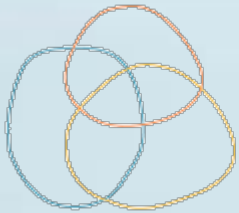


# The Future of Health



**SNIN**  
Safety Net Innovation Network



**Zayna Khayat, Ph.D.**

Future Strategist, SE Health

Adjunct Faculty, Rotman School of Mgmt, U. Toronto

Faculty, Singularity University

@ZaynaKhayat #SEFutures @SEHealth\_SEHC

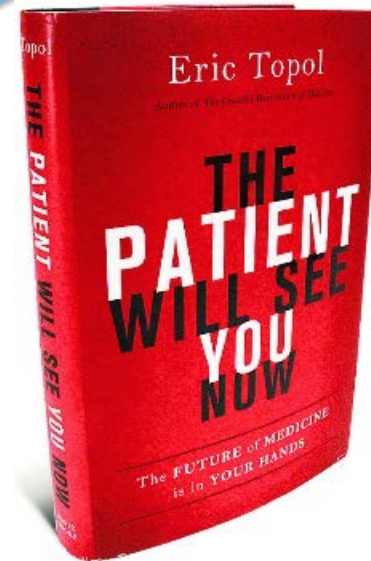
14 NOVEMBER 2018





# Future of Health

**New paradigm:**  
The Person

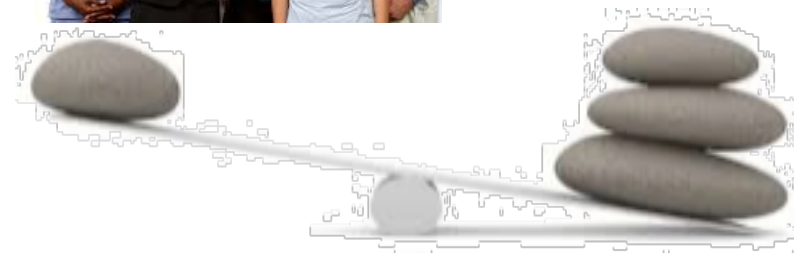
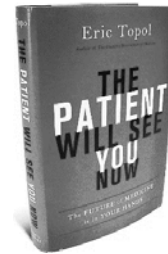


**Central paradigm:**  
The system



# Future of Health

**New paradigm:**  
The Person



**Central paradigm:**  
The system



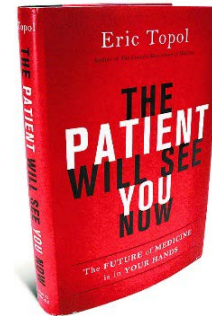




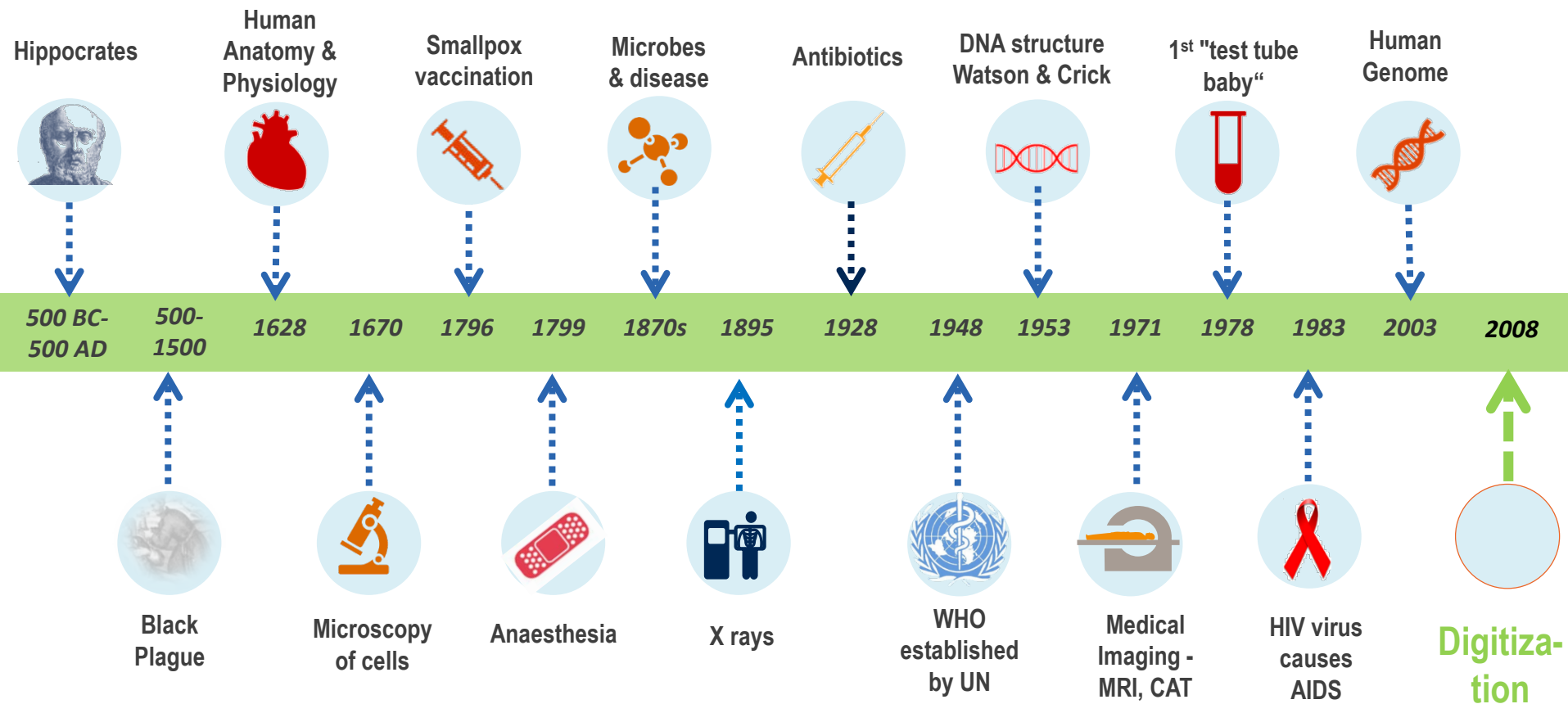
# Future of Health

**New paradigm:  
The Person**

**Central paradigm:  
The system**



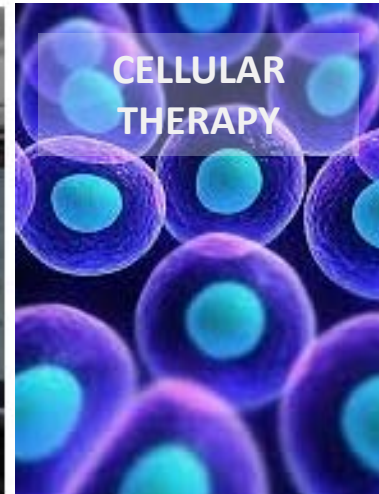
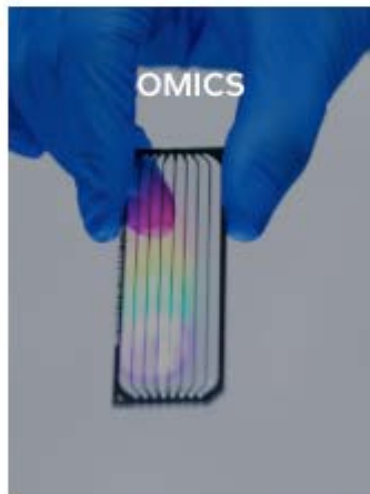
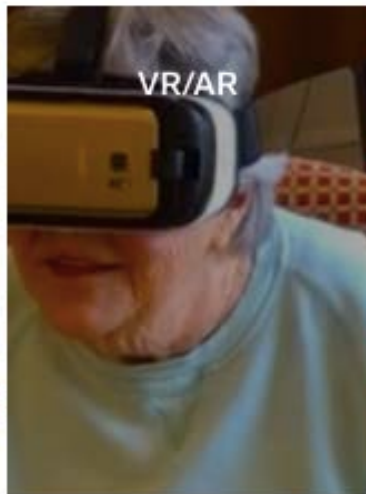
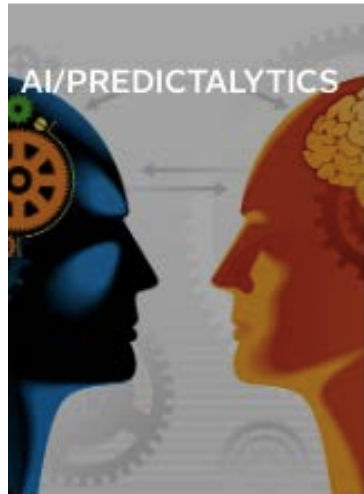




Source: Adapted from PWC Health



# Emerging technologies in health(care)



**GNHC**  
global network of healthcare innovation centers



# Future of Health

## Today: System

## Future: Person

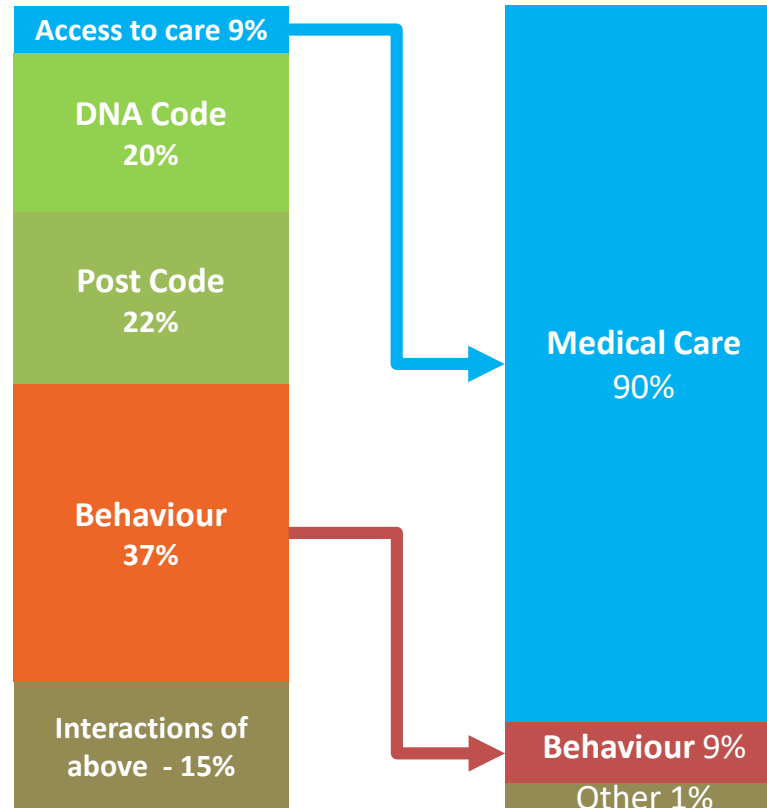
<b>TIMING</b>	Reactive, sick care	Proactive, preventative, predictive
<b>PRECISION</b>	1 size fits all, crude, analog	Personalized, intelligent
<b>MODALITY</b>	Institution-centred	Digi-cal   decentralized
<b>DURATION</b>	Episodic, intermittent, silo'd	Continuous   team
<b>POWER</b>	Provider	People-powered
<b>CURRENCY</b>	Volume, inputs, costs	Value, outcomes



