Business Approach for IoT based Health Solutions in India with respect to Osterwalder Framework

Yatin Jog[1], Apurva Sharma[2], Kalyani Mhatre[2] and AnandAbhishek[2]

[1]Professor at Symbiosis Institute of Telecom Management, Pune, India
[2]Student at Symbiosis Institute of Telecom Management, Pune, India
Email: yjog@sitm.ac.in, sharma.apurva18@gmail.com,
kalyanimhatre90@gmail.com, anand.abhishek@sitm.ac.in

Abstract

Internet of Things is an emerging trend that will take existing health care sector to a new dimension. IOT based e-health products like Smart Infusion Pumps, Smart Monitoring, & Health TV will provide the edge over the existing traditional methods used in healthcare sector. The e–Health solutions provided through IoT devices are more accurate and accountable in context of IoT landscape, which provides various challenges along with exciting opportunities in the industry. Healthcare sector is not about just affordability, access & quality but also about financial & social aspects. Therefore, different Business Models have been developed by different enterprises for Transforming Health systems so as to create real time use and impact for the users especially patients, their families & communities where they belongs the centre of care. The main purpose behind every business model is to generate money in terms of profit. It is nothing but an organized structure where a company knows about its key partners, customers, resources, channels & revenue as well as cost structure. This in turns gives a picture about what an enterprise is, what are its strategies, its competitors etc. Better model showcase the enterprise their possibilities, competencies & responsiveness with the customers as well as clients.

Keywords: Internet of Things, E-Health, Transforming Health Systems, Smart Infusion Pumps, Smart Monitoring, Health TV

1. Introduction

The Internet of Things [1] holds huge promises and opportunities for the health sector, especially in Personal care. E-health products and e-health services are the amalgamation of various resources and health care by electronic and automated devices which provides the smooth and effective delivery of health information including statistical data for health professionals, governing bodies and health facility consumers, via the Internet and most important telecommunications as a medium. IoT based e-Health solutions is an upcoming trend which will revolutionize the healthcare industry in near future.

Different technologies like Smart Infusion Pump [2], Smart Monitoring, & Health TV [3] will provide the edge over the existing traditional methods used in healthcare sector. Smart Infusion pump is a technology used for treating patients more carefully and accurately. It collects data and then aggregates in a database which contains the records of the administration in the central server. They are basically network devices which connect hospitals and clinics through wireless local area network. An Infusion device has a software which is programmed according to the various parameters of a patient such as their weight, dosages and category, either adults or paediatric. In addition to this, infusion device software uses different libraries for various patients' records according to their sizes whether they are adults or kids and later on compare doses of drug to the library which has been selected according to the patient size. The smart infusion pump

programmer is required to select the correct library in the first stage of set up so as to confirm the appropriate dose ranges are being used. In the drug library programming, the matching of a drug with appropriate infusion time is set within the infusion rate limits.Another Technology is Smart TV as a platform for E-Health Services, can also be called as "Health-TV" that provides IoT based e-Health Solutions to the patients. ICT industry mainly focuses on the easy access of remote health services such as medication reminder, health monitoring and health coaching at home. It also helps in independent living style for a patient like senior citizen, managing and accessing health services in a specific condition from home via Health TV. "Smart-o-meter" is another IoT based technological device that provides Web-based patient-centred decision support system for BP control using an iterative, user-centred design process so that it meets standards of feasibility and acceptability for patient navigators and participants. With reference to survey conducted in Pune (India), people still prefer and trust old traditional medication methods. People with high income prefer technology based solutions and readily up for new innovation and most of them are not even aware about e-Health based solutions.

The Internet has become medium for survival, which provides the medium for interaction and bonding collaboration among various institutions, health service providers, health care professionals and the public who are the user base. Two key items are important– health and technology. Various response from our survey shows that internet of things is emerging as a solution enabler in health sector. IoT based e-Health monitoring method will help in reducing number of visit to a doctor & even doctor can monitor his or her patient from anywhere. As this is technology not so feasible now but in coming years this technology and use of the Internet will meet the physical world definitely. The e–Health solutions provided through IoT devices are more accurate and accountable in the emerging IoT business landscape, which offers and provides various opportunities and challenges to an industry.

