

Innovation and Investments in Health Technology: *Overcoming Barriers to Successful Uptake*

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Presentation Outline

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Introduction

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Barriers to Innovative Ideas: *The Death Valley*

- **Part 3:**

Barriers to Innovation Uptake

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Part 1

Introduction



What is a Health Technology (HT)?

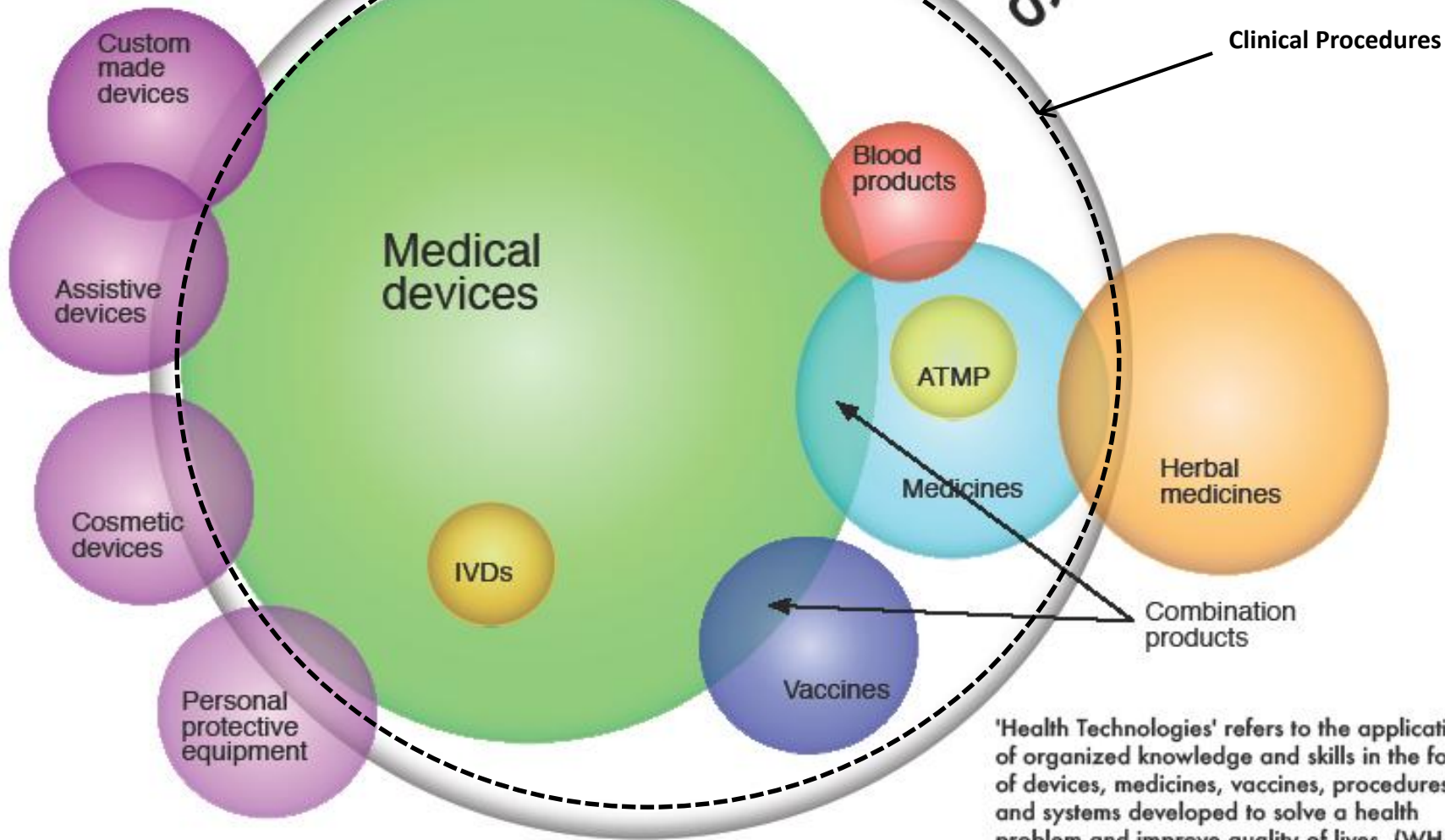
- WHO experts define HT as;

“ The application of organized knowledge and skills in the form of devices, medicines, vaccines, procedures and systems developed to solve a health problem and improve quality of lives”.