## Drivers of health

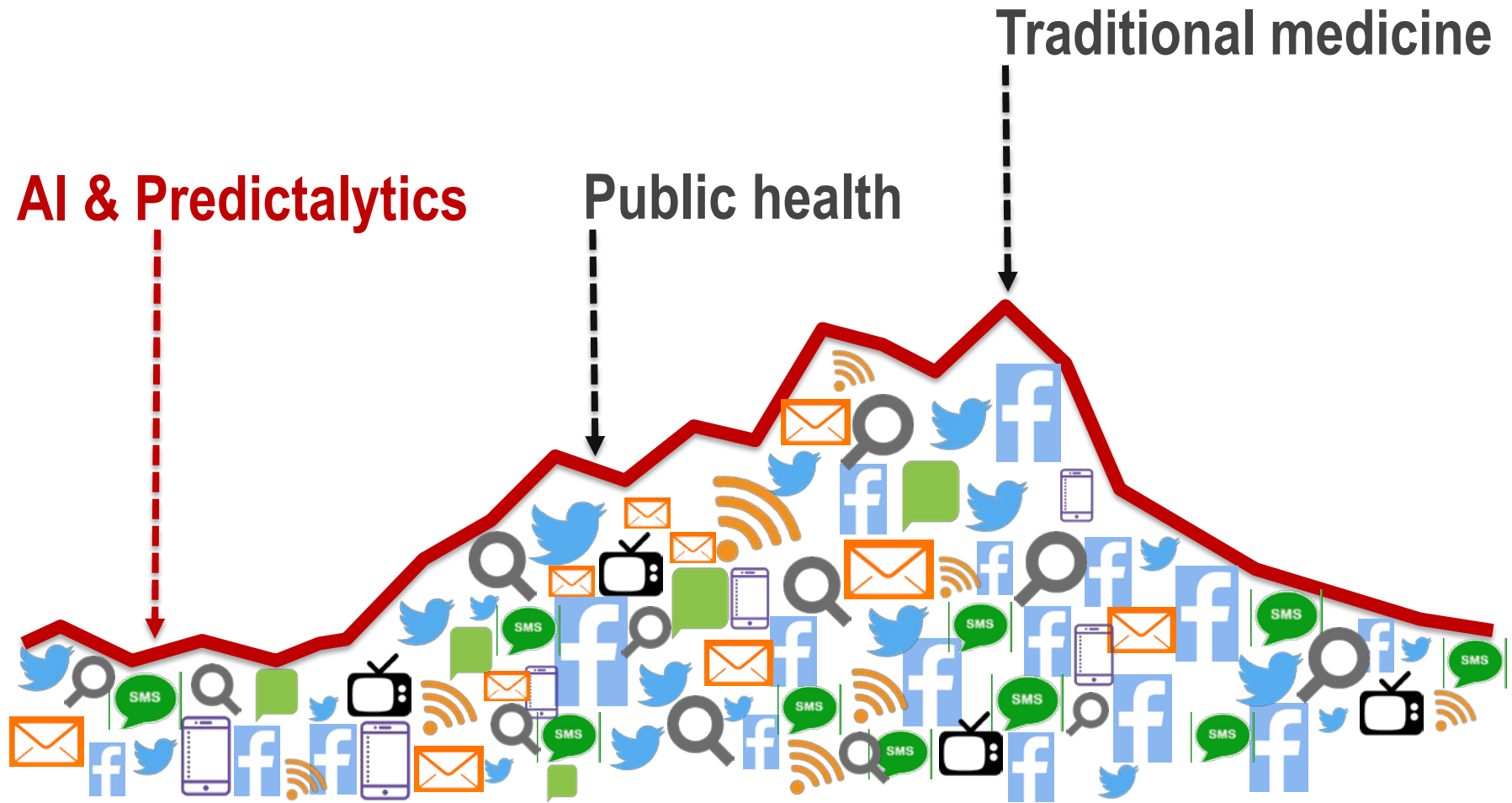
## Where we spend [\$7.8T]

*Where  
health  
is  
created*





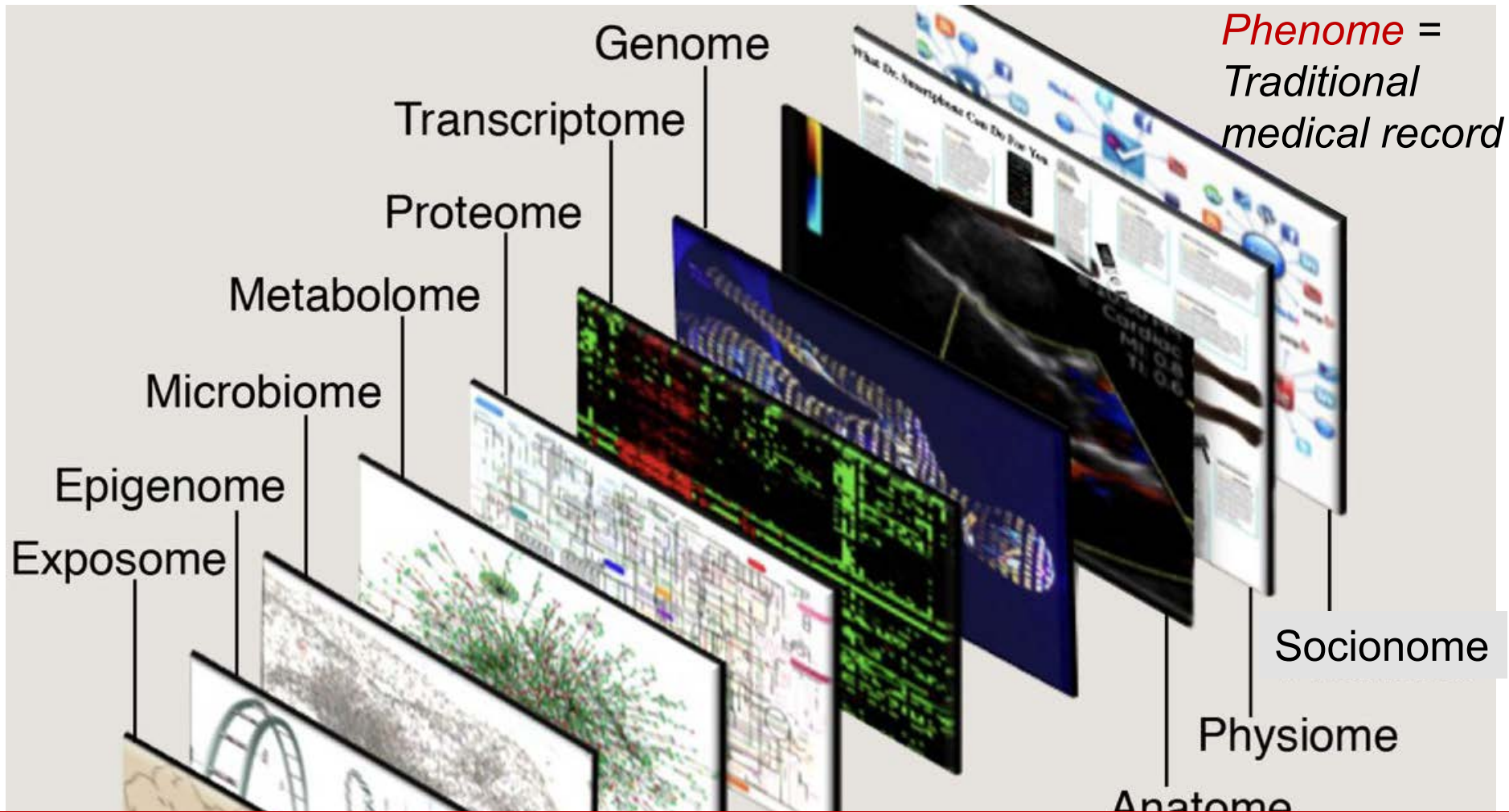
# Digital biomarkers: predictalytics



*"Medicine has been a clinical science supported by data.  
...becoming a data science supported by clinicians"*

*Dr. Brad Perkins, Chief Medical Officer, Human Longevity Inc.*





*"Medicine has been a clinical science supported by data.  
...becoming a data science supported by clinicians"* Chief Medical  
Officer, Human Longevity Inc.