2. Business Model – Concept and Form

Business model or canvas is a well-organized and planned structure to represent the assumptions about the performance and availability of various key resources &key activities of value chain [4], along with this it also shows the value proposition [5], customer relationships management, channels required in value chain, customer segments to be served, cost & pricing structures and revenue streams [6, 7]. In other words, it is the representation of how an organization makes money &profit. This can be described through nine building blocks illustrated below:
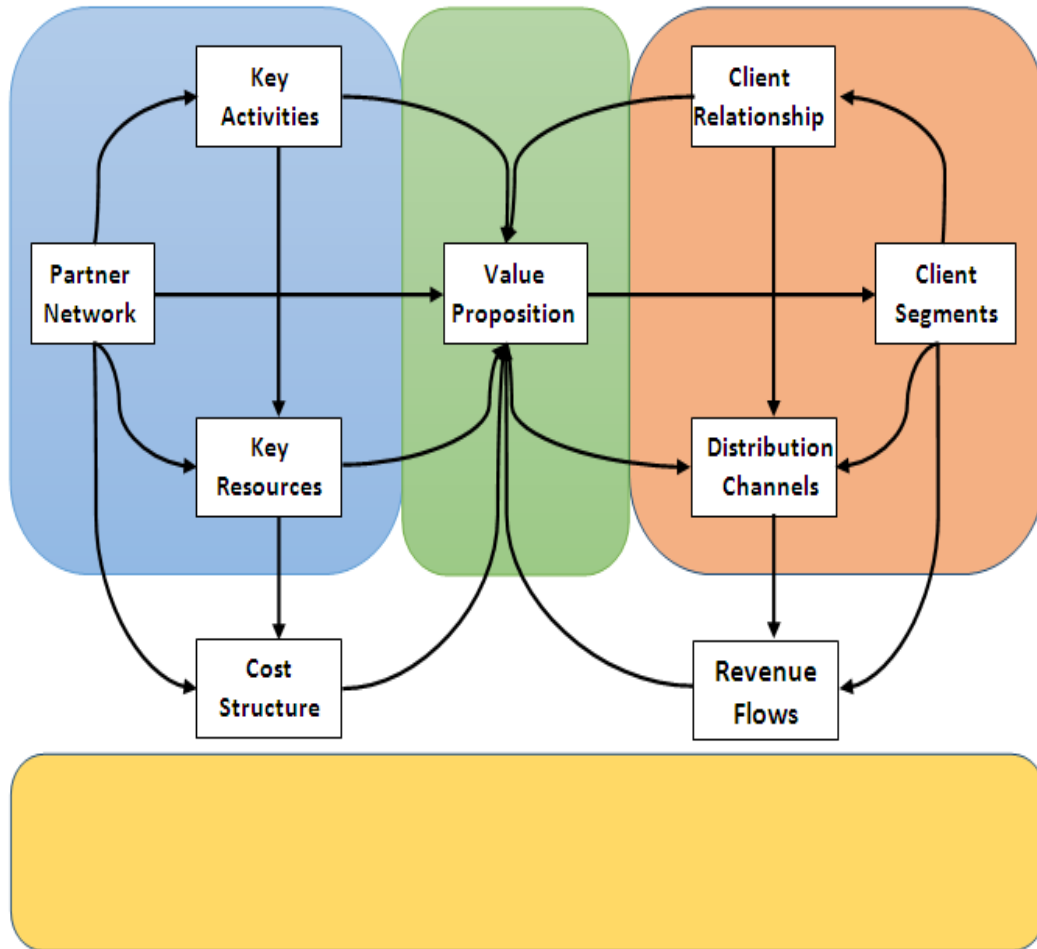
Figure 1. Detailed Flow in Business Model Canvas

1) The value proposition for business model means what exactly the services or products you are serving in a market
2) Through value proposition various segment of clients are addressed
3) The proper distribution as well communication channels are adopted so as to increase the reach of our services to the clients
4) Customer relationship is made & maintained thereafter
5) In order to make business model more feasible, key resources as per planning are required
6) For proper implementation of business model, key activities are needed
7) In this business Model, the participation of vendors and key partners as well as their motivation is required.

2.1 Key Elements of this Proposed Business Model for IoT Based Service:

The main aim is to add value to the firm and thus a detailed planned business model is created for any firm. Basically, it consists of four key broad areas:

I. Enterprise overall identity – This includes the elements such as mission, vision, reputation of the firm which in turn are the key differentiator for an organization in the market.

II. Implementation (Strategy) for the enterprise – This category could describe how an organization's action should be a translation of its mission and vision. A vital component of this role is the ability to act as per the coordination between multiple business units, each of them needs to play a unique and particular role to meet planned

& common strategic goals. Strategy may also include elements like planned goals, an agreed time frame for achieving those goals, the resources that are required and custom performance indicators.

III. Assets for the success of a firm – This will include all the internal assets that an organization might use for the inclusion in their strategy. This might also be the physical assets that are properties and intellectual properties like work culture, organizational structure and work force and so on.

IV. Environment to which organization caters and competes – This include all the stakeholders' including demographics situation for customer as well as industry and the marketplace; customers and partners, potential threats as a new entrants; legal and information about compliance, the external availability of resources like technology resources, and all other emerging trends that may or will influence position of the company in the market. [8]

3. Different Types of Business Model in Health Sector

Healthcare sector is not only about affordability, access & quality but also about financial & social aspects. Below are the six different Business Models for Transforming Health systems so as to provide the complete intended value to the patients and all others associated with them which are ultimately focused at the centre.

3.1 Business Models for e-Health Final Report [9]

• Customer Segment– This signifies that whether E-health products or services are providing any value to its customers.
• Value Proposition -The offerings of e-health services to the market.
• Distribution Channels –The distribution as well as communication channels through which these services are communicated to the end users
• Customer Relationship – This says what kind of customer relationships are developed as well as maintained as per the business model.
• Revenue Stream –Revenue streams are generated by e-Health services
• Core Capabilities – The core capabilities provided by e-Health services
• Value Configuration and value offerings –the key activities involved in developing and building capabilities into a successful value proposition which was planned and forecasted.
• Network of Partner and vendors – the partners who are going to work with in e-Health process.
• Cost Structure –the costs including variable and fixed cost, involved in providing the e-Health service [10]

On the basis of analysing these above parameters, it then, provides the sustainability of an e-Health system. These are given below:
✓ The benefits are there for stakeholders in e-health
✓ The factors responsible for making e-Health offerings sustainable
✓ The parameter in business model that provides the cause of sustainability of a service [11]

The following are the five elements that gives overall identification as well as comparison of business model. Along with this, it also maps the performance for each system in e-Health.

