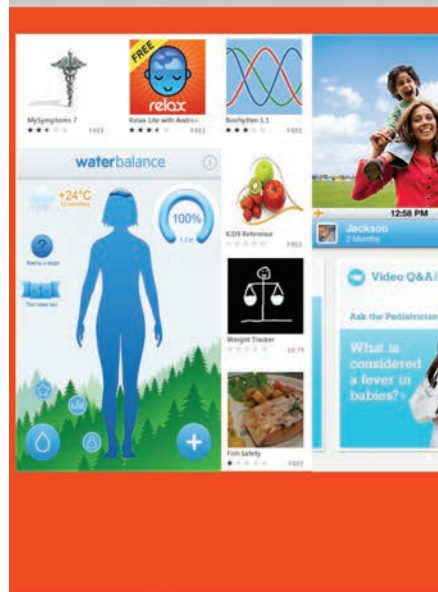


A couple of years ago I had written an article on 'Your Genome on iPad', which proved out to be a reality. Over a period, the cloud-based technology and infrastructure has drastically improved and also the speeds at which these hand-held devices link with the 3G and 4G connectivity. This by itself provides ideas for new business models for diagnostics and point of care testing by the caregiver or the patient themselves.



and now the market covers over 40 per cent of the high-end smart phones (₹30,000 and above). In terms of overall smart phones population owning iPhones, it comes to around 10 per cent.

There are no exact figures or data as to what is the population of working doctors, nurses and other para medical work force in India, which has an iPhone. The increase in the number of iPhones is not the only reason helping the growth of iDiagnostics.

The biggest driver for growth of iDiagnostics sort of services in healthcare are as follows:

Shortage of manpower:

As I had discussed in my column on Healthcare Manpower Economics (Jan 2014 issue) India has over one-fifth of world's disease burden, but only one per cent of technicians to fulfill the demand for these services. Moreover, the costs of producing more manpower is leading to counter productivity in terms of a life time earning model discussed in my column. This only means that wages for radiologists and other health techs is going to increase in the future leading to higher costs of diagnostics and testing to the consumer.

Internet access to population:

As I had discussed in my column on Inclusive Social Media (Oct 2013 issue), India witnessed a YoY growth of 31 per cent in people visiting the Internet, making it the world's third largest population on the Internet. However, a large growth in the future will now come from penetration of smart phones and tablets.

Demand for self-testing and patient control:

During our location studies for our ventures, we have found that waiting and commute times for diagnostics and

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Most good ventures get killed due to over indulgence with the medical profession & regulation



inadequate to make the right clinical judgment and hence turnaround times for the patients in treatment of chronic and multiple conditions that require a whole host of tests and those including molecular diagnostics that require specialist technician intervention, take more time. Specialty clinics: In our journey of establishing specialty clinics model using genetic and molecular diagnostics in India, we realised that there needs to be a centralised team to support the doctors and clinicians in the new age of molecular and genetic diagnostics. These have to be clearly interpreted and explained to the doctor and the patient alike.

Technology development: One of the greatest positives coming out of the iOS operating system and the phone hardware design is the development of third-party attachments and application. This has otherwise been difficult for other ecosystems.

The Power of Apps and Business Models







As of April 2014, there are 24,876 (2.16 per cent) apps under medical and another 31,814 (2.76 per cent) apps under health and fitness in the Apple's App Store. This means that around five per cent of the apps on the Apple App Store are related to healthcare. The velocity with which more apps are being generated and added to the Apple's App Store on healthcare is almost 20 apps per day! However, it is not the volume of apps or the devices that are being developed, but the business models around the devices and apps that would lead to the success and failure

testing services in large towns and cities ranges anywhere between two to four hours for a typical healthcare consumer. DIY and home care services though have a promise, they have not yet proliferated in large towns and cities to meet the growing demands. These are some of the reasons for delay or delinquency in taking of the tests. If technologies were available to the patient that can allow for self-testing and control over the time spend, it is definitely a trade off the patient is willing to make for the costs of getting such services.