De-centralized  
De-physicalized  
De-materialized  
De-monetized  
Dis-intermediated  
Digi-cal



Bricks



People

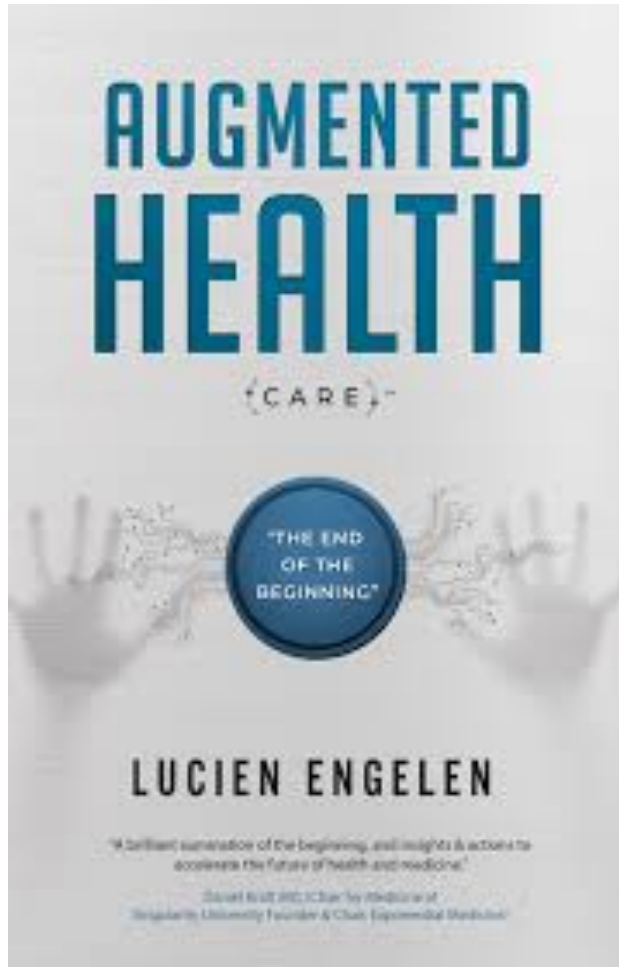


Paper & Pens

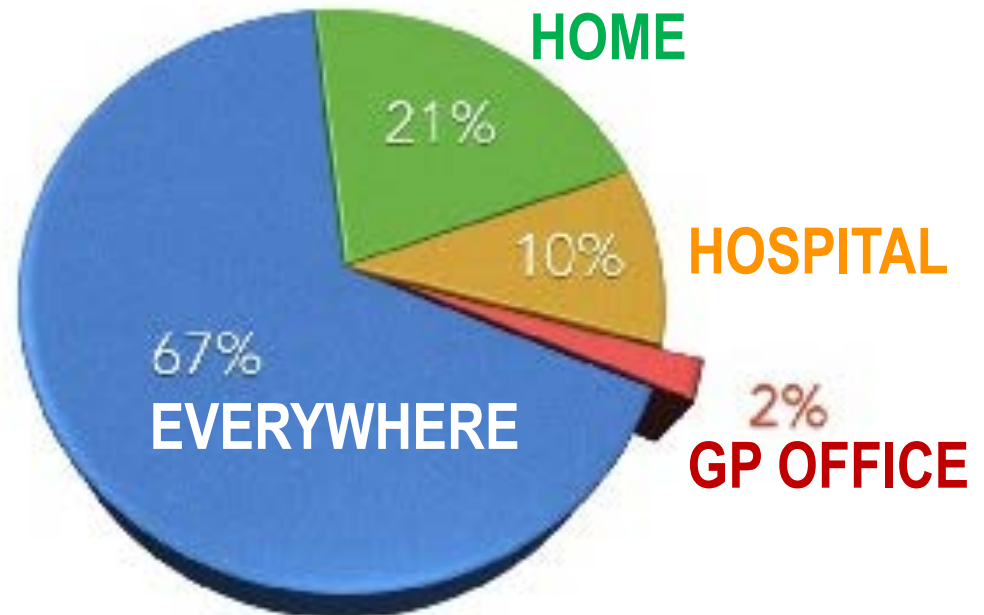


Fax Machines





*Where will good healthcare be  
delivered in the next 10 years?  
(n~2000)*





Radboudumc

15.000 COLLEAGUES

1000 BEDS

AMBITION TO 'CLOSE' 500

SIGNIFICANT IMPACT ON HEALTH(CARE)

\$1 BILLION REVENUE

FIRST ACADEMIC CENTER OUTSIDE THE USA EPIC

*“70% of what is currently done at the hospital, will not be done at the hospital”*

*“mobile first; physical next”*

New Dutch health ministry (October 2017)

- 2 billion € removed from “cure” budget [hospitals]
- 1.5 billion € added to elderly “care” budget [community, home, primary care]



# Clinician in your pocket

GP at hand  
powered by  babylon



**babylon**  
Everyone's personal health service.

Service

What we treat

GP clinic locations

About us

Download the app

**NHS**

HEALTH NEWS SEPTEMBER 7, 2018 / 3:09 AM / 6 DAYS AGO

## TELUS Health picks Babylon to bring virtual healthcare to Canada

3 MIN READ



Paul Sandle

LONDON (Reuters) - Canada's TELUS Health is joining forces with London-based AI



**dialogue**



**wello**   
GET WELL. KEEP WELL.



# Digital companions

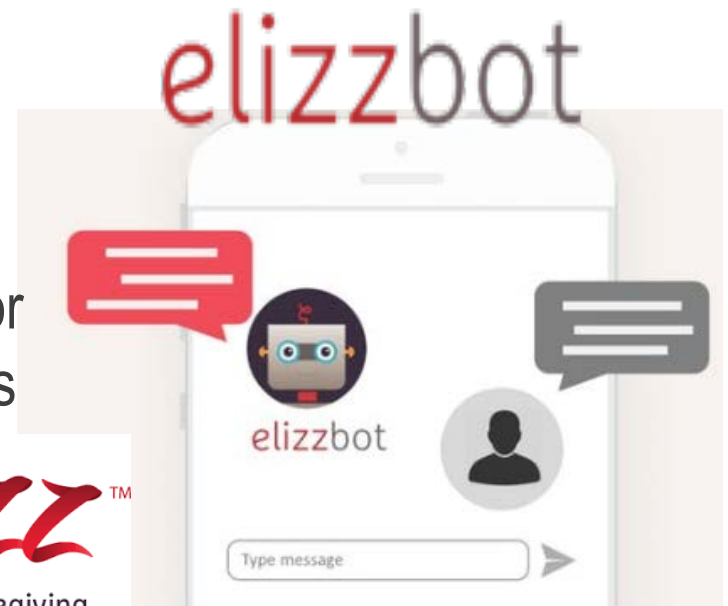


Source: Lucien Engeln



1<sup>st</sup> AI  
enabled  
chatbot for  
caregivers

**elizz**<sup>TM</sup>  
Smart Family Caregiving



@ZaynaKhayat



This is a hologram



Area of infection

POSTERIOR  
view from



Microsoft HoloLens





# Care robots

Pepper-uppers

## Japan is embracing nursing-care robots

*Around 5,000 nursing-care homes across the country are testing robots*

### Japanese robot Pepper can now teach and care for old people

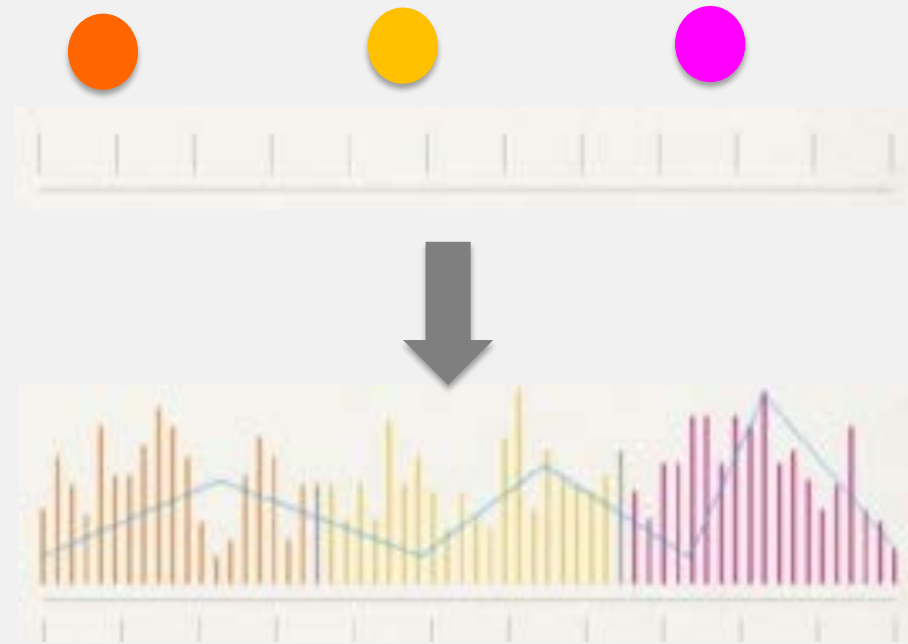
EFE | Tokyo | 28 Jan 2016





Hours  
accessing  
formal  
care

Hours living  
with chronic  
illness  
(5,800 hrs /  
year)





# Sensors: 24/7 remote monitoring

Bed sensors:  
**presence, sleep  
pattern, heart  
rate, breathing,**  
...

Person or home: **falls,**  
**wandering, meds,** ...

