exclusivity, and expected durability of relationships.
Pooling	Pooling refers to the necessity of combining complementary assets or capabilities of different partners to be able provide customer value	Extent of synergy and complementarity on various resources (talent, technology, etc.)
Project Management	Coordination of effort across different partners for launch of service, and continuing service offering	Probability of success given complexity of task and relationships

USC Marshall School of Business

VISOR Framework

Revenue Model

In a successful business model the combination of the value proposition, the way that offerings are delivered, and the investments in IT platforms are such that revenues exceed costs and attractive for all partners

Descriptor	Explanation	Method of Assessment
Pricing	Structure of pricing mechanism	Type of pricing: subscription, pay-as-you-go, advertising, all you can eat, micropayments, etc.
Partner Revenue Sharing	How revenue is shared among partners who are bringing the joint offering to market	Distribution proration among partners
Product Cost structure	Direct and indirect cost of key resources required	Product margins and cost assessment
Potential Volume	How much demand is expected in target market segment	Expected number of “units” sold in specified time period

USC Marshall School of Business

e-Health
Value Proposition

Effective and useful when geography, distance terrain, climate or other physical barriers, and climate has prevented or hindered direct contact between patient and clinician

Savings can be achieved from the reduced costs of patient care, in the U.S. Health and other national health systems through

i) better chronic disease management;

ii) reduction in both travel and time for patients and doctors;

iii) from the provision of better health care, generating cost reductions from increased monitoring and early diagnosis of chronic diseases

e-Health

Value Proposition

HealthPAL

- Enables monitoring of indicators of human health condition, such as blood pressure.
  - *Hypertension tends to lead to coronary heart disease, apoplexy and nephropathy. 45% of hypertension patients die from cardiovascular disease*
  - *Hypertension patients are 8 times higher that normal people to get apoplexy.*
- Allows “aging in place.”
  - *95% of older adults surveyed prefer to live in their own homes as long as possible*

USC Marshall School of

-Health

Value Proposition

- 51% of Adults with Chronic Disease Go Online
- The top 4 chronic diseases collectively cost $969 Billion and affect over 152 million Americans per year

Illness Categories	Device or Peripherals
Cardiology, such as hypertension, CHF and stroke	Blood pressure monitor, weight scale, digital electronic stethoscope
Respiratory disease, such as asthma, and COPD	Peak flow meter, monitor, weight scale, digital stethoscope, digital spirometer
Diabetes and wellness	Blood glucose monitor, weight scale
Post-acute recovery, such as wound care, post-surgical and organ transplant	Video camera or image-capturing devices
Mental health, such as chronic depression and schizophrenia	Video camera for live interactive sessions

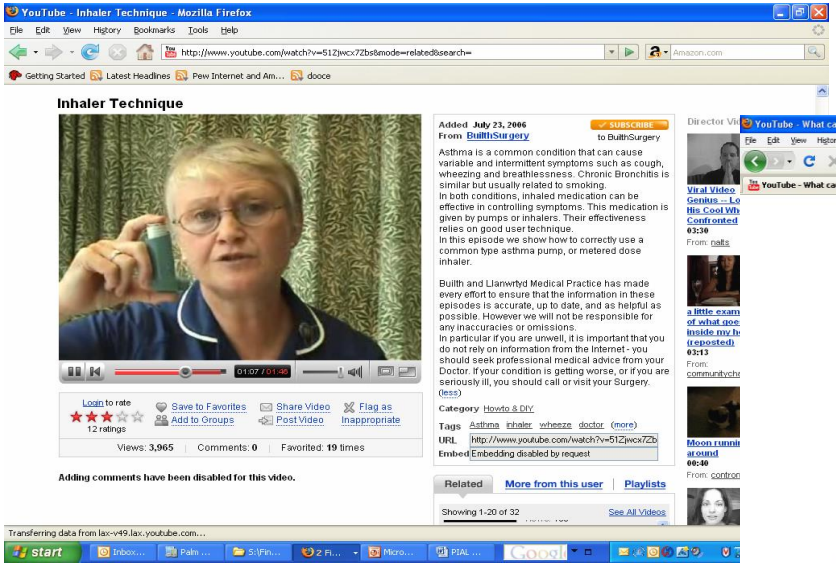
Source: Pew Internet and American Life Project (various years), Advanced Medical Technology Association