I. Overview of the situation : In this main focus is on identification of socio-economic & operational drivers
II. Value chain: the main aim is to map all the partners (that are relevant) and stakeholders
III. Analysis of Business Model: it examines the business model evolution with respect to the case study

IV. Analysis of Impact

V. Identification of best practice

Osterwalder 41 suggested a business model that focuses on both financial and non-financial elements in Business model. Mainly four main areas are looked upon:

    a. Financial performance;

    b. Offer

    c. Client

    d. Resources [12]

The components of the business model are as follow:

1) Key activities
2) Value proposition
3) Client Relationships
4) Client segments
5) Key resources
6) Partner network
7) Cost structure
8) Distribution channels
9) Financial performance
10) Revenue streams Source
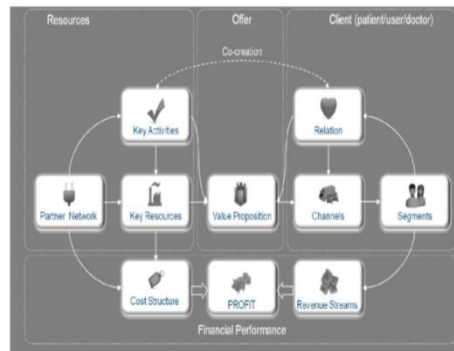
Each building block interacted among

each other, and analysis of this gives a better understanding [13].

3.2. Osterwalder and Pigneur, defines four components of a business model that is :

a) customer management
b) product innovation
c) financial aspects
d) infrastructure management [14, 15]

Apart from this, there are also following components:

• Technology (consists of service platforms, technical architecture, devices, applications)

• Organization (consisting of actors, strategies and goals, roles assigned, interactions, value chain activities)

• Service (consists of chain of vlaues from intended value - delivered value - expected value - perceived value)

• Finance (consisting of investment sources, revenue sources, cost sources, risk sources and pricing) [16]

Architecture of the Framework shown below can be used for analyzing the e-health projects [17].
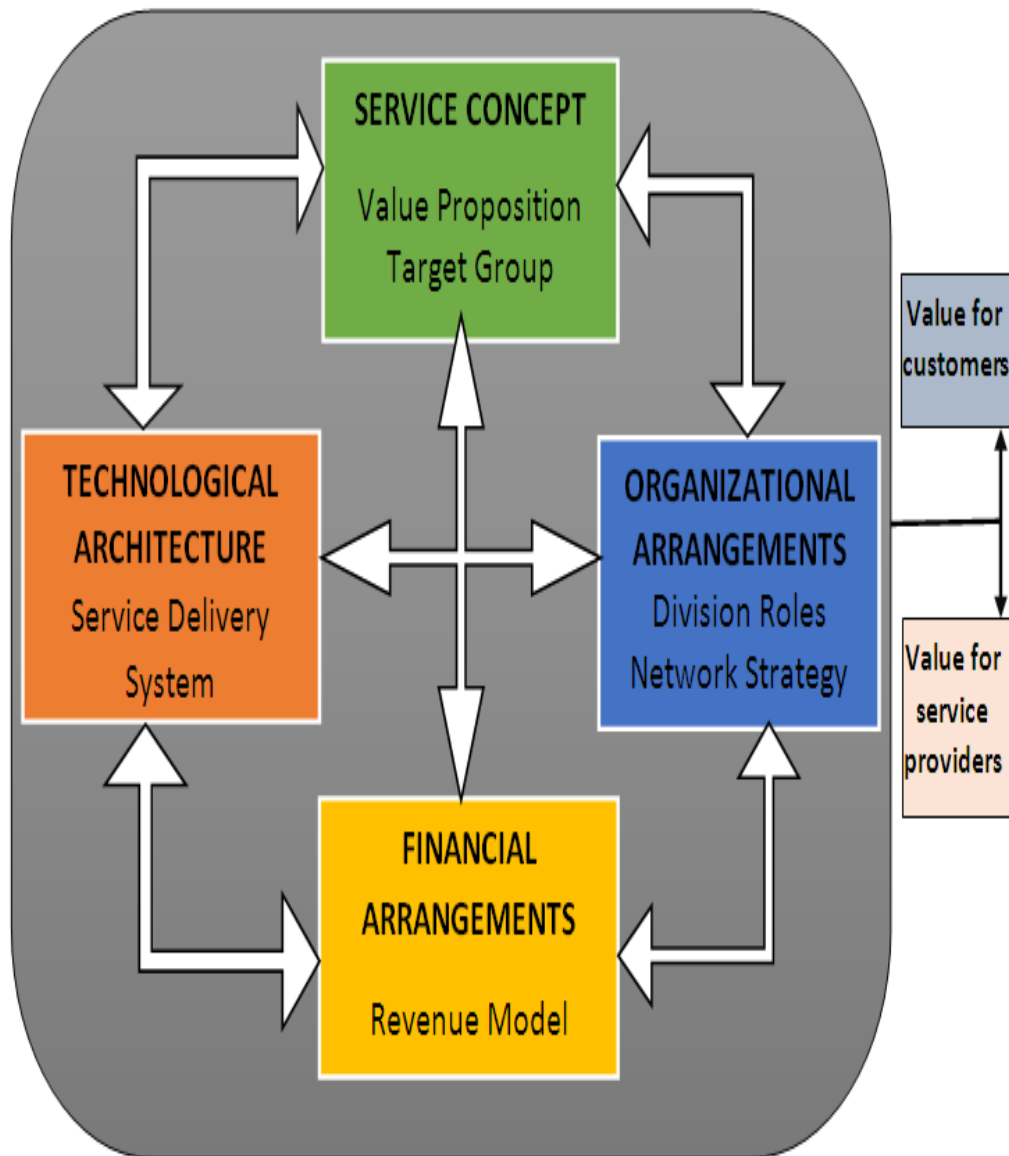
Figure 2. Framework

