

Report

UK-India joint workshop on “Affordable medical diagnostics and devices: From ideation to commercialization”

13 February 2015

Organized by:



Supported by:



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<https://www.gov.uk/government/priority/collaborating-with-india-on-science-and-innovation>

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A UK-India joint workshop on “Affordable medical diagnostics and devices: From ideation to commercialization” was organized at Venture Center Pune on Friday, 13th February 2015 via the joint efforts of UK Science and Innovation Network, Venture Center and Bioincubator at Venture Center. This workshop was additionally supported by British High Commission; Association of British Scholars, India, DBT-BIRAC and the Social Innovation Immersion Programme at Venture Center.

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Key lessons from the workshop

Session 1: Affordable Devices and Diagnostics – UK Trends

1. Affordability does not necessarily mean low-cost, but it means accessible, early and effective diagnostics which will eventually reduce treatment and therapeutic costs.
2. Need to develop devices which are user-friendly and can be used with minimum training. Hence need to develop devices with collaboration with medical fraternity.
3. Need to develop Point-of-Care diagnostics, because in India patients do not attend referrals due to various reasons.
4. Need to develop preventive diagnostics to reduce overall costs.

Session 2: Affordable Devices and Diagnostics- Emerging Needs in India.

1. Need to prioritize health problems while developing solutions.
2. Need to understand the increase in health care cost structure due to medical tourism.
3. Need to locally manufacture most low to high technology medical devices and consumables.

Session 3: Stories of tech developments and commercializations in diagnostics and devices.

1. Need for regulatory framework to be in place for medical devices sold in India.
2. Need to involve all stakeholders while designing medical devices from the early stage of prototype development so as to suit the needs of the clinicians with regards to medical devices.
3. Need to focus on customer needs and align to market pull.
4. Need for producing world class affordable products, bearing in mind that affordability does not necessarily impose an excessively low price point.

Session 4: Collaborative technology development and taking ideas to market - Experiences and opportunities

1. Several funding opportunities are available from the Indian and UK governments for the Bio-med-tech based innovations.
2. Need to find the right markets for sustainable product developments.
3. Need to link academic research with industry so that innovative ideas can be converted into market products.

Detailed record of the workshop

A UK-India joint workshop on “Affordable medical diagnostics and devices: From ideation to commercialization” was organized at Venture Center on 13th February 2015 with the objective of understanding various aspects of technology commercialization for medical devices. The workshop also aimed to explore potential industry, research and medical fraternity partnerships towards technology development and evolution.

Opening Session

An opening session provided a brief introduction to Venture Center and the Bio-incubator at Venture Center and the UK Science and Innovation Network. This was followed with an introductory note by Dr Sourav Pal (Director, National Chemical Laboratory) which outlined the importance of frugal innovations in Indian context and the importance of designing easy, reliable and non-invasive diagnostics. Dr Sourav Pal called upon entrepreneurs to understand the regulatory framework involved in reaching the market and increase the fraction of ideas which get commercialized to sustainable products.

After the opening session, a brief background of the workshop was provided by Dr Mugdha Lele which outlined the mission, objectives and agenda for the day long workshop.

Session 1: Affordable Devices and Diagnostics – UK Trends

The first session on Affordable devices and diagnostics : UK trends, was chaired by Dr Ramesh Paranjpe. As an opening remark, Dr Paranjpe briefly spoke of the need of technology innovations in field of medicine and healthcare and talked about huge expectations of the market such as TB diagnosis test for INR 2 to 5/-. Ms Sue Dunkerton gave a brief on the UK landscape and a broader overview of the Knowledge Transfer Network (KTN). The life sciences sector in UK is worth 52 billion Euros and is fast growing in terms of funding and manpower resources. The emerging trends or hot research areas in life sciences from the UK perspective include affordable medicine, personalized medicine, targeted treatments, minimally invasive surgeries, regenerative technologies, intuitive and safe devices and digital health management. There is also a major focus on rapid and point-of-care diagnostics for diseases such as TB, COPDs, sepsis and antimicrobial resistance. Currently KTN is bringing along people from

interdisciplinary sciences and working across sectors to provide know-how, multi-stage fundings and to increase entrepreneurial spirit. Strength of the KTN group lies in Chemistry, Materials Sciences and Biotechnology.

Dr Himangi Bhardwaj then spoke on some of the available funding opportunities and initiatives in the healthcare sector by the UK government, which included:

- The Invent program: This is ongoing throughout the year
- Newton-Bhabha fund: Primarily focuses on individuals, research entities and foundations. Joint UK-India research calls that were launched under this funding programme included Maternal and Child Health, Mental Healthcare and substance abuse, Affordable Healthcare and Antimicrobial resistance.
- Industrial Research and Development fund: This funding is provided in partnership with GITA and Innovate UK with a major focus on affordable healthcare.
- Affordable Healthcare Axis-Wellcome Trust:
- Longitudinal Prize: The longitudinal Prize focuses currently on antimicrobial resistance research.