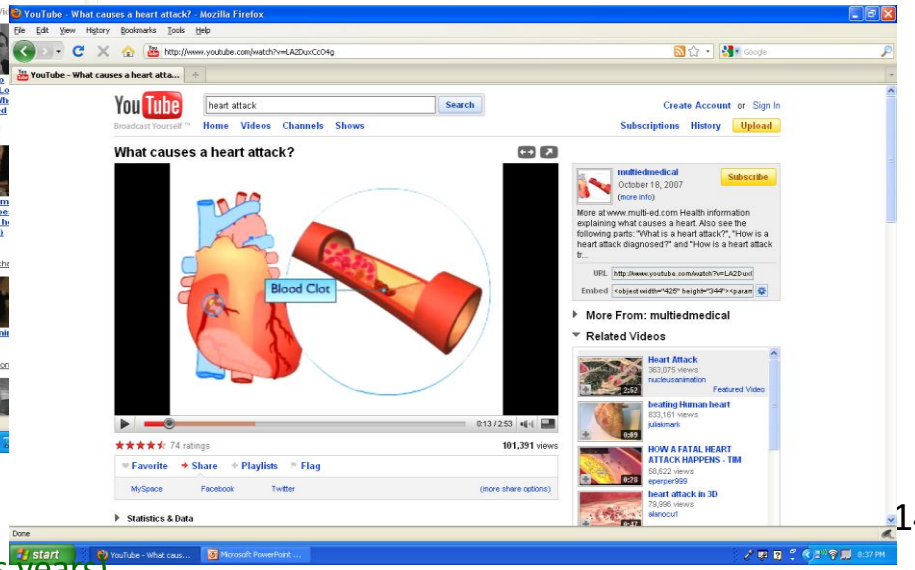
USC Marshall School of

-health

Value Proposition

- 52% of internet users watch videos online
- Estimated that over 25% of all material accessed on the net is health-related
- 75% of e-patients with chronic conditions report information they found in their last search affected a decision about how to treat an illness





Source: Pew Internet and American Life Project, (various years)

USC Marshall School of Business

e-health
Value Proposition

Cost of Inpatient Care (per patient per month) Compared to Home Care for Select Conditions			
Conditions	Hospital Costs	Home Care Costs	Dollar savings
Low birth weight	$26,190	$330	$25,860
Ventilator-dependent adults	$21,570	$7,050	$14,520
Oxygen-dependent children	$12,090	$5,250	$6,840
Chemotherapy for children with cancer	$68,870	$55,950	$13,920
Congestive heart failure in the elderly	$1,758	$1,605	$153
Intravenous antibiotic therapy for cellulitis, Osteomyelitis, others	$12,510	$4,650	$7,860

Source: National Association of Home Care & Hospice, 2010

USC Marshall School of Business

e-Health

Value Proposition

Diabetes: Appropriate disease management is critical

Pennsylvania Tele-home Project (171 patients)

Traditional Care Per patient $232, 872	Remote Monitoring Care per patient $87,327	Savings/Patient $145, 500

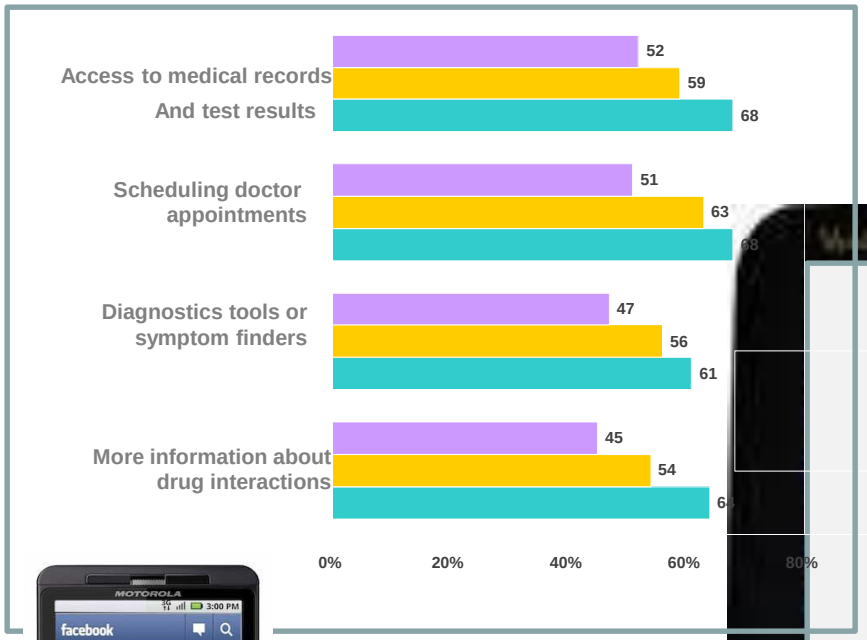
Estimated 9% of 1.5 million persons in U.S. State and Federal prisons.