- This definition also encompasses traditional medicine, health promotion & prevention activities and information systems.



Health Technologies



HT Policies

Health technology Innovation

Medical Processes (R&D)

Business Processes
(Marketing, Financing, IT
&/or Operating)



Health technology regulation

Safety
Performance
(devices)
Efficacy (drugs)

Health technology assessment

Clinical effectiveness
Ethics
Social issues
Organizational

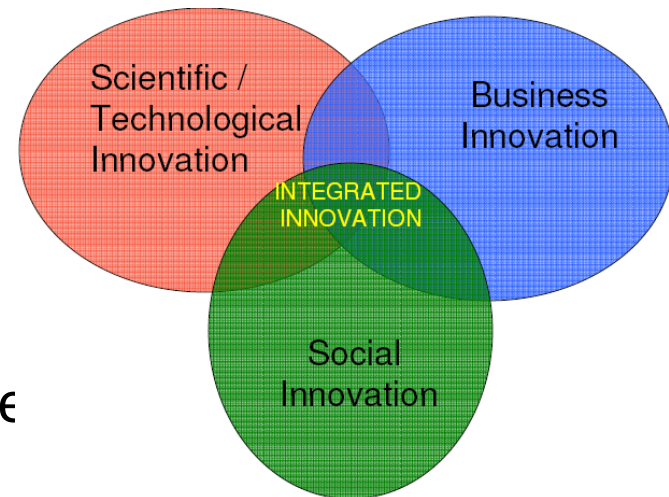
Health technology management

Procurement
Selection
Training
Use

**Valley of
Death**

HT Innovation: Introduction

- Public health needs are not often main drivers of innovation, especially in high-resource settings.
- WHO defines innovation as “**process cycle of 3 major phases that feed into each other: *discovery, development and delivery***”.
- People often decide whether or not to adopt an innovation based on:
 - Utility of invention
 - Disruptive effects on existing habits
 - Personal values
 - Social status
 - How keen individuals are to innovate