Apart from these the UK government is also exploring possibilities of collaborations with the Indian Ministry of Health to fund several exchange programs for researchers and doctorates.

(Details of funding programs are as in the given link: <https://www.h2020uk.org/funding-calls>)

The session moved further to other aspects of the technology landscape such as collaborations in eHealth, obstacles in scientific developments and potential areas for research and development. Dr Mario Giardini briefed about his projects and collaborations in smart phone-based ophthalmic screening solutions developed for low-income countries and inaccessible regions. He also discussed about the Portable Eye Examination Kit (PEEK) which is currently in use in areas of Africa, India and Antarctica, giving his perspective on the factors determining the rapid expansion and adoption of Peek technology – mainly, involvement of medical, research policymaker liaison and knowledge exchange stakeholders in the core project steering team.

Dr Richard Black further discussed on his work on biomedical materials, their processing technologies, development of scaffolds and surface treatments of these materials. He cited that the major obstacles in development of biomedical materials lie in sourcing of these materials along with the required cells and antibodies (from the perspective of ethical considerations) and

understanding surface topographies, bio-reactive technologies and the complete mechanism of interactions between biomaterials and living cells. The major focus of Dr Black's group lies in rapid fabrication of biomed materials and gel-based systems for better drug delivery.

Dr Bachmann focused on concepts of personalized medicine and stratified medicine and highlighted that most areas in healthcare need to mimic and build upon the developments in oncology for providing better solutions.

The panel discussion on UK landscape relating to medical technology innovations started with the fact that in India, as opposed to UK, the problem definitions in large-scale diagnostics transform, based on availability of products, level of awareness, access to infrastructure (such as electricity and manpower). A key to tackling this problem would be to co-create solutions along with medical practitioners and health workers at the ground level. The medical devices to be developed must incorporate ease-of-use and should be accessible to most through minimal training. Along with co-creation, it is also important to horizontally deploy the proposed solutions in other sectors such as animal husbandry and agricultural technologies.

Another issue in developing a robust healthcare landscape lies in gaining the trust and feedback of patients where around half of patients don't return for results after undergoing any tests. This makes patient monitoring and adherence to drugs and therapy a major issue in healthcare market. The panelists discussed and debated on the definition of affordability, deployment of existing solutions to rural environments and sustainable technology models. Also, there was a unanimous agreement that affordable doesn't necessarily mean low-cost and a target price must be given and roadmaps should be derived wherever necessary. Affordability can be brought in healthcare by early and effective diagnostic techniques which help lower the cost of treatment and drugs.

Key lessons:

1. Affordability does not necessarily mean low-cost, but it means accessible, early and effective diagnostics which will eventually reduce treatment and therapeutic costs.
2. Need to develop devices which are user-friendly and can be used with minimum training. Hence need to develop devices with collaboration with medical fraternity.
3. Need to develop Point-of-Care diagnostics, because in India patients do not attend referrals due to various reasons.

4. Need to develop preventive diagnostics to reduce overall costs

Session 2: Affordable Devices and Diagnostics- Emerging Needs in India.

The second session on Affordable devices and diagnostics – emerging needs in India was chaired by Ms Sue Dunkerton and Dr Ramesh Paranjpe. This session focused on needs and priorities for medical technology in India. The panel constituted of veteran medical practitioners, biochemists and biotechnologists and also new-age entrepreneurs working in the field of affordable healthcare. Dr Nikhil Phadke (Founder, GenePathDx) explained the challenges with design and manufacturing of microfluidic kits and elaborated upon modular and low risk strategy of his enterprise. Presently, GenePathDx focuses on molecular diagnostics and aims to monetize each step in molecular diagnostics rather than manufacturing of complete kits. Also, he emphasized that there is a need to design mix and match of costly and cheaper technologies and offer such diagnostics using the cross-subsidization model. Dr Prasad Rajhans, intensivist at Deenanath Mangeshkar Hospital and Research Center elaborated on the urgent need to locally manufacture a number of low to high technology medical devices and consumables ranging from CPR mannequins to MRIs. The panel also discussed about the need of investment and innovations in technologies which are peripheral to healthcare, such as water & sanitation and immunization processes. It was agreed that India as a country still needs to collate a huge amount of medical data on Indian demographics, especially in the field of non-communicable diseases (NCDs).