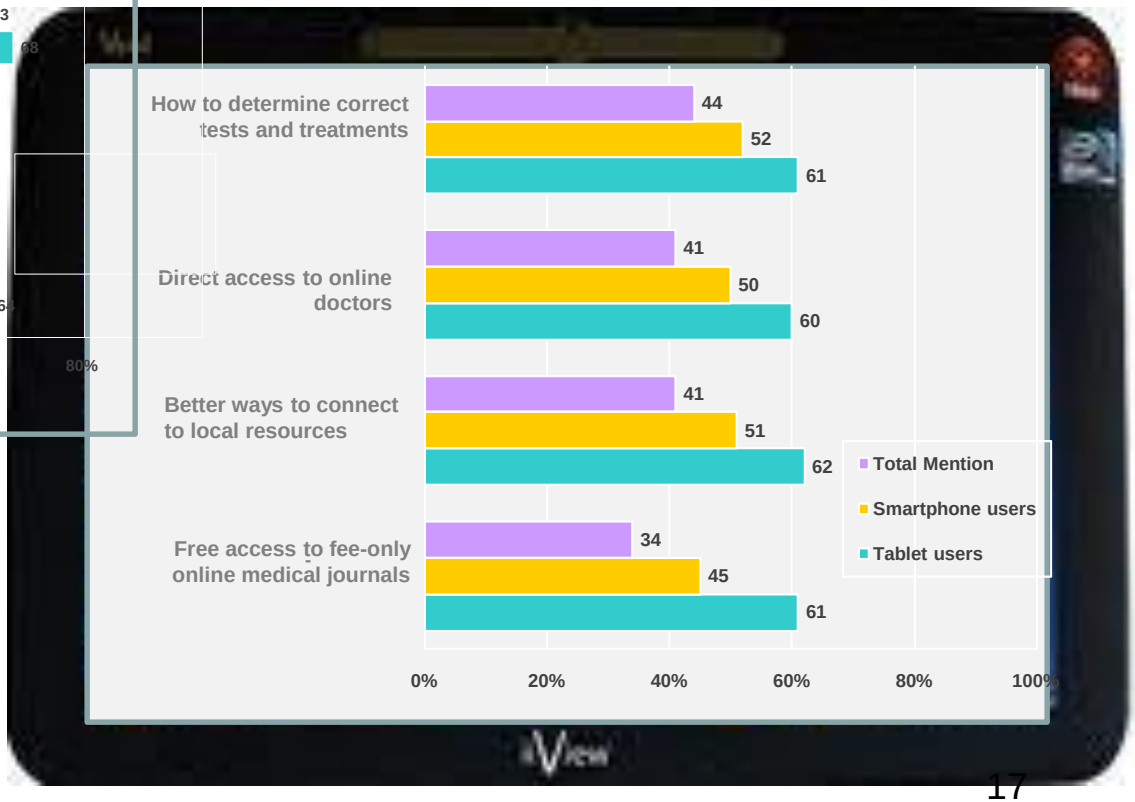
- Improvements in glycemic, blood pressure and lipid control with tele-visits

USC Marshall School of Business

e-Health Value Proposition

US cell phone users are receptive of MHealth services





Question: How valuable are the following aspects of healthcare to you?