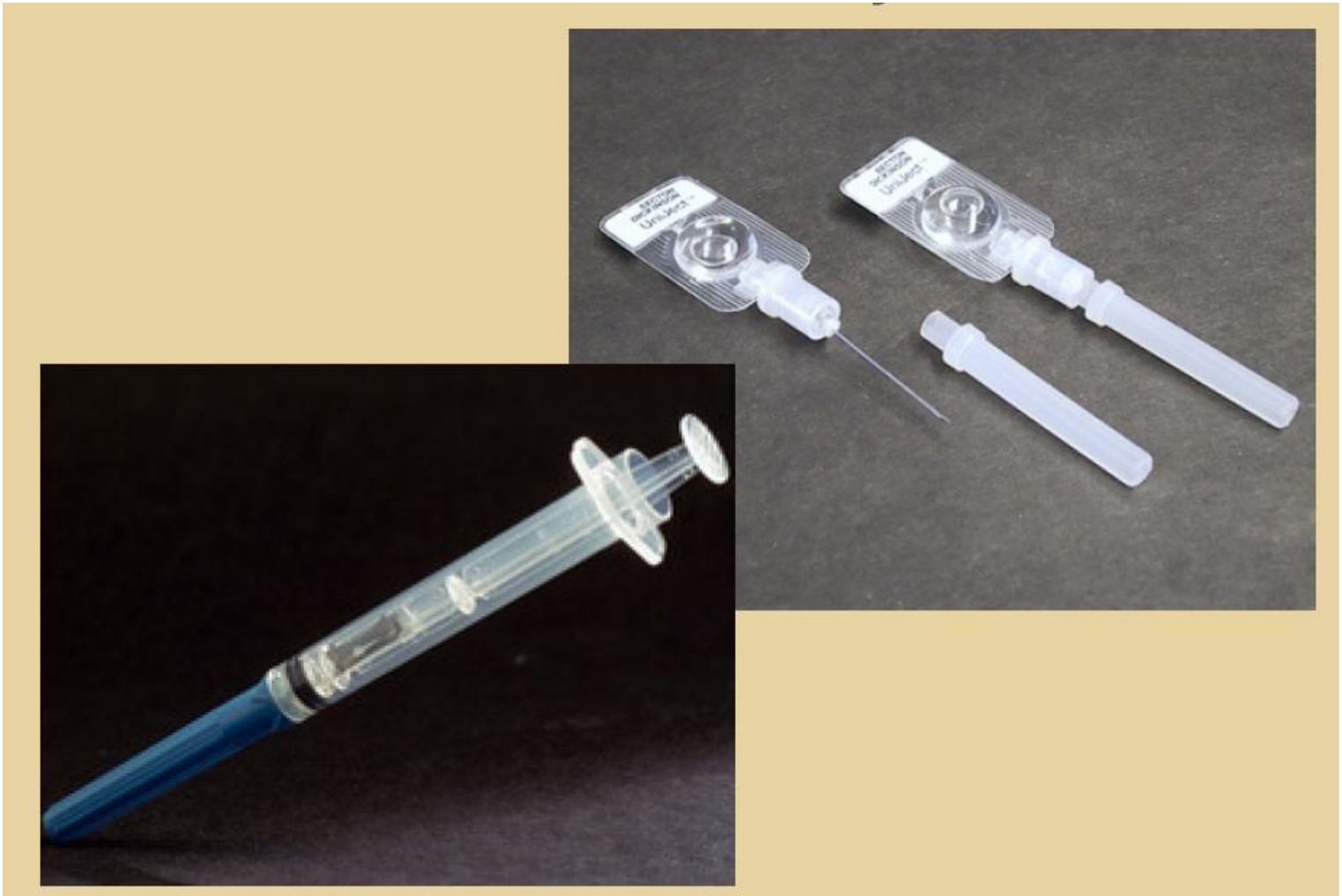
Willingness to adopt new HT

- Within any population, people have different abilities & willingness to adopt new HT.
- They can be categorized as:
 - *“Innovators” constituting 2.5% of pop;*
 - *“Early adopters” constituting 13.5% of pop;*
 - *“Early majority” and “Late majority”, respectively constituting 34% each of pop;*
 - *“Laggards” constituting 16% of the pop.*
- When considering barriers to innovation, it is important to differentiate between obstacles to innovative ideas and obstacles to the uptake of medical innovation.