The panel further discussed issues around medical tourism. Medical tourism has been a buzzword in the Indian healthcare market since a long time. People from neighboring regions have been visiting India for low-cost and affordable medical procedures. Market analysis of medical tourism does pose India as a favorable location. However, there is a difference in opinion on whether the diagnostic and medical device industries see a sudden growth in demand due to medical tourism. Though, a uniform opinion on this matter couldn't be reached, it was agreed that coming years will see more competitors in the healthcare industry which will lead to reduction in prices. A number of labs in India are already accepting samples from other countries for conducting diagnostics tests and providing results via electronic means. This system needs to be made more robust and labs must be certified and standardized with international systems to encourage this trend. It is also important to look at innovations from process viewpoint rather than the viewpoint of manufacturing to further boost growth of medical

devices industry. On the other hand, medical tourism may also lead to increase in cost of healthcare in the long run due to better buying propensity of the market.

During the discussion, Dr Niranajan Khambete (Clinical Engineer, DMHRC) pointed out the need for prioritizing health problems while developing solutions, which is difficult due to the non-uniform structure of Indian market. The fragmentations in Indian healthcare industry pose a big challenge in developing diagnostic devices. This reduces scalability of solutions and also increases the cost of delivering the solution to masses. There is a need of policies by the Indian government that enables the marketing and distribution of low cost diagnostics and medical devices through government hospitals, laboratories and health missions. There was also a suggestion to try out the open source model for developing diagnostics where each innovator could benefit from the developments and advancements of another.

Key lessons:

1. Need to prioritize health problems while developing solutions.
2. Need to understand the increase in health care cost structure due to medical tourism.
3. Need to locally manufacture a number of low to high technology medical devices and consumables.

Session 3: Stories of tech developments and commercializations in diagnostics and devices.

During the third session, delegates from India and UK presented their stories of tech commercializations in medical technology. Dr Bachmann presented his work on rapid diagnostics for infectious diseases with major focus on molecular in vitro diagnostics, biochip technology and medical microbiology. His group is working on bio-sensing platform project, chronic wound care program and EIS (Electrochemical Impedance Spectroscopy) techniques for Point-of-Care (POC) devices. Several devices and IPs were developed as an outcome of these programs such as electrochemical sensors, detection platforms and handheld machine for wound care detection. Another technology developed by Dr Bachmann's group was an ePCR which utilizes intercalation techniques for DNA denaturation. This technology provides an edge over PCR which is a relatively slower and complex process.

Following Dr Bachmann's presentation, Dr Prodromakis also spoke about integrated bio-sensing technologies and the key challenges in achieving them. Some of these challenges are

sensitivity of the chemical sensing processes, encapsulation materials and finding appropriate bio-markers. He emphasized that contrary to popular belief, it is futile to integrate nano-electronics with micro-fluidic devices as these add to the cost of fabrication and processing. Dr Prodromakis' group has developed several solutions such as hybrid chemical sensing platforms, disposable diagnostic prototypes and Lab-on-PCB devices. The Lab on PCB device uses a cartridge concept wherein trenches are etched in the PCB which are then stacked together to design the required channels. This system incorporates micro-fluidic sample delivery network, electrochemical bio-sensing reagents and reference electrodes. A key challenge for this technology lies in minimizing the drift of these reference electrodes. In future, his group intends to design customized user interfaces and integrate primitive logic to disposable cartridges and also exploit the possibilities of deploying these solutions to alternative markets.

Dr Black from the Department of Biomedical Engineering, University of Strathclyde, elaborated on his team's work in rapid manufacturing of tissue scaffolds. The rapid fabrication was achieved using electro-spinning of PU dispersions and later functionalizing them through various means. His current research focuses on coronary artery diseases and development of artificial arteries which can be used as grafts; biomaterial surface functionalization for developing blood vessel substitutes, vascular bioreactors and perfusion bioreactors

The session on tech development continued with stories by some successful Indian entrepreneurs which included: Mr Aniruddha Atre, Mr Nishant Kumar, Mr Sachin Dubey, Mr Dhiman Sarkar, Mr Mandar Gadre and Mr Jayant Khandare. All of which were incubated at Venture Center, NCL Pune.

The panel discussed about a large number of adoption barriers in the Indian medical devices industry which include:

- 1.) a lack of a regulatory framework
- 2.) lopsidedness of the market for imported devices
- 3.) mistrust in new and cheaper technologies
- 4.) clinical history based decision making systems

A possible solution to overcoming these hurdles could be to involve opinion setting customers early in product development stage and co-create a prototype which is suited to the needs of medical practitioners. Discussions was summarized by Mr Ajay Pitre, where he highlighted the

need to focus on customer needs and align to the real market pull; and also insisted on the need to give world class affordable products, which need not necessarily be cheap.