3.3. Apart from these Two, there are Six More Business Model for Health Care Systems:

I. ChangamkaMicrohealth in Western Kenya -Scaling Proven Mobile Maternal Health E-Vouchers:

It is a social organization which aims to increase the accessibility of maternal health care services. This organization is partnered with Kenya Ministry of Health. Basically, mobile phones are used as a tool which is "at centre of every common person living in Kenya". The organization founded by Samuel Agutu aims at delivering health care financing services to the people outside the Kenyana Health-Care system. This is an estimation of approximately 90% of the population.This project also delivers various e-vouchers so as to provide support to those expectant mothers who have low income, so that they receive care & micro-insurance product. This allows to accumulate savings to cover the cost of healthcare facilities by mobile phone user.

II. Registries for ALL: Reg4ALL – Genetic Alliance

Ashok Fellow Sharon Terry has Founded Genetic Alliance. It is one of the world's first that is controlled by the participant, health registry for cross disease. It provides the power or rights to consumers to make decision about how, and with whom, to share their information regarding to health. This solution is applicable from the trials in clinics to get the authorized registries & further to electronic data exchange which are as per as the mentioned guidelines.

III. Improving Access to Oral Healthcare - Sarrell Dental & Eye Centres

Sarrell dental is heading towards to provide quality of dental as well as eye care facilities to children in the unserved communities. It is a non-profit organization, while providing these services it minimizes the cost to Medicaid.There are 14 brick and mortar health care centres. Apart from these centres, a mobile dental bus service is provided to serve rural people in Albama. Since 2004, Sarrell has served, approximately 4,00,000 patients without any complaint.

IV. A WaterFirst health model - Healthpoint Services India Pvt. Ltd

The main aim for establishing Health point services is to provide all necessary required person, equipment and Medicare facilities to the people who are in need through a dual way telemedicine services. These services are designed in such a way that they scalable & sustainable to provide preventive health care for various aspects for just Rs. 99.78 per month per household.This social organization provides affordable health care service to 300 households daily with 140 active water centre. Health point services heading to expand their reach in next two years by serving more than three million Indians by building 20 units of active water centre every month.

V. Health "Kiosks" for Kenya Slums – Access Afya

Access Afya is US based, co-founded by CEO Melissa Menke and Director Duncan Goldie-Scot. The main purpose of this organization is to build a high tech network for providing paperless health centres in Kenya's Slums.In this organization, there are registered nurses who create & update medical record for every patient electronically. Patient care process and procedure along with medication instructions are sent via SMS. Along with this, health practitioners counsel patients on comprehensive wellness & offering products like water purifiers and clean cook stove.

VI. MeraDoctor – MeraDoctor

This service is all about unlimited medical consultancy from the advisory team in touch from licensed MMBS doctors. This is basically for low income families across India. This service is been offered by telephone & accessible 24*7 throughout a year. The MeraDoctor Membership requires very less cost.In this, the doctors are trained accordingly to ask callers about their problems, understand symptoms & suggest measures accordingly.Till now, MeraDoctor general physicians and doctors have addressed approximately 400 ailments on phone.In case, if any call is missed by MeraDoctor then the representative will do the registration and transfer to the doctor as soon as possible. For better customer experience REFUND facility is also there for unsatisfied customers[18].

4. IoT Based Business Model For Indian Market

4.1. IoT in India

Category: Smart Services or Smart Support
One of the major players in technology brand i.e. Apple has come up with the case why Smart Business model are not developing in the Indian Market. Apple gives a model for creating Smart System Solution for the global market that will integrate with others technologies. Along with this, it also provides solution to attract buyers.
In B2B context, the notion about M2M application has risen up to a great extent. The models based on this focuses on customer support & automation particularly, expect Smart Services value beyond support. These two classes of business models resemble to each other in the marketplace. It is quite evident that consumer Smart Business model provides an overview of cloistered equipment manufactures in B2B area. This brings out the recognition of B2B area in a large scale collaboration & social networking.