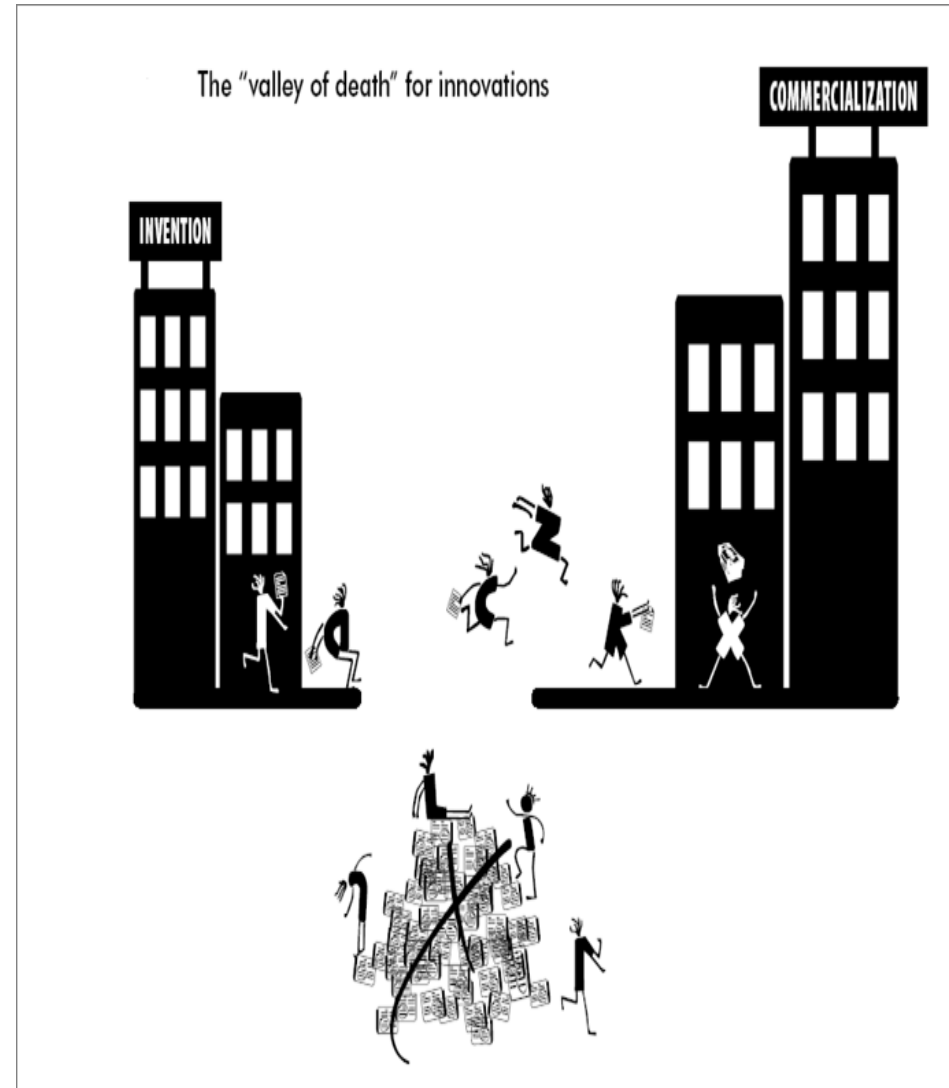
Part 2

Barriers to Innovative Ideas



The Valley of Death

- Lack of funding can kill good ideas before hitting the market.
- At this stage, risk for innovators is high & profit is uncertain.
- Private sector stay away and prefer to fund more mature projects.



Out-of-Context Situation

- Health professionals, especially in low-resource settings, often develop ideas for improving medical devices.
- Difficulties faced in moving innovative ideas forward can be due to:
 - Lack of local research infrastructure
 - Little encouragement for local innovations
 - Lack of marketing mechanisms
- This leads to an out-of context situation where:

“Medical Devices for low-resource settings are developed in high-resource settings”.



Regulatory Requirements

- Regulations ensure safety but can also be a financial burden on designers and manufacturers, especially in low-resource settings.
- For ex., Immunodiagnostic tests incur low development costs; however, costs are doubled or tripled when they are submitted to regulatory process for licensing.
- High regulatory costs can prompt companies to elude regulatory oversight and market their products in unregulated markets, thereby compromising patient safety.



The need for NRAs

- International standards vary from one local conditions to the other.
 - For ex., standards require batteries of portable defibrillators to function at temp as low as (-10) °C. This might not be applicable to tropical settings.
- Manufacturers are usually asking perplexing questions :
 - Should the same standards be applied everywhere?
 - Could standards be adapted to local conditions?
 - Could lowering standards lead to lowering overall HC standards?
 - What body could authorize such exceptions?
 - Would compliant manufacturers suffer a comparative disadvantage with respect to those who bend the rules?
 - Could compliant manufacturers be permitted to market their products at lower safety, quality, and/or performance than those necessary for other devices?
- National Regulatory Authorities (NRAs) at national, regional and global levels are required.



Part 3

Barriers to Innovative Uptake



Reluctance, Resistance, Rejection

- Obstacles to the introduction of any new method, procedure or piece of equipment exist in both industrialized and developing countries.
- Common barriers between high- and low-resource settings include:
 - **Reluctance** to alter existing practices or be trained to develop new skills
 - **Resistance** *can be based on* reluctance of the medical community to adopt new technologies.
 - **Rejection** by traditional communities proud of their culture or of local brands in favor of international brands.



Inappropriate Design

- Sometimes it is difficult to strike a balance between solving problems & creating new needs.
 - Disposable batteries may solve electricity shortage, but may require a supply chain and waste management.
- An ex. of inappropriate design could be the failure of affordable wooden-seat wheelchairs to achieve widespread use among users in Nicaragua.
 - Though appropriate to local conditions (narrow doorways, high pavements and lack of access to buildings for wheelchair users), it required a cushion to prevent ulcers in people with spinal cord injuries.
 - Although cushions were provided during the first year of use, most people in Nicaragua could not afford a replacement once the cushions wore out.



Cost of Innovative devices

- Though their main purpose is to improve health, in many times innovations lead to escalation in HC expenditures.
- Efforts to reduce costs mean that some innovations will diffuse, while others will not.
- Conversely, inappropriate uptake can lead to overuse of innovative, expensive devices that may not meet urgent clinical needs.
 - The frequent implantation of defibrillators.
 - The inappropriate use of diagnostic imaging devices.