USC Marshall School of Business

e-Health Singapore
Value Proposition

Changi Hospital Heart Failure Telehealth program in Singapore

- *Total cost of heart failure-related care for each patient dropped by 42%* (S$ 2,514)
- *Length of stay for heart failure related readmissions shortened by 67% (2.2 days vs 6.7 days)*
- 93% of the respondents in the telemonitoring group felt that they were more involved in their own care.

Source: https://www.philips.com.sg/a-w/about/news/archive/standard/news/press/2018/20180125-telehealth-program-by-changi-general-hospital-and-philips-empowers-heart-failure-patients.html

USC Marshall School of Business

e-health (Singapore)

Value Proposition

Telemedicine-based diabetic retinopathy (DR) screening model had significantly lower costs (total cost savings of S$173 per person) while generating similar quality-adjusted life-years (QALYs) compared with the physician-based model (i.e., 13.1 QALYs).

From the health system perspective that includes only direct medical costs, the cost savings are S$144 per person.

the present value of future cost savings associated with the telemedicine-based model is estimated to be S$29.4 million over a lifetime horizon.

USC Marshall School of Business

e-health (Singapore)

Value Proposition

GPConnect/SmartCMS Program

190 Man hours saved at 380 clinics- $7500 Daily cost savings from integration with public healthcare systems for claims and clinical data submissions

Multiple Readmissions Predictive Model

Up to 90% reductions in manual assessment work by clinical teams

Antimicrobial Stewardship Initiative

Average length of Hospital stays reduced by 5 days for general medicine and 5 days for surgery

USC Marshall School of Business

e-health (U.S. vs Singapore)

Value Proposition

1. Benefits of Telehealth seem similar
2. Extent and scope of benefits are relatively much larger and broader in Singapore
3. Few examples of full-scale deployment models in the U.S