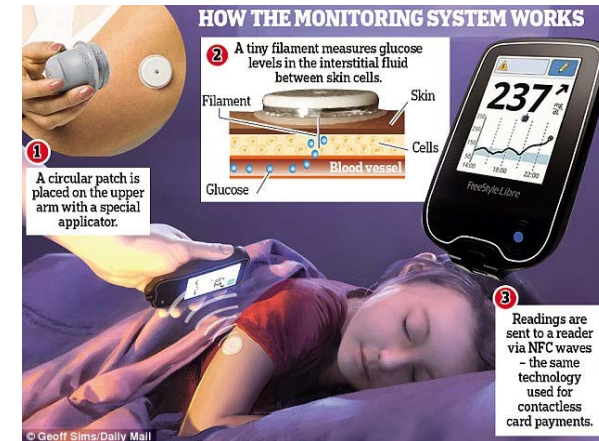
Patch **cardiac rhythm**  
monitor continuously  
for weeks



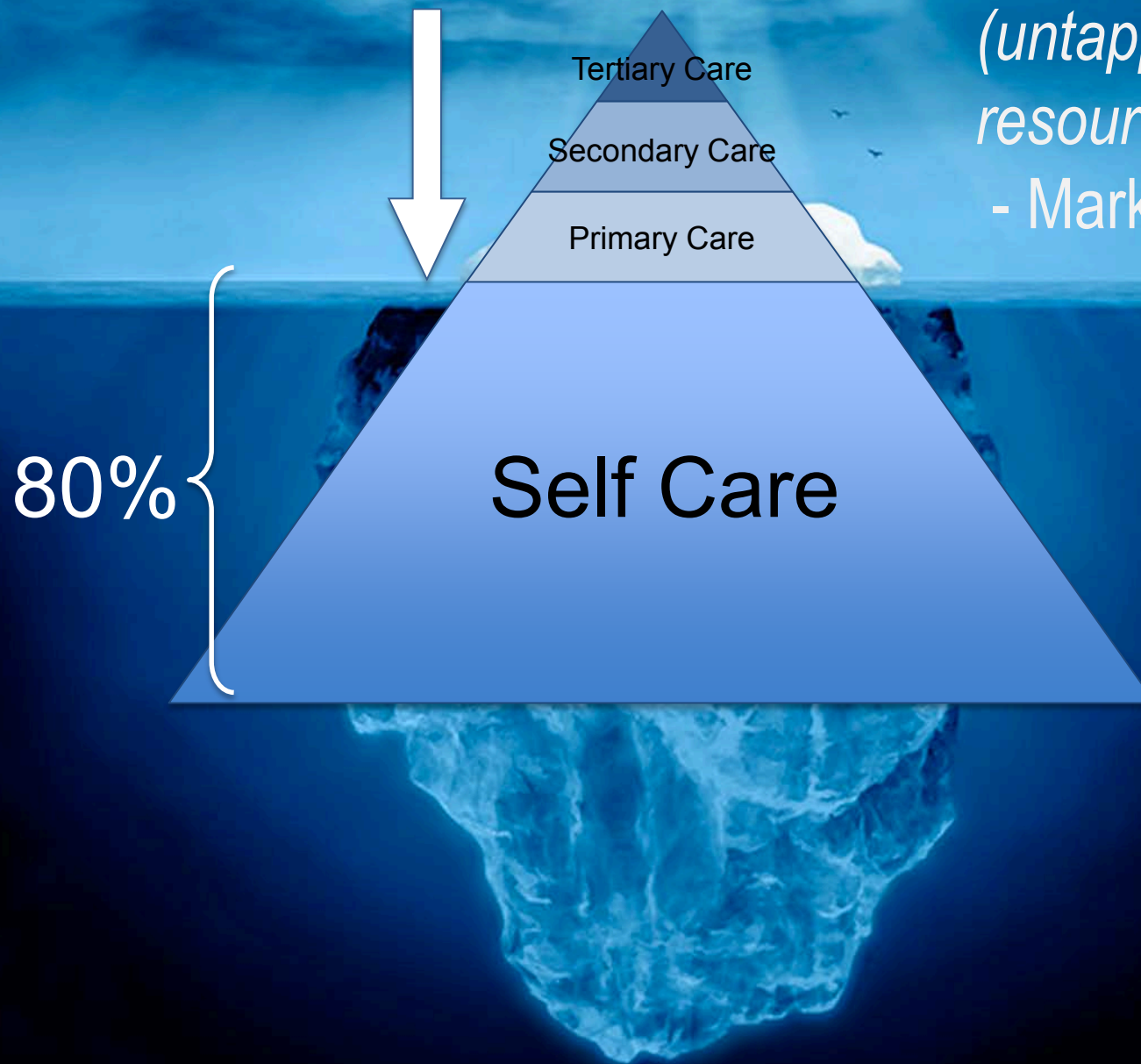
Formal & informal  
caregivers remote  
access to **vital signs**  
from anywhere



Continuous noninvasive –  
**glucose, other biomarkers**





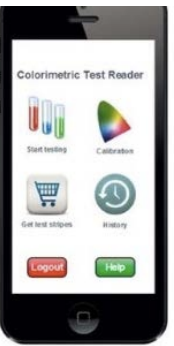


*“Patients are the  
(untapped) renewable  
resource of healthcare”*  
- Mark Britnell

*“Most exciting  
innovation of our  
era is not access to  
medical information,  
but access to each  
other”*  
- Susannah Fox



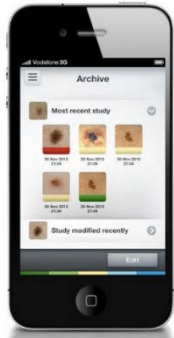
# Personal diagnostics



## Urinalysis (colorimetrix)



## Dermatology



## Otoscope



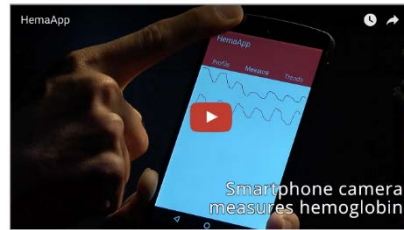
## X-Ray



## ECG



## Opthalmology



## Anemia



# HIV Test



## Ultrasound



# Pulse Ox



## Smart scale

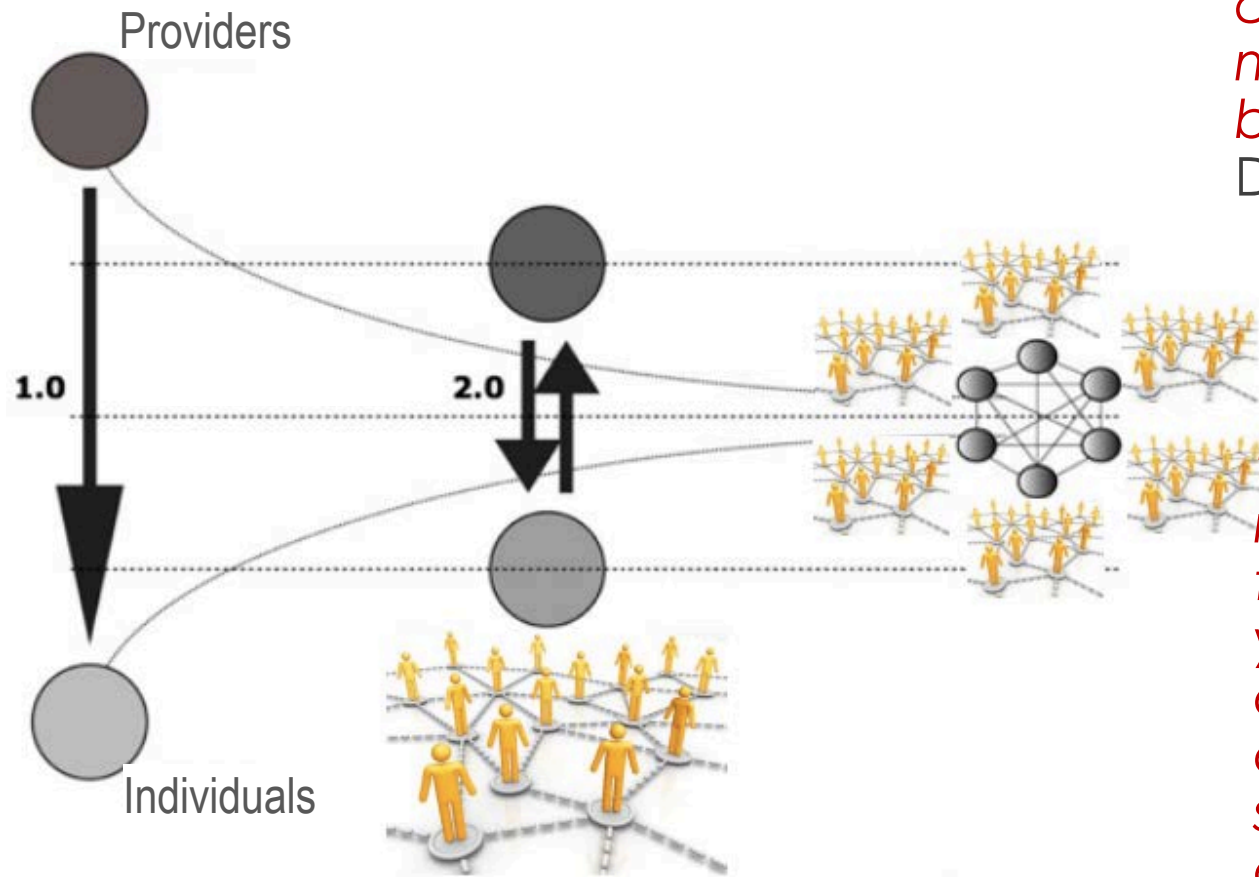


## Smart thermometer patch



## Infection monitoring





*“If you can have a social network of 1.4 billion people, why can’t you have a medical network of billions of people?”*  
Dr. Eric Topol

*“When you think of medicine, you won’t think of 1 doctor, you’ll think of a global community of experts aggregated to make sure that every patient gets their answer quickly and inexpensively”*