Key Lessons:

1. Need for regulatory framework to be in place for Indian medical devices.
2. Need to involve all stakeholders while designing medical devices from the early stage of prototype development so as to suit the needs of the clinicians with regards to medical devices.
3. Need to focus on customer needs and align to market pull.
4. Need for producing world class affordable products, which do not necessarily need to be cheap.

Session 4: Collaborative technology development and taking ideas to market - Experiences and opportunities

This was the last session of the workshop and focused mainly on collaboration opportunities and challenges. An opening remark during this session was given by Dr Satya Dash who gave a brief background of BIRAC, its focus areas, funding opportunities and programs. Major paradigms at BIRAC include affordability, quality and localisation. Dr Dash also briefed about the recently started SIIP program grants available at PoC stage.

After the opening remark, Ms Sue Dunkerton emphasised on collaborative funding programs provided by the UK government. She elaborated on Innovate UK which supports innovative businesses with a goal to improve wealth of the UK and provides funding for themed calls, technology inspired calls, industry academia partnerships and small industries. Ms Sue also spoke about the H2020 programs that are more SME specific. The H2020 programs include Eurostars, SME instrument and FastTrack to Innovation.

Mr Vishy Chebrol outlined the importance of finding the right customers to have sustainable developments. As an example, he quoted that most medical diagnostics can target low scale private clinics and doctors who cannot afford to invest into full-functioned high end equipments due to budget or space constraints. Mr Chebrol also suggested to back link the innovation happening in industry to academia so that research can take it further and frugal innovations may mature into advanced science.

Dr Mario Giardini highlighted some of the barriers to eHealth adoption he experienced in Peek, and briefly referenced them to the points highlighted in the eHealth Action Plan 2012-2020 by the European Commission.

The panelists, which also included Dr G Prabhakaran, Dr Magesh Nandagopal, Dr Nitin Tewari and Dr V Premnath further discussed and debated on hurdles in collaborations which included differences in opinion between industry and academia, lack of interest in high risk solutions and challenges of IP protection.

Key Lessons:

1. Several funding opportunities are available from the Indian and UK government funding agencies for bio-medtech based innovations.
 2. Need to find the right markets for sustainable product developments.
 3. Need to link academic research with industry so that innovative ideas can be converted into market products.
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Appendix 1: Workshop Outline

| Time (hrs) | Topic | Speakers |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0830-0915 | Registration and Breakfast | |
| 0915-1000 | <ul style="list-style-type: none"> • Welcome to Venture Center and associated programs • Introduction to BioIncubator • Introduction to SIN • Introduction to the workshop. • Workshop inauguration (lighting of the lamp) • Welcome by Director, NCL | V Premnath Pradnya Aradhya Sheryl Anchan Mugdha Lele Sourav Pal & guests Sourav Pal |
| 1000-1100 (60 min) | Session I: Affordable devices and diagnostics – UK trends Panel Discussion: UK landscape relating to medical technology innovations <ul style="list-style-type: none"> • Opening comments by each panelist • Followed by discussion • Followed by Q&A | Chair: Ramesh Paranjpe Sue Dunkerton (Business and Innovation trends) Mario Giardini (Biomed electronics/IT/mobile) Richard Black (Tissue engg) Till Bachmann (Rapid diagnostics) Himangi Bhardwaj (UK governments initiatives in Healthcare technologies) |
| 1100-1130 | Networking Tea | |
| 1130-1200 | Tour of Venture Center | |
| 1200-1300 (60 min) | Session 2: Affordable devices and diagnostics – Emerging needs in India Panel Discussion: Medical technology needs and priorities in India <ul style="list-style-type: none"> • Opening comments by each panelist • Followed by discussion • Followed by Q&A | Chair: Sue Dunkerton Co-Chair: Dr. Ramesh Paranjpe Nikhil Phadke (Diagnostics) Prasad Rajhans (Medical doctor, ICU specialist, DMHRC) Niranjana Khambete (Clinical engineering) Venkat Panchagnula (Bioseparations/diagnostics) MV Hegde (Biochemical diagnostics) |
| 1300-1400 | Lunch Break | |
| 1400-1530 (90 min) | Session 3: Stories of tech developments and commercializations in diagnostics and devices <ul style="list-style-type: none"> • UK stories (Short talks – 45 min) <ul style="list-style-type: none"> ○ Talk 1: Rapid diagnostics for infectious diseases ○ Talk 2: Bio-inspired biomedical | Chair: Niranjana Khambete Till Bachmann Themis Prodromakis |