4.2 Opportunities

Smart System opportunities gives an overview about new products and services in manner in which business is to be performed. For developing these smart systems, the organizations itself need to know new ways as well as designs, tools and methods.
For this, the consumer can be asked following questions:

I.   In which activities does the consumer engage in, to own, use, procure & dispose of the product or services? (this gives the Life Cycle opportunities)
II. While doing these activities, the consumer is involved in what other activities? (this gives the Adjacency Opportunities)
III. Is there any other participant who interacts with the equipment beyond the primary vendor and immediate operator of the equipment? (this gives the Collaboration Opportunities)

4.3. Solo Opportunities

In a solo opportunity, a single product is the dominant gateway to the opportunity. Based on scope of activities that makes the economic value, three business models are differentiated and described below:

- Embedded Innovator
- Systems Professional
- Solutions Provider

In Indian market, the IOT still didn't have full grown eco system where any single business model can be implemented. The government bodies and concerned officials are yet to declare standards for the players to come up in the market. However, the companies will have a first mover advantages if they take risk and enter into Indian market[19].

4.4. Business Model for Smart E-Health devices

The commonality is that the supplier is the dominant player in the activity/delivery chain in all three of these models -- whether it's a single device (a sensor embedded in a running shoe), or a family of devices (Apple Devices). The Business model is driven as a solo opportunity in each case. The detailed System Professional Business Model for IoT in E-Health Sector is described below.
System professional model enhances services automation to serve diverse functional needs across group of related products. It also feeds device intelligence from field to support for efficiency, provides preventive maintenance, replenishment via remote monitoring & diagnostics of networked product. In our case, it will be suitable for variety

of services in "Health TV", "Smart Infusion pump" and "Smart-o-meter". The aim is to provide smart services in the health sector.

I.   <u>Own Product Performance Data:</u> Initially, detect the performance issues to prevent its impact on your users. The Performancegives a detailed view of its underlying solutions and maximizes the productivity. Look carefully the performance of existing services and applications. Correct those issues that could affect system performance before users are impacted. Check its negligible impact on system performance and collect its data. Different platform must support this business model and works seamlessly across a wide range of operating systems and platforms.

II. <u>Manage installed system User Experience</u>: Here check, coordinate and performs end user inputs in a timely manner to meet evolving user needs. Proactive support and delivery services must be provided with utmost professionalism and in a timely manner. For example: Keep a record or track of the number of appointments to the doctors registered by Health TV users. Out of which, how many are successfully registered and how many successful records of the administration are done by Smart Infusion Pump.

III. <u>Manage value Chain Interactions and data:</u> The business model and canvas needs to map and monitor all the value chain relationships, key supporting & performance activities and dependencies that are affected by the introduction of an E-Health service. Analysis ofE-Health financing decisions was opened by IoT enabled E-Health products. Taking into account this step, the overall 'healthcare value chain' and the other participants are involved. The focus should represent all relevant partners, stakeholders involved as well as their interactions.

IV. <u>Manage System/User Experience and delivery chain relationships:</u> E-Health services should be such that it should combine the best proof from human-computer interaction, human factors engineering, psychology, and usability so as to create transformative improvements in the quality of care. Safety as a system property is taken into consideration for E-Health across levels of users and across the value chain.

V.   <u>Multi User Interactions and cooperative Development and management:</u> ICT has pushed communication and interaction as a centre to e-health and multi-agent systems are promoted as ideal candidates for support to next-generation e-health applications and services and also the product in the portfolio. The main agenda is to confirm that the person retrieving or generating information can interact without any obstruction or any adaptation of the normal workflow or style of working. Further processing consists of making diagnoses, detecting trends and react on it. The System Professional model also comprises feedback devices that are able to interact with the user as well as with professional services.
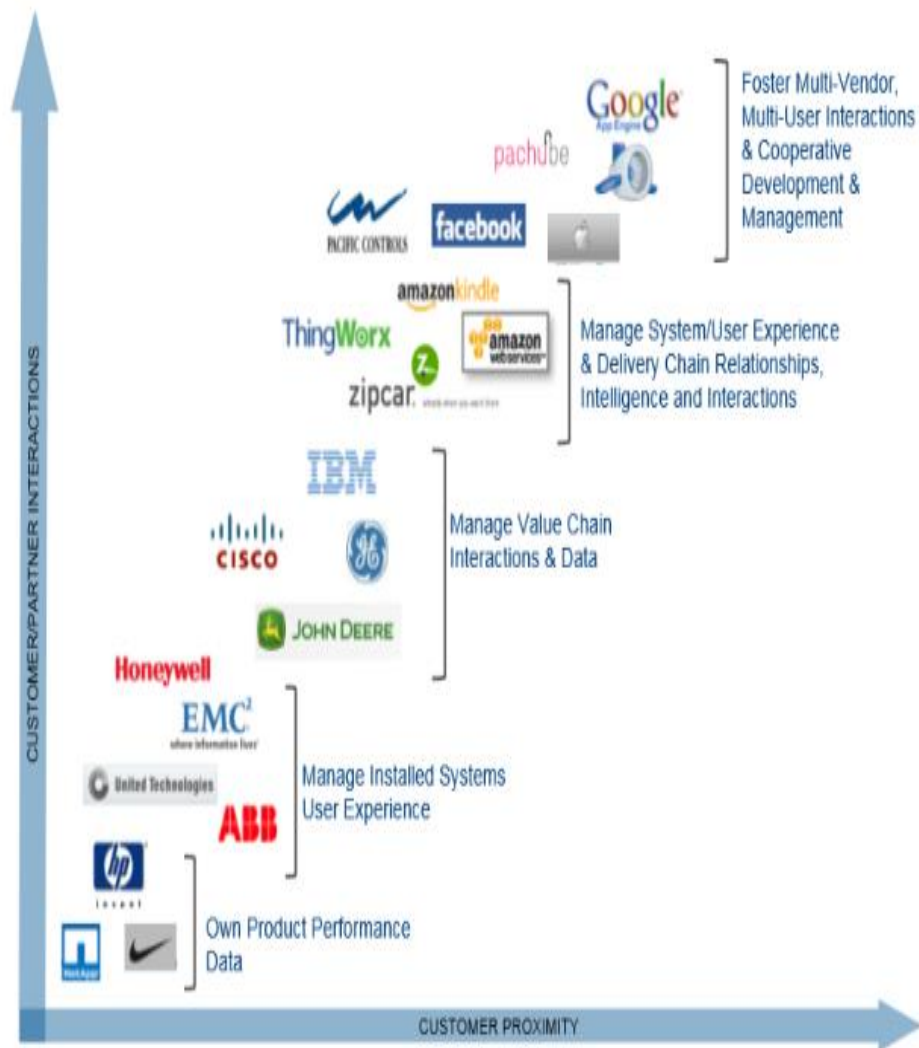
Figure 3