USC Marshall School of Business

Singapore's Integrated Health Information System

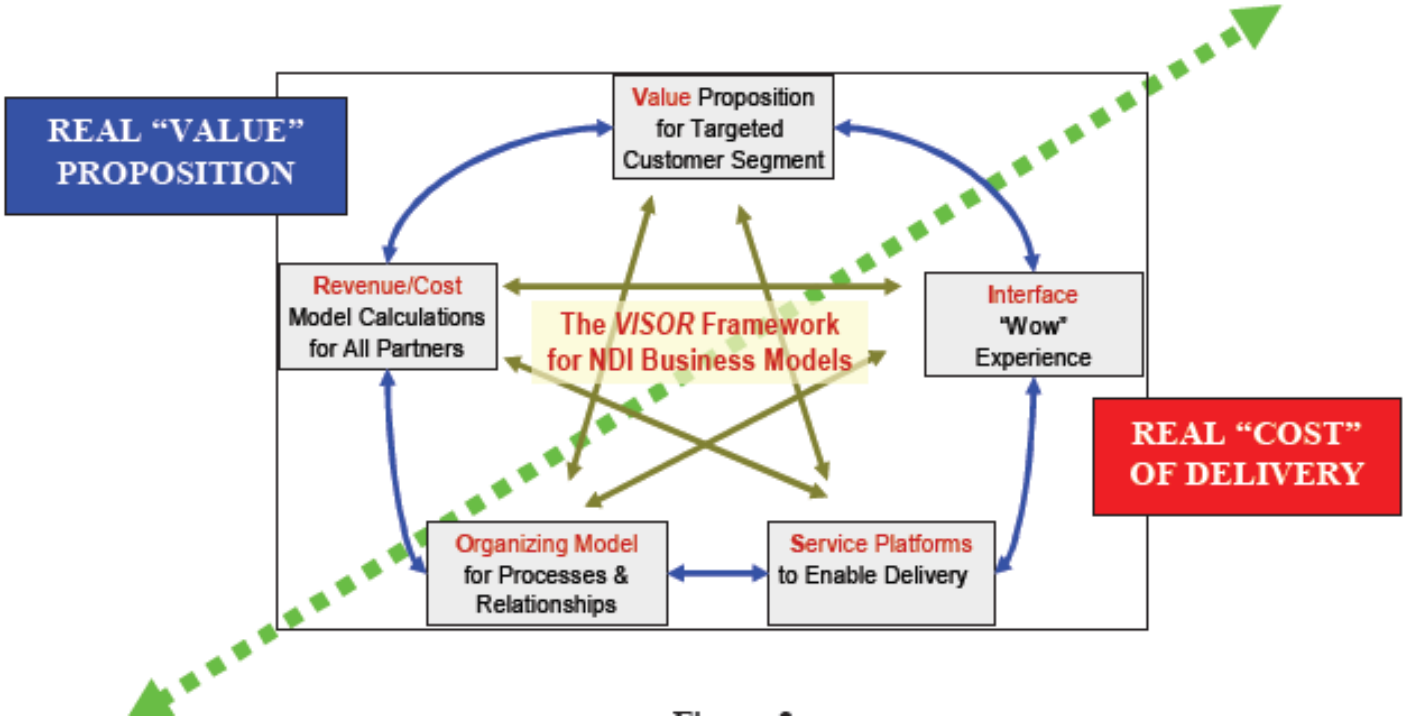
2008 Established

2011 Assisted 4 Public Hospitals in receiving Healthcare Information and Management Systems Society Analytics Stage 6 awards (for Electronic Medical Records Adoption Model)

2013 Development of the strategic Health IT Masterplan (HITMAP) – Business-Government Consultative process

USC Marshall School of Business

Singapore's Integrated Health Information System Approach Through "VISOR"



USC Marshall School of Business

e-Health Organizing Model Issues

VISOR

Challenges in the U.S.

- Multiple Federal regulatory agencies, up to twelve, have oversight on specific aspects (DEA, FDA, FCC, etc) of home-health
- States regulate health related issues within own borders. Multiple and different legal definitions between states.
- Telemedicine defined as “bringing doctor to the patient” as opposed to “patient to the doctor.”

Descriptor	Comments
Processes	The technical complexity in the delivery of e-health services requires the active participation of network service providers. Network service providers also offer the advantage of being able to set and/or establish standards and protocols
Partnerships	Formal partnerships are a pre-requisite with a “key-stone” player taking the lead
Pooling	Effective delivery of e-Health applications requires pooling of resources across different stakeholders in the eco-system
Project Management	Coordination of effort across the different partners will be crucial for success. Should governments take the lead?

USC Marshall School of Business

Home-Health

Interface Issues

Challenges

- Ease of use of devices and equipment still present some problems for the “average” physician.
- Interface devices generally have low compatibility to existing medical practices – health care professionals have to “adapt” to the devices and not vice-versa
- Interoperability issues still exist across devices, software and protocols.
- Home-based interfaces still need to be developed.

VISOR

Descriptor	Comments
Functionality	Devices and applications must be able to accommodate patients’ differing physical capabilities
Form Factor	While important, may not be as crucial as some of the other qualities
Fluidity	For medical applications and services, single-use devices may be preferred
Forgiveness	Automated correction of end-user “error” is crucial for eHealth applications

USC Marshall School of Business

e-Health Service-Platform

Challenges

- Ease of use of devices and equipment still present some problems for the “average” physician.
- Interface devices generally have low compatibility to existing medical practices – health care professionals have to “adapt” to the devices and not vice-versa.
- Home-based interfaces still need to be developed.

VISOR

Descriptor	Comments
Architecture	Non proprietary/ open systems would help ensure rapid innovation of new services
Agnosticity	Interoperability of access devices is crucial and to ensure medical applications will not fail on different devices
Acquisition	From a cost perspective, applications that run on network service providers current NGN platforms provides value for all stakeholders
Access	Must be available to all

USC Marshall School of Business

e-Health
Revenue Model Issues

Challenges in U.S.

- Current cost-benefit studies are limited in scope
- Most studies are small and involve samples of between 30 to 450.
- Need for comprehensive and extensive studies of savings to patients/health care providers due to early detection of diseases as well as health maintenance
- Reimbursement by Medicare has been extremely limited
- New comprehensive revenue and payments models need to be developed

VISOR

Descriptor	Comments
Pricing	Subscription pricing for various tiers of types of services would prove optimal. Because total benefits accrue to all stake-holders in society, “subsidized pricing” by corporations, government and other private stake-holders are both appropriate and necessary for ubiquitous adoption
Partner Revenue Sharing	Equitable revenue sharing agreements across all stake-holders in the eco-system is crucial
Product Cost structure	Costs defrayed across multiple applications and services, and all stake-holders may be manageable
Potential Volume	Potential demand for myriad of eHealth services is great