Demands for faster turnaround times:

As I had discussed in my article on Big-Data in Healthcare, the number of modalities for diagnostics and point of care have increased exponentially, leaving the general physician



Application	Description	Key Developers
Glucometer 	Created a Logbook app for iPhone; Cable connects iPhone to glucose meter (supports 17 different meters) and allows download of meter data; Can email or fax data to healthcare provider	IBGStar (Sanofi)
Otoscope 	This device can be used in clinical settings, by consumers in home settings, in medical colleges by residents and in schools and day care settings	Cellscope Inc
EKG 	A real-time, a high quality one lead ECG that can be done anywhere a iPhone. AliveCor's ECG device basically enables medical professionals and regular consumers to monitor a person heart health; It goes, and allows for rapid, quick assessment of some cardiac problems in the field, including rhythm disturbances; Additionally, it's low cost also allows for mass screening in developing countries	AliveCor
Digital Microscope 	This device can be used in clinical settings, by care givers in remote settings, in medical colleges by residents; There are multiple configurations available for different type of applications	OTAS, Carson Micromax, 10 other vendors
Dermatoscope 	This is a standardised zoom with autofocus and optical magnification of up to 20X directly to the camera of the apple device for detection of skin cancer and examination of moles; App and cloud technology to store and archive the photos	FotoFinder Systems
Mobile Ultrasound 	Portable ultrasound that is inexpensive, which will lead to even wider use, especially in rural and third-world areas; widespread use in Emergency Rooms, and in the surgical and medical wards, as well as in office practice	MobiSante Inc

of the device or apps on Apple.

Key learnings developing a business model

After having reviewed hundreds of business plans for different healthcare ICT ventures as an advisory board member, here are three key points that most validate the solutions to solve the world's healthcare problems. There are three key components to building your successful venture:

- value proposition,
- delivery proposition, and
- lastly the financial proposition

Value proposition:

Let us understand what is the

value proposition that the ventures are addressing and what are the key service lines that the ventures propose to incubate. In the short to medium term, mHealth is a personal, additional, discretionary spend; the value proposition would need to address this discretionary consumer's spend on healthcare and what they are willing to pay for. Once the venture has zeroed into the value proposition then it needs to define the compelling services that would be paid for by the consumers.

A word of caution here is to engage with those consumers that do care for their health and use their experience to

build compelling feedback to other potential consumers and clinicians. Most of the good ventures that have been killed are due to the over indulgence with the medical profession and regulation rather than thinking of the patient's problems that should be solved.

Delivery proposition:

Having defined the value proposition and the services, the second component is to define the delivery proposition and competencies that would be required to deliver the mhealth services through the apps or the devices developed by the venture. Many techies often start by building the



We need to stop thinking like doctors & techies and start thinking like patients and consumers



FDA had released guidelines to enable the regulation of mobile apps for healthcare in September 2013



Wages for radiologists & other health techs is going to increase in the future

WHO Guidelines

WHO has developed guidelines for development of diagnostics for low-resource settings:

- Assured
- Affordable
- Sensitive
- Specific
- User-friendly
- Rapid and Robust
- Equipment-free
- Deliverable to end-users

Application	Description	Key Developers
Slit Lamp: Eyepiece Digital Adapter 	Iphone eye piece is attached to the slit lamp and used to take high definition pictures and video. This iPhone adapter is equipped to adapt to most slit lamps on the market today	Optivision2020, Inc
Blood Pressure Monitoring 	This iPhone peripheral blood pressure cuff, does readings, and the app is programmed to record the readings, time of day, and keeps a log; It allows patient to send their record to where ever they wish, including to their doctor. This device allows a truer measure of blood pressure, avoiding “white-coat hypertension” or having falsely high readings at a doctor’s office	IHealth, Carsons, Withings, 5 other vendors
Breathalyzer 	This attachment measures the alcohol in the breath. The helps detection and reduce drunken driving; Other applications such as spirometry are also being developed which can measure through an algorithm with the audio portion of an expiration, and there is a 5% difference in studies performed, compared against the old, conventional spirometer	iPega
Assisting in Bio Analysis for Tox and Culture Tests 	The computing power of the iPhone, as well as its powerful optical properties to, essentially, record and interpret the movement of cell cultures, when exposed to various drug toxic environments, thereby testing drug potency, or toxicity.	n3D Biosciences

technology castles rather having an understanding of the value proposition they would like to deliver to the consumers. The idea here is we need to stop thinking like doctors and techies and start thinking like patients and consumers.