5. Business Model For IoT Based Product And Services

The key elements for business model in context with Indian market are:
- ✓ Key Partners
- ✓ Key Resources
- ✓ Customer Segment
- ✓ Cost Structure
- ✓ Revenue streams
- ✓ Key Activities
- ✓ Customer Relationship
- ✓ Channels

5.1 Key Partners

In Indian market every product or services need a value chain. In India, with the evolution of Internet of things is still not standardized. Thus to launch a successful product or service enterprise/start up needs lot of factors to be considered.

Smart Monitor, Smart TV, Smart Infusion pumps all three requires a cluster of key partners.
Advantages:
a) Overcome the issue of government regulatory policies
b) Safeguard the product or service launch
c) Improve the performance

5.2. Key Activities & Resources

Key activities involve the hardware and software integration for the Internet of things enabled devices. In Indian market the major issue for roll out of IoT devices is the lack of customer faith in the technology (as per the survey conducted in Pune 2015).

The other important activity is the installation of connectivity kit and performance of the kit under various network issue and maintenance issue as well.
Advantages:
a) Enhanced smart monitoring
b) Effective Infusion as per the criticality
c) Error free data transmission and report generation

5.3 Customer Segment

Indian market a niche group of customer is ready to adapt the technology involved in IoT based product or services. Thus the customer segmentation can be done in following ways:
a) Demographic
b) Niche
c) Multi sided platform
This segmentation will enable the service provider to cater the specific demand and the need of the customer. Also this will enable the provider an option to cater the customer effectively creates value for them.

5.4 Customer Relationships

This segment plays vital role in the area of customer retention and customer engagement. In Indian context the vital key point is customer satisfaction which directly affects the use and promotion of any product or services.
The processes that should be involved are:
a) Customer grievance cell
b) Automated services
c) Dedicated personal assistance

5.5. Revenue Streams & Cost Structures

In India the product and services are highly cost sensitive, and the pricing need to be accurate as per the demand and the customer purchasing power.
Few initiatives to be included:
a) Different pricing strategy for different segment of users
b) Subsidiary for the rural market user
c) Tie Up with the government bodies
d) B2B segment tie ups with the leading medical centres and hospitals

5.6. Channel

The supply chain and various distribution channels are used effectively in India, but a health care device needs separate unique distribution.
Some of the suggested initiatives:

a) One to One selling with customer interaction
b) Customised supply based on the segmentation and customer base
c) Customer interaction programme with institutional activities and mall intercept concept
d) Purchase option should be followed by online as well as offline payment mode.