# Future of Health = Innovation

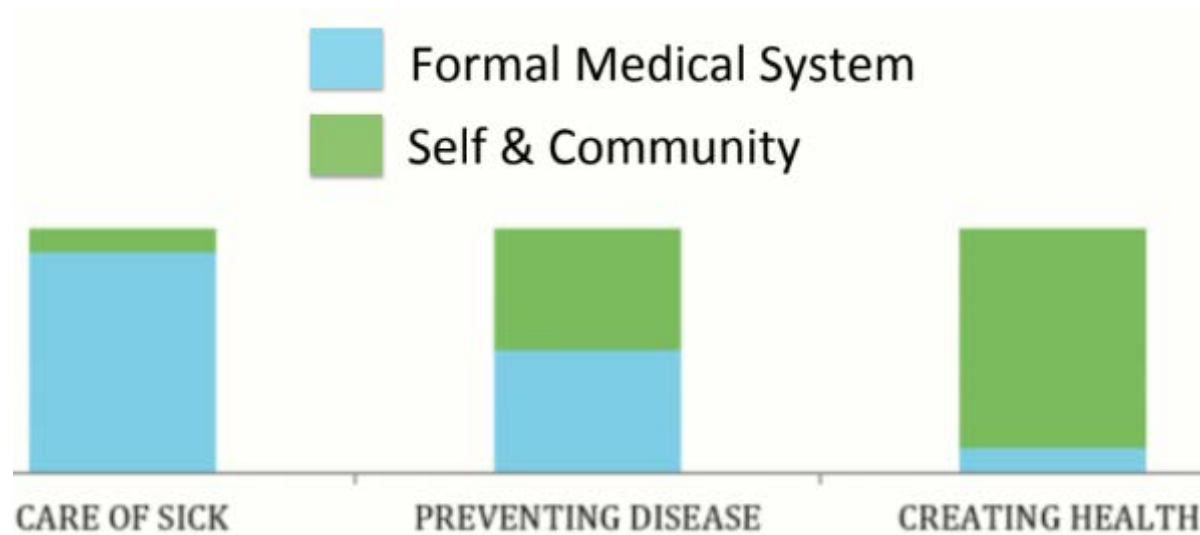
## Today: System

## Future: Person

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<b>PRECISION</b>	1 size fits all, crude, analog	Personalized, intelligent
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<b>DURATION</b>	Episodic, intermittent, silo'd	Continuous   team
<b>POWER</b>	Provider	People-powered
<b>CURRENCY</b>	Volume, costs, fee-4-service	Value, outcomes, fee-4-health



# Health is created in the community





# Strategy: Niche out

**Chinese** immigrant communities

- Int'l District Healthy Communities (Seattle)

**Children** in school

- Promise Neighbourhoods (Harlem)

Chronically **homeless**

- Community First! Village (Austin)

**Digital natives**

- Sidewalk Labs (Toronto Quay)



De Hogeweyk – Dementia Village in Netherlands (1993)

- Now: Denmark (Bryghuset), California (Town Square), Australia (Korongee), BC (2018)
- Barrie? TBD



# Strategy: SDOH + primary care





# “Management-free” care models



Buurtzorg: the Dutch model of neighbourhood care that is going global

Innovative nursing model cuts bureaucracy and gives nurses more freedom and time with clients

- 2006: 1 team of 4 nurses
- 2017: 850 teams (10,000 nurses) ... with no recruitment
- Independent, autonomous
- No management ... but coaches
- 50% reduction in hours of care, quality, happier staff
- Scale: national, USA, Japan, Korea, Sweden, Germany ...  
*Canada?*



📌 New Dutch homecare model insists nurses spend more than half of their time in direct contact with the people they support. Photograph: Fred Froese/Getty



# From hospital → “health village”



**Farmer’s markets** -target neighborhoods

Healthy Sustainable Food Vision: Farmers Markets to Sustainable Food Purchasing to Food Rx



Farmers Markets and Farm Box Distribution





Healthy Food Criteria



Sustainable / Local / Fair Food Purchasing





Housing | Transportation | Employment

3,226 views | Aug 3, 2016, 11:28pm

## This Children's Hospital In Dallas Is Reimagining The Healthcare Business Model



Greg Satell Contrib



Children's Health in Dallas has developed a number of innovative programs, such as the "Your Best You" camp pictured above, that seek to improve entire well-being, rather than merely treat patients when they get sick. Pilot studies have shown that programs such as these can improve care while reducing costs. Children's Health will be integrating its community focused strategy into a new WMD next year (image courtesy of Business Innovation Factory).

By any measure, Children's Health in Dallas is a world class institution. It boasts a top notch medical staff, is consistently ranked among the best children's hospitals in the country and features a Level 1 Trauma Center. Yet by 2011, despite the accolades, its CEO, Chris Durovich, was beginning to have doubts about the center's impact on the community.



# Lessons learned building healthy communities movements in US



## Improving Health through Innovative Collaborations



# Lessons

- ✓ Multi-sector
- ✓ Data
- ✓ Policy
- ✓ Sustainability plan up front



# Why Hospitals Are Getting Into The Real Estate Business

August 19, 2018 - 9:00 AM ET

PAUL CHISHOLM



WOMEN'S COLLEGE HOSPITAL  
Health care for women | REVOLUTIONIZED

WHAT IS THE  
**HEALTH GAP**

AND WHY SHOULD I CARE?



Nationwide Children's Hospital developed Career Gateway Homes, a combination low-income employment-training center.

Courtesy Nationwide Children's Hospital

## Bruyère Village

An innovative response to the needs of our aging population and community.



Located on the banks of the Ottawa River in the east end of the city, the Bruyère Village includes



# Strategy: Multi-stakeholder consortia ... with unusual suspects



## HEALTHY BUILDINGS

---

### Bronx Healthy Buildings Program

Address the social determinants of health through education, organizing, work force development, and building upgrades

Northwest Bronx Community and Clergy Coalition

Montefiore Medical Center

The New York City Department of Health and Mental Hygiene

BlocPower

Emerald Cities Collaborative

NY Lawyers for Public Interest

Councilman Ritchie Torres



# Libraries, restaurants, barbershops – vectors of scale for MH care

BRIDGING THE OPPORTUNITY DIVIDE

## LOOKING FOR HOUSING OR AFFORDABLE HEALTHCARE? YOUR LOCAL LIBRARY IS HERE TO HELP

July 27, 2018  
by Adrienne Day



## Welcome to barbershop therapy

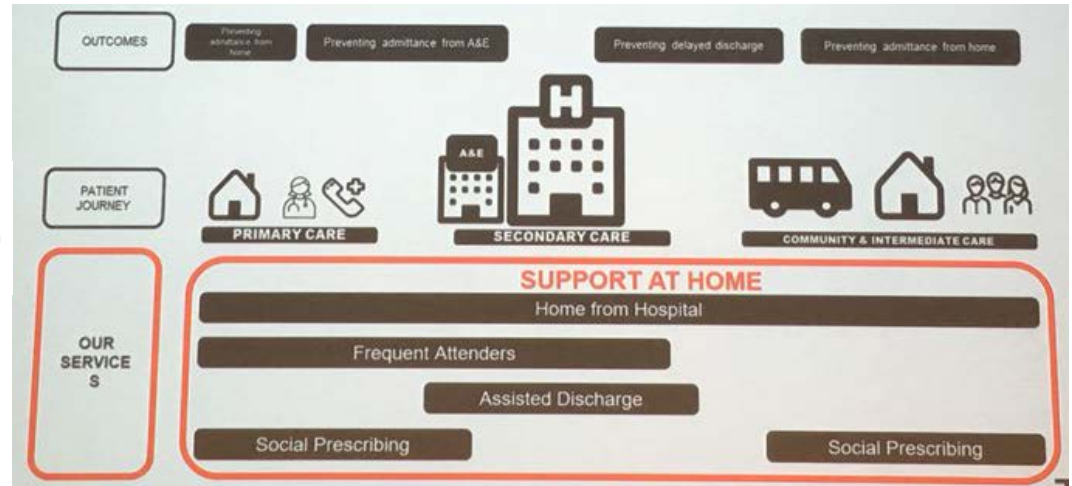
CELESTE HAMILTON DENNIS 20 September 2018

Barbers in the US South are training as first responders to assist men with their mental health concerns.





# New players delivering care in the community



## Postal workers deliver meds and check on health of seniors

An innovative program expands role of mail carriers to look for signs of illness

Oct 2, 2015

## French postal workers are doubling as elderly caretakers

By Alex Campbell Dec 20, 2017



## Ontario extends paramedic house-call program for seniors

Pilot project employing paramedics to make health-care visits helped reduce 911 calls and emergency room visits.



Tweet

G+1

2

reddit this!



HOSPITALS

## A new role for first responders: providing in-home health care

By LEAH SAMUEL / NOVEMBER 17, 2017



# New Entrants: customer obsessed, savvy with exponentials, patient







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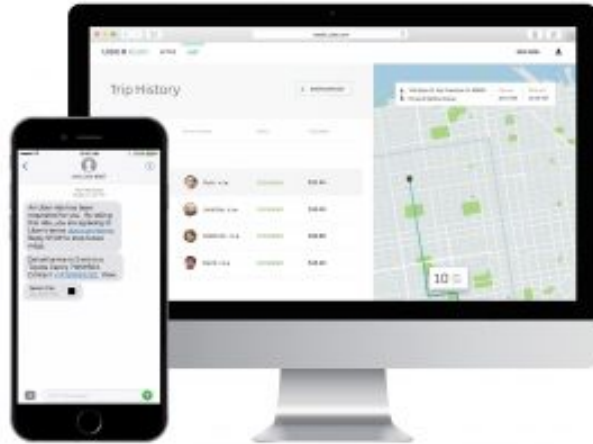
[Home](#) > [News](#) > Ford Launches GoRide Service To Get Patients To Their Medical Appointments

## FORD LAUNCHES GORIDE SERVICE TO GET PATIENTS TO THEIR MEDICAL APPOINTMENTS

APR 18, 2018 | DEARBORN, MICH.



UBER Health



lyft | MOBILITY SOLUTIONS

### Ride with Care

From elder independence to appointment efficiency, Lyft has you covered.

[Contact Us](#)

@ZaynaKhayat





# Telecoms and banks – bundling health services with other services





# Apple's latest Watch can sense falls and heart irregularities

It's like a high-tech version of the "I've fallen and I can't get up" gadget.



*"Apple Watch is moving from a trendy option to a clinical imperative"*



*"intelligent guardian for your health"*





## Humana Deal Could Bring Walmart Into Homes For Care



Bruce Japsen, CONTRIBUTOR

I write about healthcare business and policy [FULL BIO](#) ✓  
Opinions expressed by Forbes Contributors are their own.



### TWEET THIS

- Talk of a deal with Walmart comes with Humana on the verge of expanding its "Humana At Home" operation
- Kindred shareholders over the next three days are voting on whether to sell to Humana and two private equity firms



## Amazon's secretive health team talking with AARP about making products for older people

- Amazon is interested in developing technologies targeted to aging populations.
- Its vice president of special projects, Babak Parviz, made a very rare public appearance last month where he described this as something "we deeply care about."
- Sources say that Amazon has approached groups like AARP, a lobby that represents older Americans.