Part 4

Overcoming Innovation Barriers



Identifying local design priorities

- The need and potential for identifying local design priorities is overwhelming.
- Since HT developed in high-resource settings rarely function efficiently in low-resource settings and thus R&D in appropriate local context is urgently needed.
- There are some successful examples of how local innovation based on local design can be widely implemented, such as the Jaipur foot assistive device produced in India.



The Jaipur Foot Device



- The Jaipur foot is a lower-limb replacement device.
- Imported prosthetics were out-of context as they didn't meet local requirements, such as: need to walk on uneven surfaces, or to sit on the floor squatting or cross-legged.
- The Jaipur foot had special a special design :
 - Made of waterproof, durable material that is locally available,
 - Allows rotation of the foot to facilitate walking on uneven surfaces
 - Cosmetically acceptable so that it can be worn without a shoe
- Price is affordable (US\$ 30), and assembled in 1 hour.
- It was not-patented to facilitate its spread at a low cost.
- Currently used in India, South-East Asia and Africa.

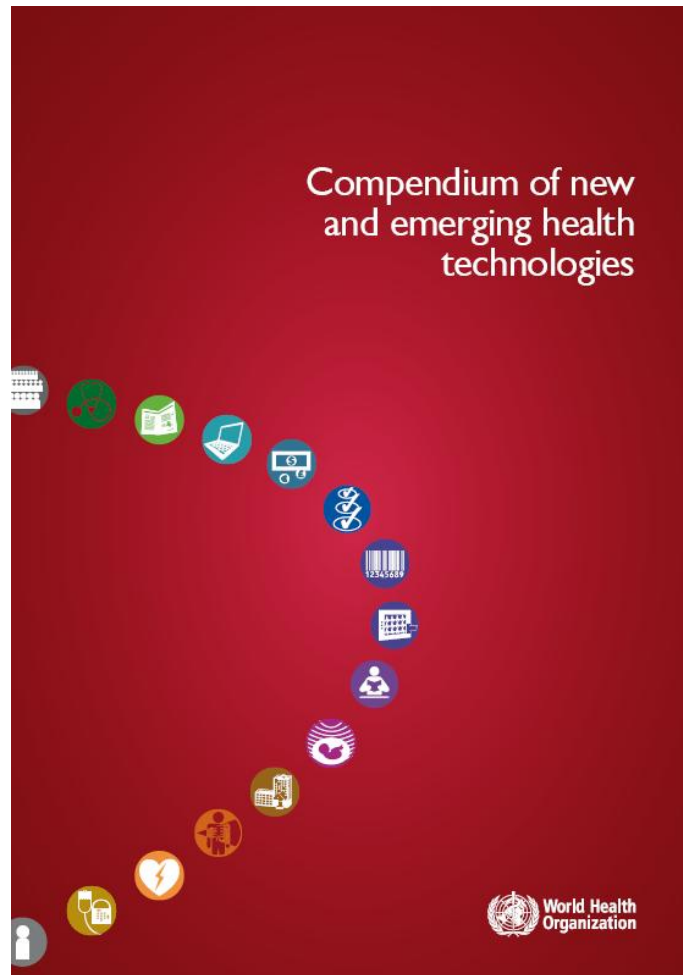


Networking for Innovation

- Community networks can help with
 - Free exchange of knowledge and experience of imaginative ideas.
 - Support innovation from proof of concept to proof of added value.
- Innovation institutes can help to bridge the gap between research & commercial applications:
 - University of Exeter Innovation Centre in UK,
 - Innovation Center Denmark in Munich, Germany
 - University of Cape Town Centre for Innovation in South Africa
 - Center for Medicine & Innovative Technology in USA
- A call for innovative HT, launched by WHO in 2009, urged inventors to provide solutions to existing health problems. Solutions should be:
 - In the form of existing concepts of technology or those that are still in development.
 - Appropriate for, accessible to, and affordable by low-resource countries.