Thus, Smart Monitor, Smart TV, Smart Infusion pumps the above parameters should be taken care of for successful business launch in Indian Market.
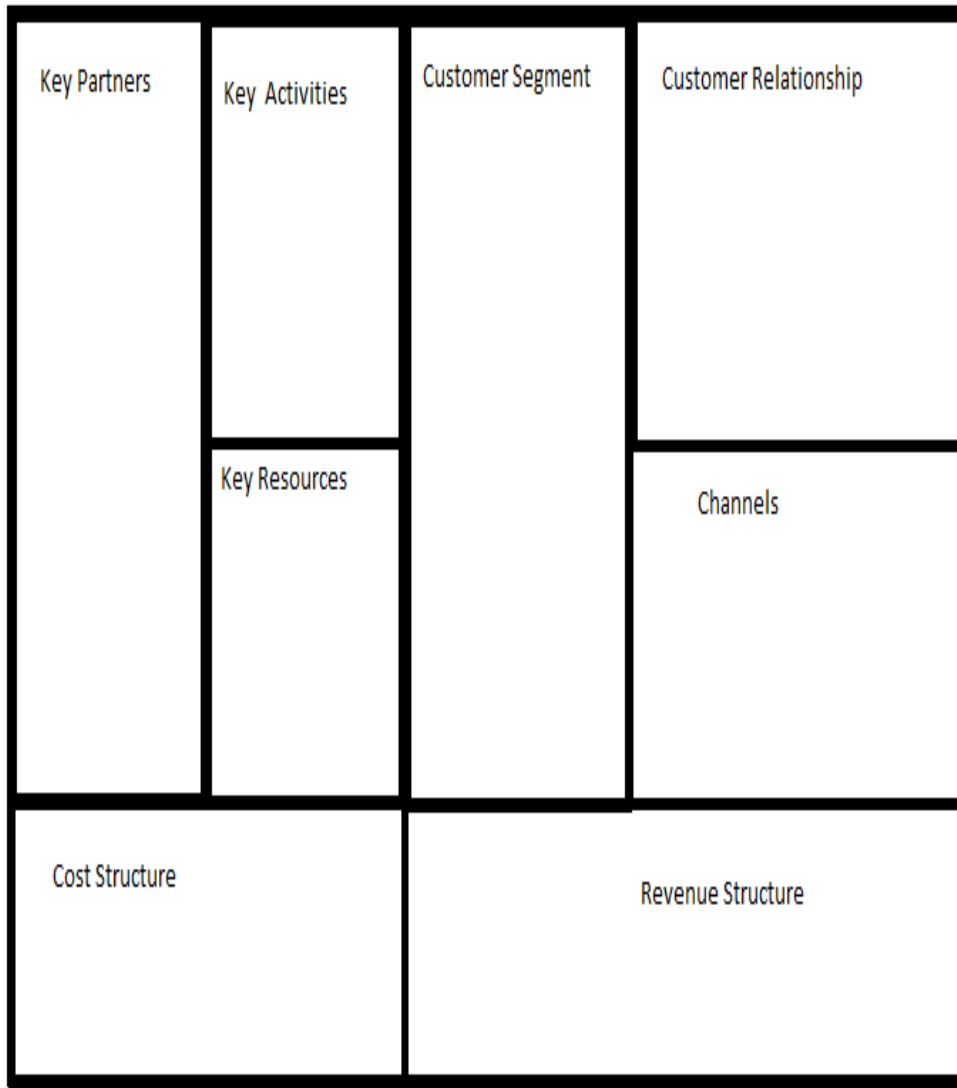
Key Partners	Key Activities	Customer Segment	Customer Relationship
	Key Resources		Channels
Cost Structure		Revenue Structure	

Figure 4

6. Conclusion

Business Model Canvas for E-health Products based on IOT

Key Partners	Key Activities	Value Propositions	Customer Relationship	Customer Segments
1. Well Knowned private hospitals 2. Suppliers of physical assets like sensors, computers. 3. Govt. Hospitals like JJ hospital	1. Mobile application creation 2. Sensing devices to maintain record without any manual intervention. 3. Automated solution in terms of software as well as hardware **Key Resources** 1. Physical resources like Sensors, Database, DB connection, App. 2. HR for maintenance purpose 3. A strong supply chain	1. Efficiency- Improve the health care efficiency enhanced communication possibilities between health care establishments and by involvement of patient. 2. Enhanced healthcare quality 3. Empowerment of consumers and patients - E-health has opened the new doors for patient centered medicine, personal electronic records accessible to consumers. 4. Extending the health care scope beyond its conventional boundaries 5. Equity – E-health can be accessible in both urban and rural population. 6. Enabling the exchange of information as well as communication between health care establishments in a standardized way.	1. Professional Customised Service. 2. On call Support to provide extra care for customers. 3. Domestic user of e-health product will be best suited with dedicated personal assistance 4. Free home delivery option **Channels** 1. E-Media Campaign (social media platform, TV advertisement) 2. Advertise nearby hospitals with smart health solutions 3. Digital Advertisements particularly in health care websites 4. Customer Engagement Programmes (Mall Intercept activities, Product demo and feedback session in leading medical institutes as well as B-School) 5. Word of mouth,news, magzines	1. Technology users, 2. Hospitals 3. Medical Stores 4. Health centers 5. Old Age House 6. E-Commerce Website Users 7. People suffering from various health issues **USERS** 1. General Public 2. Patients **EARLY ADOPTERS** 1. Big Hospitals 2. People having higher income 3. Frequent/ Regular visitors to the clinic

Cost Structure	Revenue Sharing
1. **Fixed Cost-** Wireless sensors, computers, Database, IOT Platform, Wires/Connections 2. **Variable Cost-** HR + App, Legal, Wages, Logistics.	1. Installation Charges 2. Maintenance charges(providing first 3 services free for manufacturing defects) 3. Tie up with Medicals (Lending/Renting/Leasing)

References

[1] F. Xia, L. T. Yang, L. Wang and V. Alexey, "Internet of Things", Wiley Online Library, vol. 25, no. 3, **(2012)**.

[2] P. L. Trbovich, S. Pinkney, J. Cafazzo and A. C. Easty, "The impact of traditional and smart pump infusion technology on nurse medication administration performance in a simulated inpatient unit", BMJ, vol. 6, **(2009)**.