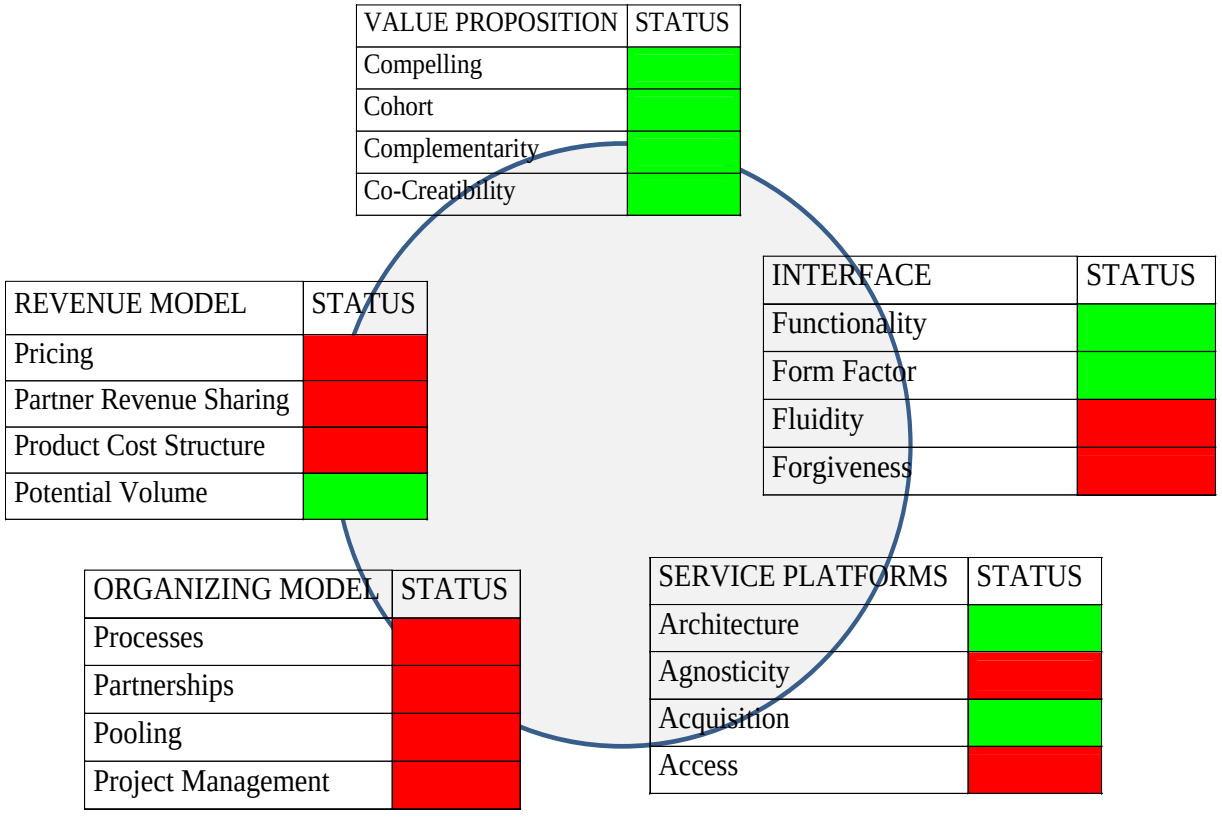
USC Marshall School of Business

Conclusions
Prospects for e-health

- E-Health is not seen by end-users as means to replace “physician-patient” contact. Applications designed to support and enhance “face-to-face” contact have yet to be fully developed
- Rising health costs, aging population and shortage of clinical staff are accelerators to adoption
- End-user surveys suggest cost and time savings from reduced hospital admissions, emergency department and medical practitioner visits and reduced travel costs.
- Inclusion of non-traditional stake-holders and key-stone player.

USC Marshall School of Business

e-Health: From a Visor Perspective



USC Marshall
School of Business

Thank You

pereira@marshall.usc.edu
Marshall School of Business
University of Southern California
www.marshall.usc.edu/ctm