WHO Call for Innovative HT: Commercialized & Under-developed



Overcoming the Cost Barrier

- Financing mechanisms influence the rate at which innovations emerge and gain acceptance.
 - When coronary angioplasty was reimbursed at a level significantly greater than its cost, the procedure was widely adopted.
 - When cochlear hearing implants were reimbursed at a fraction of their cost, their uptake was low.
- Cost barrier could be partly overcome by creating locally-owned companies manufacturing for local markets.
- Governments of some emerging economies subsidize R&D for domestic products to be used in rural areas.
- These companies can soon develop the capability to design and produce HT that compete directly with products patented in Europe, Japan, and the US.



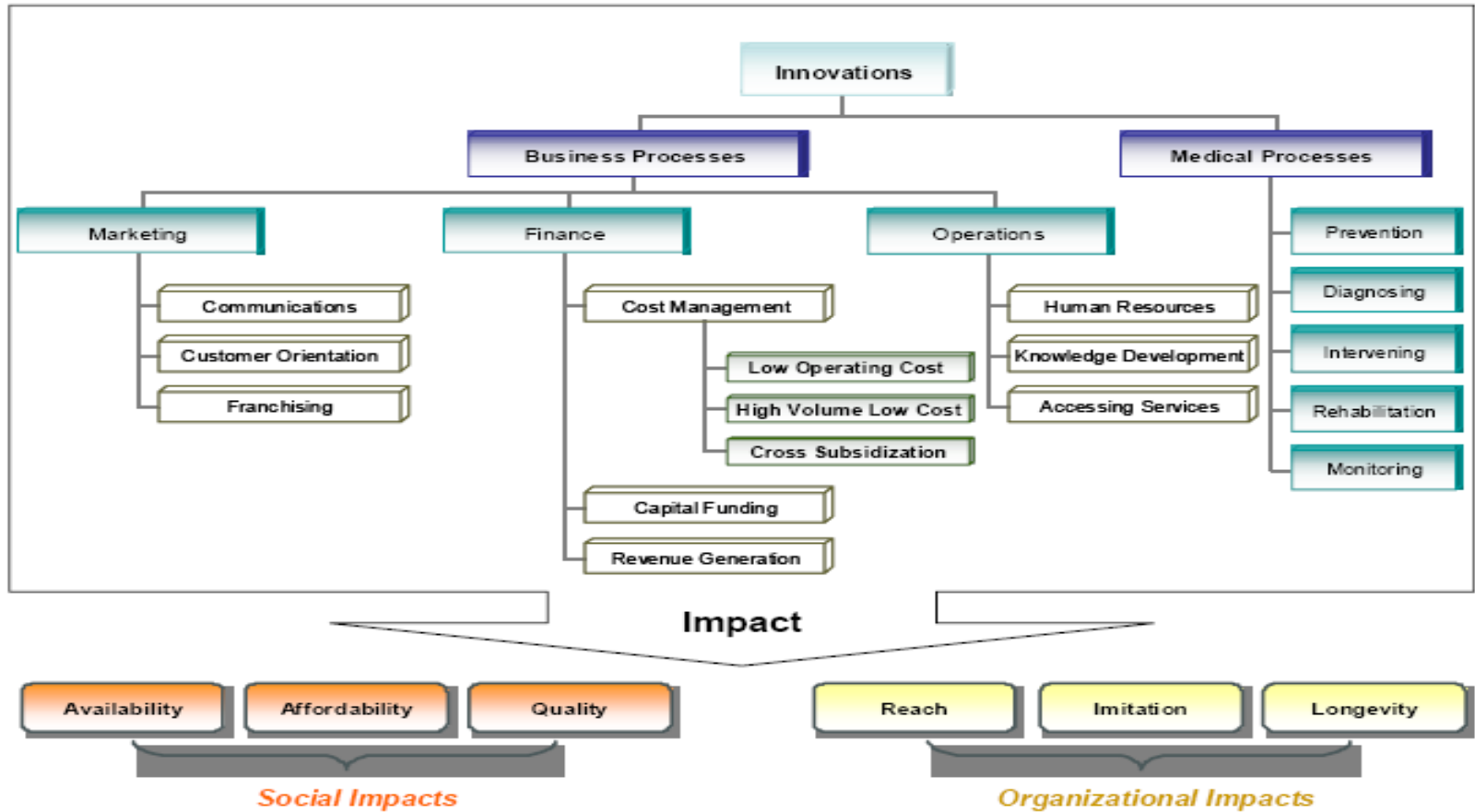
Inexpensive Innovation in action

- A non-profit hospital in India, teamed up with industry to manufacture high-quality intraocular lenses, suture needles, pharmaceuticals, surgical blades, & hearing aids.
- This resulted in overcoming cost barrier of many products
 - Hearing aids sell for about US\$ 50 a piece, versus around US\$ 1500 in US.
- A sliding scale charging model was adopted such that:
 - Poorest people pay nothing
 - Moderately poor pay a price that roughly covers the manufacturing costs (between US\$ 20 and US\$ 60)
 - Well-off people pay higher prices to generate profit and offset losses on below-cost sales.
- In this way, sufficient revenue is gained for the company to be profitable and grow while serving the poorest.



Part 5

Creative & Innovative Examples



Innovative Technologies:

Practical Examples 1

Innovation in Medical Processes, Prevention Stage:

- A non-profit social enterprise in India developed a kit that allows lay health workers to screen for problems with visual acuity.
- The treatment can be made with inexpensive reading glasses (less than \$4).
- This new process makes it possible for staff with limited training to screen people door-to-door, thus greatly facilitating access to this service.
- Now they are operating in 13 countries, including: El Salvador, Guatemala, Bangladesh, Mexico, Ghana, and Sub-Saharan Africa.



Innovative Technologies:

Practical Examples 2

Innovation in Medical Processes, Treatment Stage:

- Another vision company innovated a surgical procedure for cataracts that does not require sutures and that makes use of a mobile microscope.
- Accordingly, one surgeon can operate at two tables, side by side.
- This results in great reduction of costs (no expensive sutures and less space required) and increase in service volume (reducing time needed for a surgery).