Financial proposition:

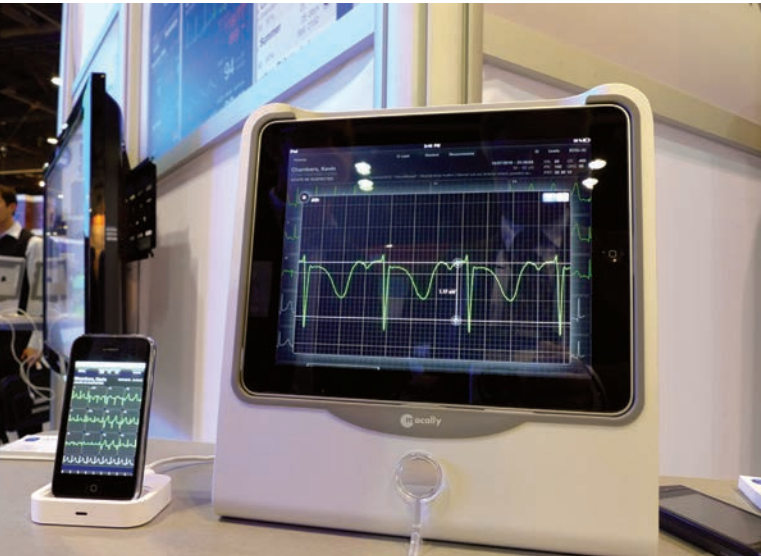
Lastly, the business plan or the financial proposition of running the healthcare venture. Obviously with good intent, there is a health indicator that the venture would strive to improve upon. The revenues and costs need

to be balanced to ensure that there is profit or the venture run efficiently where there is no profit motive.

What does the future entail?

Considering that smartphone applications will enable



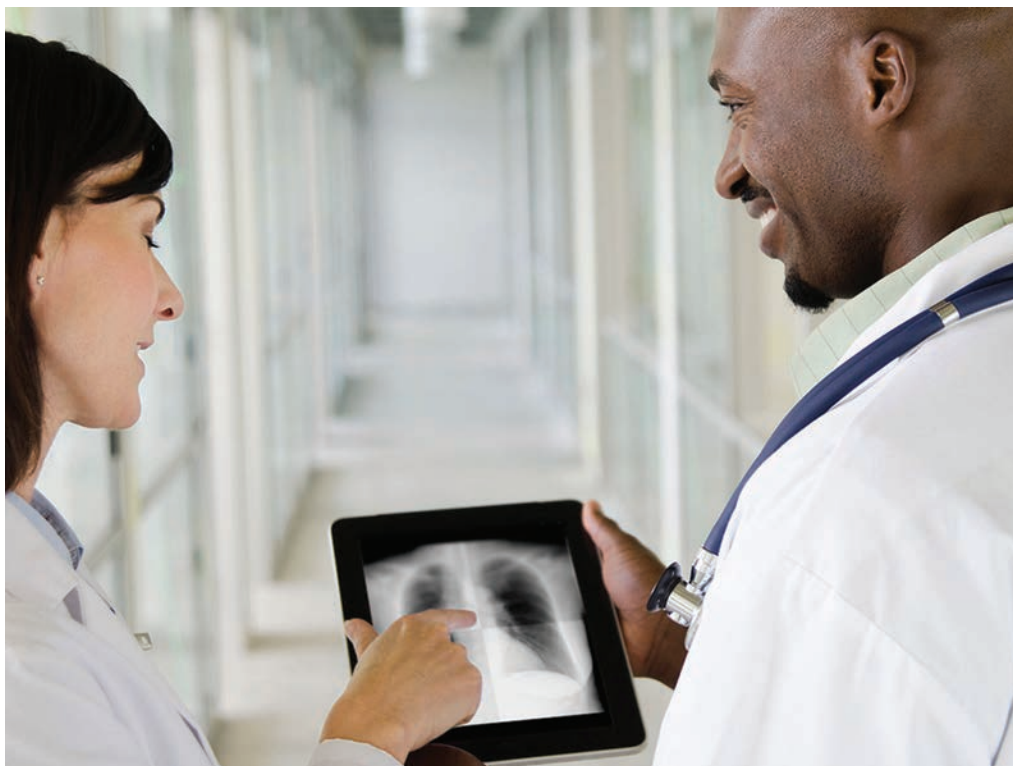


the mHealth industry to successfully reach out to 500 million of a total 1.4 billion smartphone users in 2015, FDA has released guidelines to enable the regulation of mobile apps for healthcare in September 2013. These have far reaching implications as some of the risks in these healthcare apps are going to be viewed as Class II and Class III in terms of risk mitigation. This by itself will create entry barriers for many fly by night operators and developers.