[3] Z. Fan, R. J. Haines and P. Kulkarni, "M2M Communications for E-Health and Smart Grid", An Industry and Standard Prespective, vol. 7.

[4] G. Gereffi and S. Frederick, "The Global Apparel Value Chain Trade and The crisis", Policy Research Working Paper, vol. 5281, **(2010)**.

[5] H. Agndal, B. Borgström and V. Pereseina, (n.d.) "From product through service and solution to performance", Value propositions, interaction patterns and capabilities, **(2013)**.

[6] http://businessmodelalchemist.com/blog/2005/11/what-is-business-model.html.

[7] https://hbr.org/2015/01/what-is-a-business-model.

[8] http://www.fastcompany.com/3013968/leadership-now/do-you-really-understand-what-your-business-model-is.

[9] J. Gordijn, "What's in an Electronic Business Model? Paper presented at Knowledge Engineering and Knowledge Management: Methods, Models, and Tools", 12th International Conference, (2000), available at: http://www.cs.vu.nl/~hans/publications/EKAW2000.pdf(visited March 15, 2009); see also Gordijn, J. *et al.,* 'Business modelling is not process modelling', in Conceptual modelling for e-business and the web (ECOMO- 2000), Springer-Verlag, LNCS 1921, Salt Lake City, UT, **(2000)** October 9–12, pp. 40–51.

[10] J. Hook, *et al.,* "Using barcode medication administration to improve quality and safety: findings from the AHRQ Health IT portfolio", AHRQ publication no. 09-0023-EF, **(2008)** December.

[11] "European Commission, 'Lead Market Initiative: accelerating the development of the eHealth marketing Europe – Lead Market Initiative", **(2007)**, available at: http://ec.europa.eu/information_society/activities/health/docs/publications/lmi-report-final-2007dec.pdf.

[12] A. Osterwalder, "The business model ontology: a proposition in a design science approach", PhD thesis, University of Lausanne, **(2004)**.

[13] "Adapted from Osterwalder, A. 'Business model generation", Available at: http://www.businessmodel generation.com, visited, **(2009)** June 30.

[14] "An interesting approach in this context is Buccoliero, L. 'A methodological and operative framework for the evaluation of an eHealth project", International Journal of Health Planning and Management, vol. 23, **(2007)** May 4, pp. 3–20. (published online)

[15] B. Kijl, H. Bouwman, T. Haaker and E. Faber, "Developing a dynamic business model framework for emerging mobile services", ITS 16th European Regional Conference, Porto, Portugal, **(2005)**.

[16] A. Osterwalder and Y. Pigneur, "An e-business model ontology for modeling e-business", 15th Bled Electronic Commerce Conference, Bled, Slovenia, **(2002)**, pp. 17–19.

[17] A. G. Pateli and G. M. Giaglis, "A research framework for analysing eBusiness models", European Journal of Information Systems, vol. 13, **(2004)**, pp. 302-314.

[18] http://www.forbes.com/sites/ashoka/2013/06/07/6-business-models-that-are-transforming-health-systems-around-the-world/.

[19] http://harborresearch.com/wpcontent/uploads/2013/08/HRI_White-Paper_Smart-Business-Models-Paper.pdf.

Authors

Yatin Jog, is a faculty at Symbiosis Institute of Telecom Management, Pune and teaches IT, Telecom, Statistics and Networking subjects. He has obtained his MSc degree in Computer Science from Ahmednagar College (2003-2005) and MCM from Wadia College (2001-2003). His certifications include Business Process Framework (eTOM) Level 2, ITIL Foundation V3, ISO 27001 Lead Auditor and ISO 22301 Implementer.

Apurva Sharma, is currently pursuing MBA in Telecom Management with specialization in Systems and Finance from Symbiosis Institute of Telecom Management, Pune. She has completed her BE in Electronics and Communication from Rajiv Gandhi Technical University, Bhopal. Her area of interests includes Tele-Communication, Wireless Technologies and Marketing. She is IBM SPSS &COGNOS, Information Storage Management certified.

Kalyani Satish Mhatre, has completed her B.E. Electronics and Telecommunication from Mumbai University in 2011. She is currently pursuing MBA (Systems and Finance) from Symbiosis Institute of Telecom Management, Pune. Prior to this, she has 33 months (2011-2014) of Work Experience in Infosys Limited (Senior Systems Engineer) in Financial Services Application Development and Maintenance department. Her research paper abstract was published in India's biggest M2M + IoT forum 2015. Her certifications include ITIL V3 Foundation, BCMS Implementation ISO 22301:2012, Revenue Assurance (tmforum).

Anand Abhishek, B-Tech (Instrumentation and Control Engineering) is a techno manager pursuing MBA (Marketing and Finance) from SITM (Symbiosis Institute of Telecom Management), Pune. His experience in the field of projects of N.C.E.R.T and DRDO provides edge in his work for IOT – Internet of Things. He also had exposures of interacting and showing talent in the international summit like India M2M + IoT Forum, Indian Science Congress and J.N.S.S.C. He is a member of IEEE forum and certified professional by EMC, B.C.M.S and ITIL.