Christina Farr | [@chrissyfarr](#)

Published 1:02 PM ET Tue, 20 March 2018 | Updated 10:27 AM ET TH

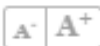


Published Aug. 18, 2018 at 05:31PM

# Best Buy makes an \$800M investment in aging America

BY JACKIE CROSBY

STAR TRIBUNE  
(MINNEAPOLIS)



Best Buy Inc. is preparing to ride the age wave.





# Strategy: creative financing vehicles



\$22 million PE fund investing in building blocks of healthy communities in Massachusetts



## HealthyFuturesFund★

\$200M  
Co-op bank + Kresge Foundation + Morgan Stanley  
Focus on housing.







Omada is a digital behavior change program that can help you lose weight, reduce your risk for chronic disease, and feel better than you have in years.

## **How does Omada Health make money?**

**The company's model is outcome-based: the more weight the patient loses the more money it makes**



# Canada's 1<sup>st</sup> Health Social Impact Bond






# Future of Health = Innovation

## Today: System

## Future: Person

<b>TIMING</b>	Reactive, sick care	Proactive, preventative, predictive
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<b>CURRENCY</b>	Volume, costs, fee-4-service	Value, outcomes, fee-4-health





Health Medicine

# Medicine Will Advance More in the Next 10 Years Than It Did in the Last 100

By Vivek Wadhwa - Oct 26, 2016  75,029



## Time to reach 50 M users



75 Years



38 Years



13 Years



17 yrs

4 Years



3.5 Years

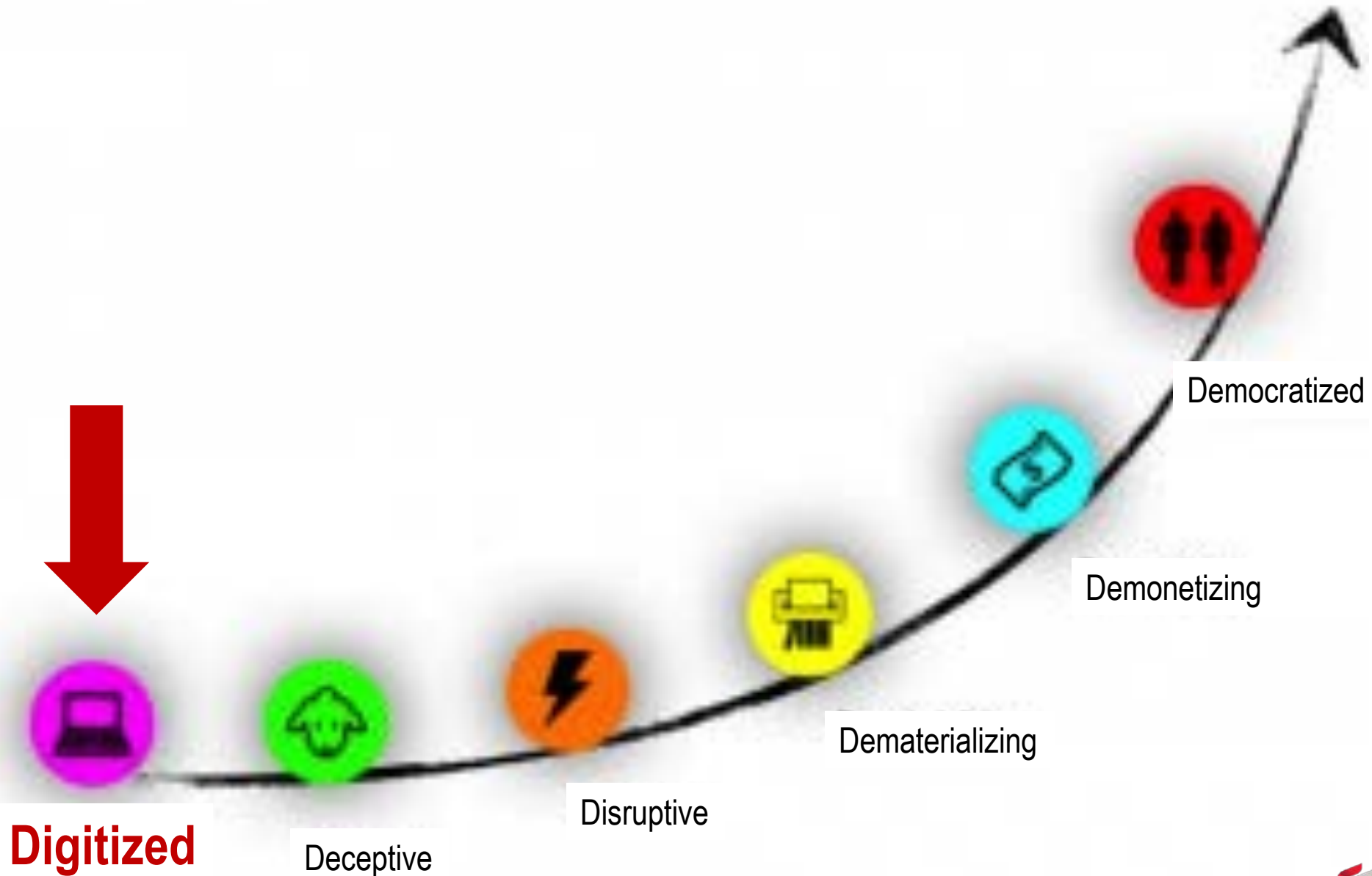


35 Days

Average time  
from  
evidence to  
practice in  
medicine: 17  
years



# Required: exponential mindset





# AUGMENTED HEALTH

{CARE}

"THE END  
OF THE  
BEGINNING"

LUCIEN ENGELEN

"A brilliant examination of the beginning, and insights & actions to accelerate the future of health and medicine."

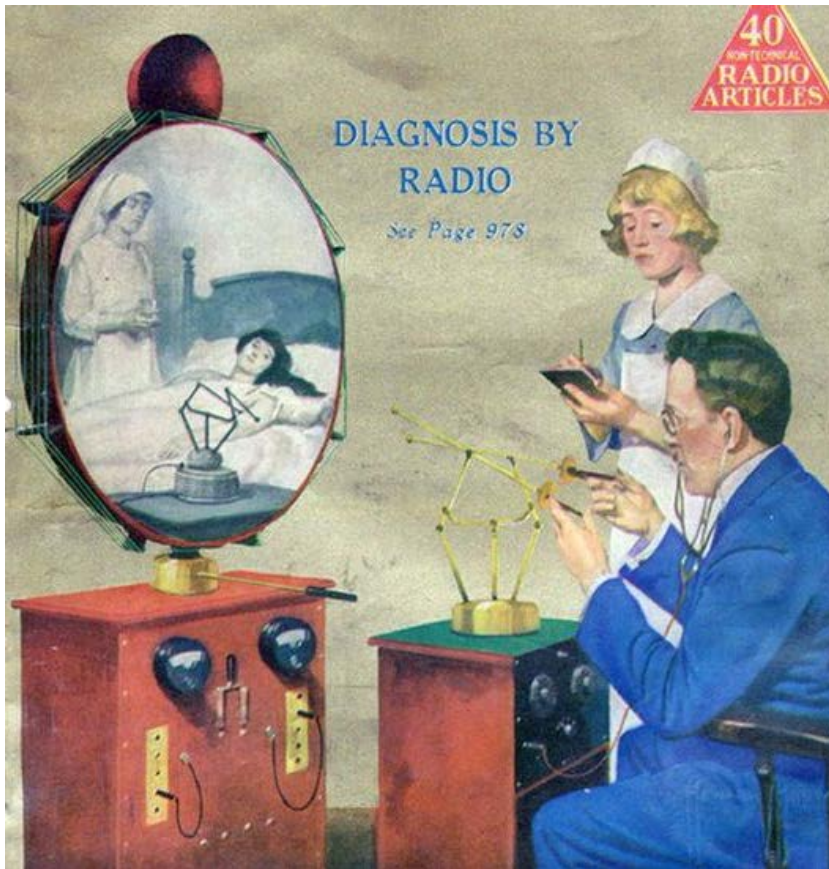
David N. S. Lee, MD, PhD, Chair, Department of  
Biomedical Engineering, University of California, San Diego



*"It will be retro to have your  
blood pressure taken by a  
human again"*



# “Radiomedicine” (1925)



# The Jetsons (1962)





This Room Is Equipped With  
Edison Electric Light.