- From April 2007 to March 2008, about 285,000 have undergone eye surgeries using this innovation.



Innovative Technologies:

Practical Examples 3

Innovation in Medical Processes, Rehabilitation Stage:

- A company specialized in manufacturing prosthetics innovated a new affordable, hand-made prosthesis that is fitted using a one-time intervention procedure that minimizes the need for follow-up.
- The prosthetic limb costs approximately \$35 with materials that can be locally found in any developing country (normally costs \$4,000 to \$8,000 in USA).
- Outreach camps to promote the product are present in many countries, including: Afghanistan, Bangladesh, Dominican Republic, Honduras, India, Indonesia, Malawi, Nigeria, Nepal, Kenya, Panama, Philippines, Papua New Guinea, Rwanda, Somalia, Trinidad, Vietnam, Zimbabwe, and Sudan.



Innovative Technologies:

Practical Examples 4

Innovation in Business Processes, Financing Strategies

- A non-profit hospital in India, have teamed up with industry to manufacture high-quality intraocular lenses, suture needles, pharmaceuticals, surgical blades, and hearing aids.
- Hearing aids sell for about US\$ 50 a piece vs. approx. US\$ 1500 in USA.
- Price reduction stems from a sliding scale charging model adopted by company:
 - Poorest people pay nothing
 - Moderately poor pay a price that roughly covers the manufacturing costs (between US\$ 20 and US\$ 60)
 - Well-off people pay higher prices to generate profit and offset losses on below-cost sales.
- In this way, sufficient revenue is gained for the company to be profitable and grow while serving the poorest.



Innovative Technologies:

Practical Examples 5

Information and Communication Technologies (ICT)

- ICT can provide important solutions to many existing health problems.
 - For ex., handheld computers equipped with various sensors could provide remote consultation, diagnosis and treatment.
- A Local hospital in Gambia provide remote health services to residents in a Ginnack (a remote island village) as follows:
 - Nurses visit the island twice a week and take digital pictures of the patient's visible symptoms.
 - Pictures are taken to local hospital physicians examine them.
 - If further consultation is required, the physician can send the pictures over the internet to a medical institute in the UK.
- Success of ICT methods relies on presence of strong power infrastructure, internet connectivity, trained staff, and supporting government regulations.



**TO RAISE NEW QUESTIONS, NEW
POSSIBILITIES, TO REGARD OLD
PROBLEMS FROM A NEW ANGLE,
REQUIRES CREATIVE IMAGINATION AND
MARKS REAL ADVANCE IN SCIENCE**

Albert Einstein, 1921