The process of getting FDA clearance can take some time. The consistency afforded by

Category	Apps
Disease Diagnosis Applications	John Hopkins Antibiotic Guide, 5MCC, 5-Minute Infectious Diseases Consult, Sanford Guide to Antimicrobial, ePocrates, Normal Lab Values, Lab Unit Converter, Labs 360, Davis's Laboratory and Diagnostic Tests, Pocket Guide to Diagnostic Tests, IDdx, eRoentgen Radiology Dx, iSeismometer, Video Laser Level, EyeChart, EyePhone, DizzyFIX, Eye Test (5 Apps), Diagnosaurus DDX
Drug Reference Applications	Skyscape's Rx Drugs, Epocrates, Medscape, FDA Drugs, DrugDoses.Net, Micromedex Drug Information
Medical Calculator Applications	Epocrates MedMath, MedCalc, Medical Calculator, Calculate, Archimedes, uBurn Lite, Softforce's Antibiotic Dosage Calculator, Paeds ED, PICU Calculator
Literature Search Applications	PubSearch, PubMed on Tap,
Clinical Communication Applications	UniteAcess, Amcom Mobile Connect, mVisum
HIS Client Applications	OsiriX Mobile, AirStrip OB
Medical Training Applications	CheckAid, Heart Pro, EKG Rhythms, Draw Surgery, Plastic Surgery Simulator, Surgery101, ECG Rhythms, Paramedic Protocol Provider,
General Healthcare Applications	Wiser, Swine Flu Scanner, Outbreaks Near Me, MedWatcher,
Medical Education Applications	I-Surgery Notebook, Eponyms, Netter's Atlas (5 Apps), Blausen Atlas (15 Apps), Oxford Handbook of Clinical Specialties, Dissection (20 Apps), Cranial Nerves, Instant ECG, Medical Terminology Flashcards, Radiology 2.0
Applications for Patients	12000+ Apps.





Apple hardware really helps here, especially if the medical device or the app specifically involves the characteristics of the hardware. In many cases, the image display for diagnosis is inextricably tied to the quality of the display of the iPhone. Having a smaller variety of models, a consistent manufacturing process, and a device life cycle that is long, many ventures can start the FDA clearance process and end

it using the same devices.

This is difficult when compared with an Android where the number of devices on the market changes monthly; therefore there is difficulty associated with quality assurance. On the other hand, two weeks ago, a reported leak sparked rumors that Apple is developing Healthbook, a health and fitness tracking platform, presumably set to be unveiled

with the release of iOS 8 in June 2014.

Healthbook features a variety of functions and looks to be an all-in-one software platform for device makers looking to create health tracking hardware. Rather than having to create their own software, hardware makers may soon be able to easily tether their device to the iPhone. For software companies a healthcare app from Apple could provide a center platform where multiple apps could provide their data in a simple, efficient way.

There will come a day in the future when a care giver's armoury for diagnosis will not contain heavy equipment in their clinic but a smart phone with the point of care medical device attachment and real time processing of the information along with peer specialists to arrive at the right prognosis! **HBI**



About the Author

Kapil Khandelwal has earned recognition as an angel investor, venture capitalist and expert in health sciences, education, agri, clean tech and information communications and technology (ICT). His expertise positions him as one of the thought leaders in India, Asia Pacific and emerging markets. In his 25 years of his career, he has carried out over 30 transactions including cross-border and buyouts. He has chaired various committees at various industry bodies. Kapil runs an early stage investment fund and his own investment banking and advisory services company EquNev Capital Private Limited. He can be contacted at: kapil@kapilkhandelwal.com