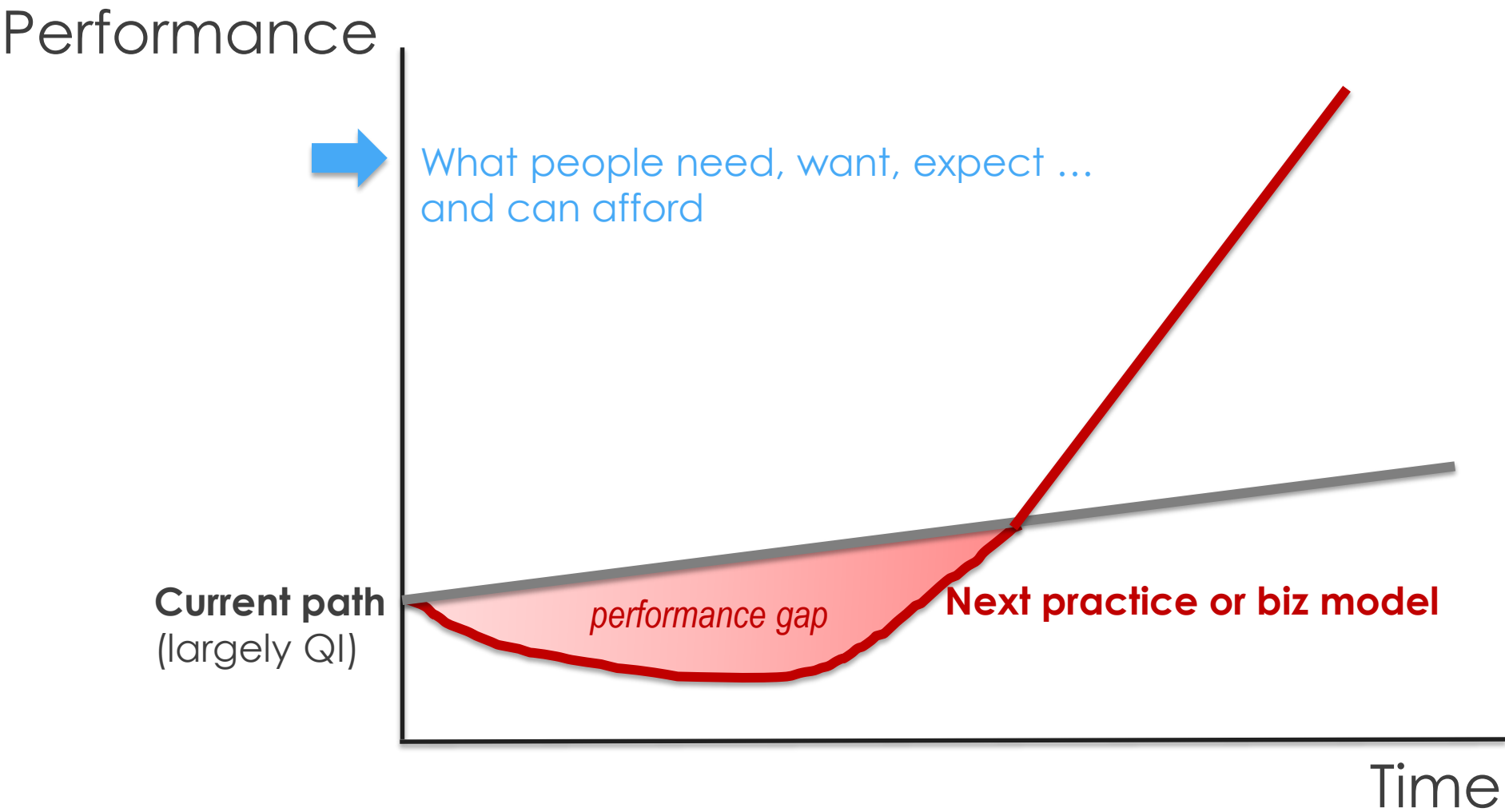
Do not attempt to light with  
match. Simply turn key  
on wall by the door.

---

The use of Electricity for lighting is in no way harmful  
to health, nor does it affect the soundness of sleep.



# Most innovations under-perform ... at first











**3. Every Locomotive propelled by Steam or any other than Animal Power on any Turnpike Road or public Highway shall be worked according to the following Rules and Regulations ; viz.**  
**Firstly, at least Three Persons shall be employed to drive or conduct such Locomotive, and if more than Two Waggon or Carriages be attached thereto, an additional Person shall be employed, who shall take charge of such Waggon or Carriages.**



1<sup>st</sup> ATM  
bank  
machine  
(1967)




*“The only people using the machines were **prostitutes** and **gamblers** who didn’t want to deal with tellers face to face”*



Posted by **CarBuzz**

4,467,137 Views

 **Save**



0:00

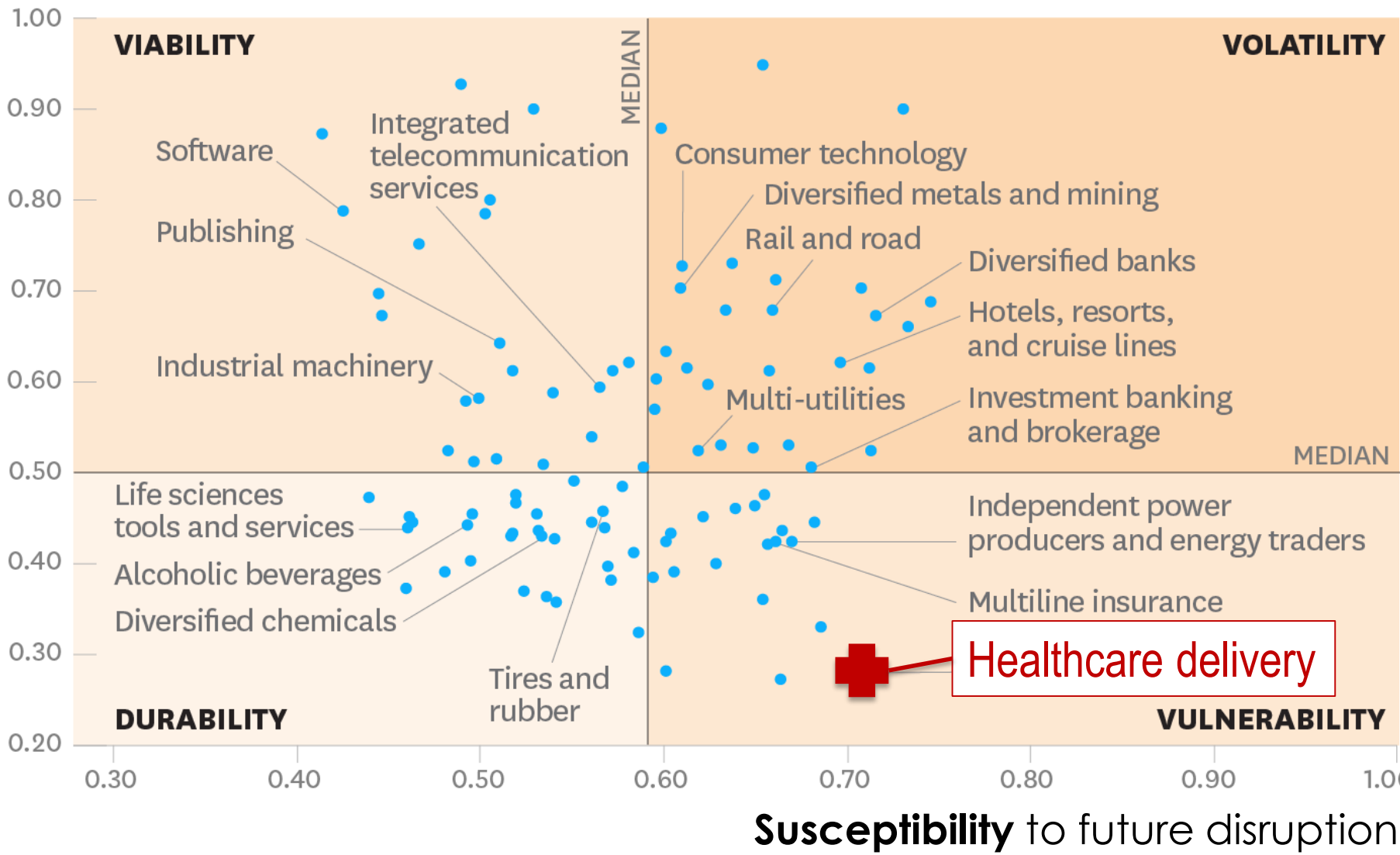








# Current disruption



Source: Accenture Research Disruptability Index– in HBR.org, How Likely Is Your Industry to Be Disrupted? (Jan 2018)



# Horse vs. Automobile

**BEFORE** you discard your horse and buy an auto it is well to think of the cost.

Figure how much you spend for harness and then think of what new tires amount to.

Figure up what it takes to feed Dobbin in a year and then think of gasoline, repairs and storage charges.

Dobbin is worth what you paid for him two years ago, where's the man with an auto that can say the same?

Come in and get a new harness instead of a new car and remember that Dobbin will take you through snow and mud as well as on good roads and that his carburetor is never out of order.

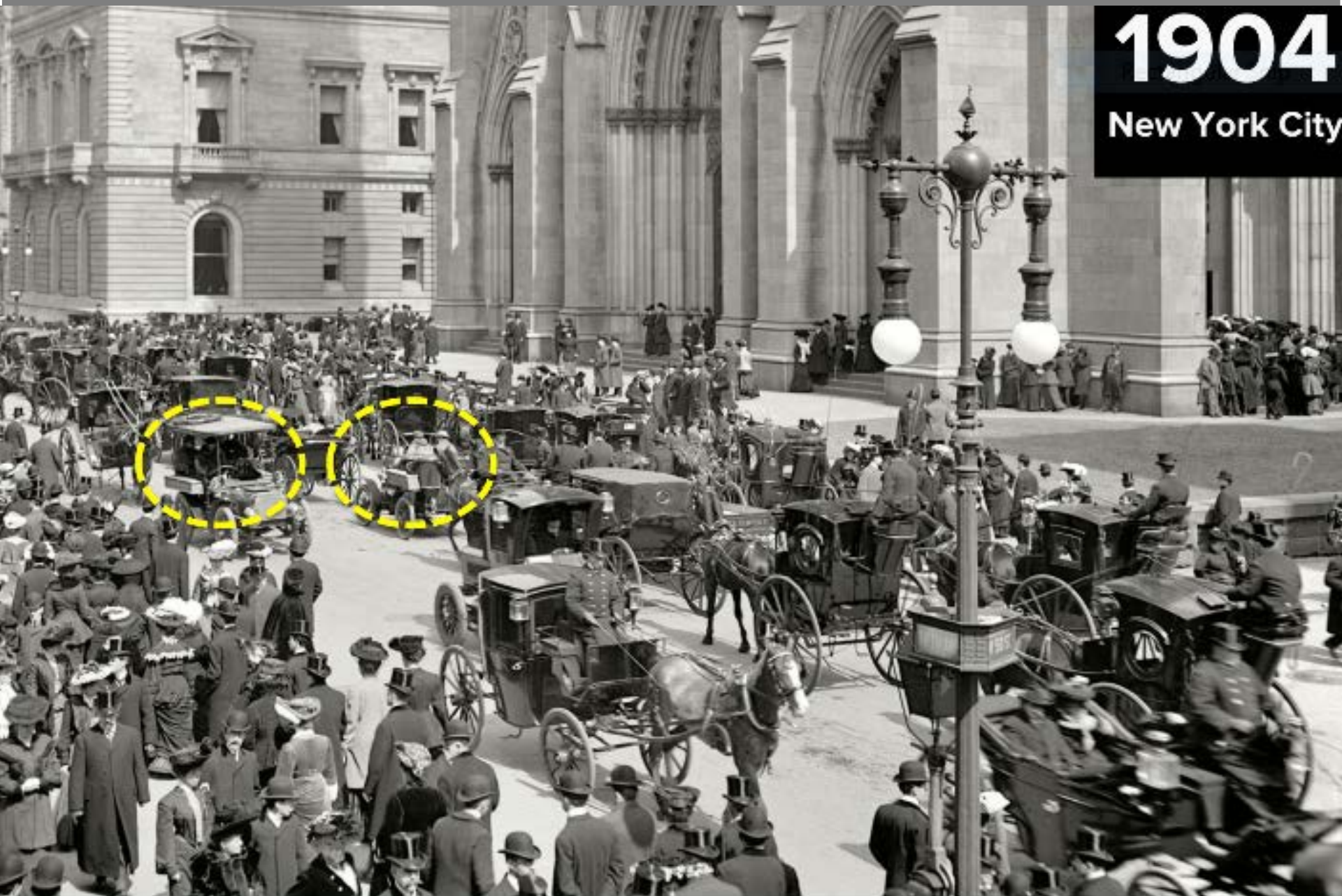
## Ed. Klein

732 Massachusetts Street



# 1904

New York City







**1917**  
New York City

In 1912, traffic counts in New York showed **more cars than horses** for the first time.