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| | <p>technologies</p> <ul style="list-style-type: none"> ○ Talk 3: Rapid manufacturing of tissue scaffolds • India stories (Opening comments followed by discussion by panel of innovators/ entrepreneurs – 45 min) | <p>Richard Black</p> <p>Aniruddha Atre, Nishant Kumar, Sachin Dubey, Dhiman Sarkar, Mandar Gadre, Jayant Khandare</p> |
| 1515-1600 | Networking Tea | |
| 1600-1730 (90 min) | <p>Session 4: Collaborative technology development and taking ideas to market – Experiences and opportunities</p> <ul style="list-style-type: none"> • Emerging funding opportunities (Short talks – 45 min) • Experiences and issues in setting up collaborations; Issues in technology transfer and spinning off ventures (Opening comments followed by panel discussion – 45 min) | <p>Chair: Mike Stewart</p> <p>Satya Dash (over Skype), Sue Dunkerton, Vishy Chibrolu</p> <p>G Prabhakaran, Magesh Nandagopal, Mario Giardini, Nitin Tewari, V Premnath</p> |
| 1730-1800 | Closure and high tea | |

Appendix 2: Participant List

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|----|--------------------|------------------------------------------------------------|
| 1 | Sourav Pal | National Chemical Laboratory |
| 2 | Sue Dunkerton | Knowledge Transfer Network |
| 3 | Mario Giardini | University of Strathclyde |
| 4 | Richard Black | University of Strathclyde |
| 5 | Till Bachmann | University of Edinburgh |
| 6 | Themis Prodromakis | University of Southampton |
| 7 | Ian Walker | Vivakti Healthcare |
| 8 | Himangi Bhardwaj | British High Commission, New Delhi |
| 9 | Satya Dash | BIRAC-Department of Biotechnology, Gov of India |
| 9 | Ramesh Paranjpe | National AIDS Research Institute, Pune |
| 10 | Nikhil Phadke | Genepath Dx |
| 11 | Prasad Rajhans | Deenanath Mangeshkar Hospital, Pune |
| 12 | Niranjan Khambete | Deenanath Mangeshkar Hospital and Research Centre, Pune |
| 13 | Venkat Panchagnula | National Chemical Laboratory, Pune |
| 14 | M V Hegde | Bharati Vidyapeeth University, Pune |
| 15 | Aniruddha Atre | Jeevtronics Pvt Ltd |
| 16 | Nishant Kumar | Embryyo Technologies Pvt Ltd |
| 17 | Sachin Dubey | Module Innovations |
| 18 | Dhiman Sarkar | National Chemical Laboratory, Pune |
| 18 | Mandar Gadre | Nayam Innovations, Pune |
| 20 | Jayant Khandare | National Chemical Laboratory, Pune |
| 21 | Mike Stewart | Open University |
| 22 | Vishy Chebrol | InvAscent Ltd |
| 23 | G Prabhakaran | National Chemical Laboratory, Pune |
| 24 | Magesh Nandagopal | National Chemical Laboratory, Pune |
| 25 | Nitin Tewari | National Chemical Laboratory, Pune |
| 26 | Sharmila Bapat | National Centre for Cell Sciences, Pune |
| 27 | Anuya Nisal | National Chemical Laboratory |
| 28 | BLV Prasad | National Chemical Laboratory |
| 29 | Pranay Goel | Indian Institute of Science and Educational Research, Pune |
| 30 | Madhur Rao | |
| 31 | Nandgopal Kakde | Novartis India Ltd. |
| 32 | Clara Aranda-Jan | |
| 33 | Gautam Morey | Sofomo Embedded Solutions Pvt Ltd |
| 34 | Koustubh Naik | Periwinkle Technologies Pvt Ltd |
| 35 | Ajay Pitre | Pitre Ventures Pvt Ltd |
| 36 | Sangeeta Kumari | |
| 37 | Sheryl Anchan | British Deputy High Commission, Mumbai |
| 38 | V Premnath | National Chemical Laboratory, Pune |
| 39 | Manisha Premnath | Venture Centre, Pune |
| 40 | Pradnya Aradhye | Venture Centre, Pune |
| 41 | Mugdha Lele | Venture Centre, Pune |
| 42 | DSS Chaitanya | Venture Centre, Pune |
| 43 | Sarang Kulkarni | Venture Centre, Pune |

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| 44 | Amrita Sukrity | Venture Centre, Pune |
| 45 | Piyush Joshi | Venture Centre, Pune |
| 46 | Soma Chattopadhyay | Venture Centre, Pune |

Appendix 3: Selected Photos