# Unbundling of incumbent providers

## CARE PLANNING



## SUPPLY MANAGEMENT



## EMR/ PRACTICE MANAGEMENT



## COMMUNICATION



## RADIOLOGY



## DIAGNOSTICS



## PATIENT MONITORING



## SURGERY



## MEDICATION MANAGEMENT



## REFERRALS



## HOSPITAL NAVIGATION



## INFECTION CONTROL



## PATIENT EXPERIENCE



## READMISSIONS / EMERGENCY DEPARTMENT



## CARE COORDINATION



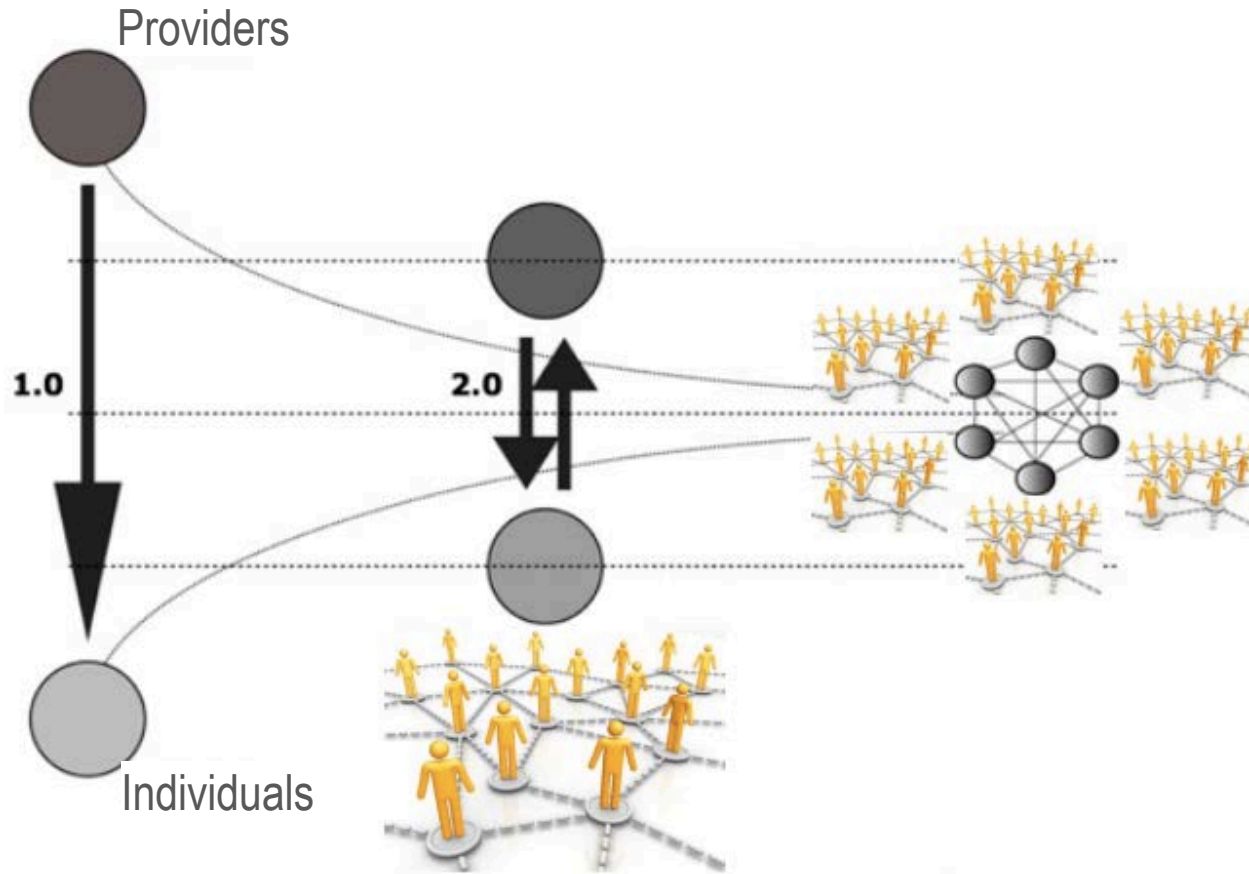


# New Entrants: customer obsessed, savvy with exponentials, patient





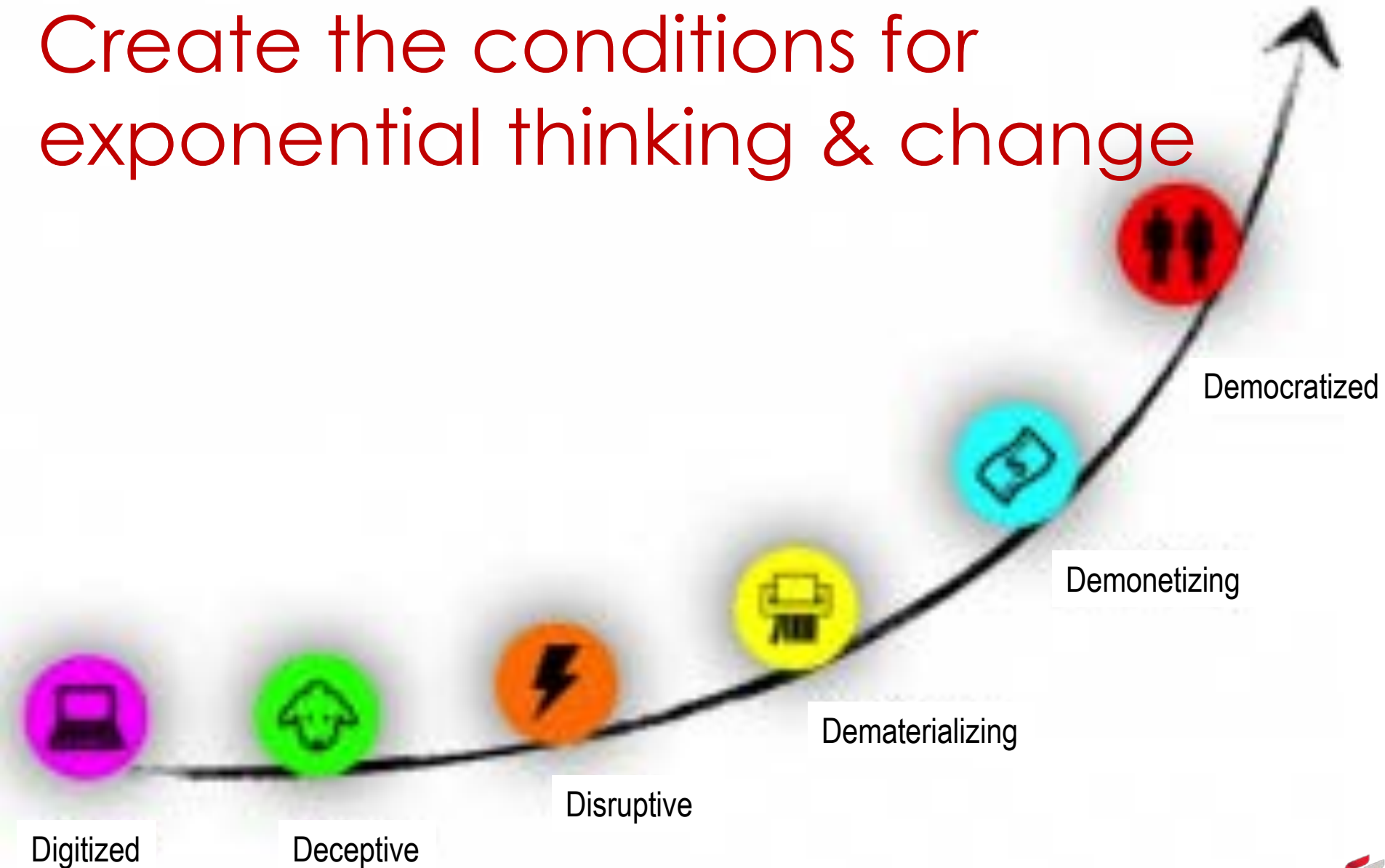
*“If you can have a social network of 1.4 billion people, why can't you have a medical network of billions of people?”*  
Dr. Eric Topol



*“When you think of medicine, you won't think of 1 doctor, you'll think of a global community of experts aggregated to make sure that every patient gets their answer quickly and inexpensively”*



# Your mission: Create the conditions for exponential thinking & change





# KEEP CALM & KEEP INNOVATING

Zayna Khayat, Ph.D.

SE Futures

[ZaynaKhayat@SEHC.com](mailto:ZaynaKhayat@SEHC.com)

@ZaynaKhayat | #SEFutures | @SEHealth\_SEHC

