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Disruptive innovation for development

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Outline

- Disruptive innovation and the need to stretch the concept
- Case of the Budget Telecom Network Model emerging around 2005-2008 in South Asia
- Innovations that ride on ubiquitous telecom access
- Location-specific and timely flood warnings

Disruptive Innovation

Disruptive innovation

- Disruptive Innovation describes a process by which a product or service initially takes root in simple applications **at the bottom of a market**—typically by being less expensive and more accessible—and then relentlessly moves upmarket, **eventually displacing established competitors**.
- Disruptive Innovations are NOT breakthrough technologies that make good products better; rather **they are innovations that make products and services more accessible and affordable, thereby making them available to a larger population**.

C. Christensen, *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*, Boston: Harvard Business School Press, 1997.

Innovation for development: extending the metaphor

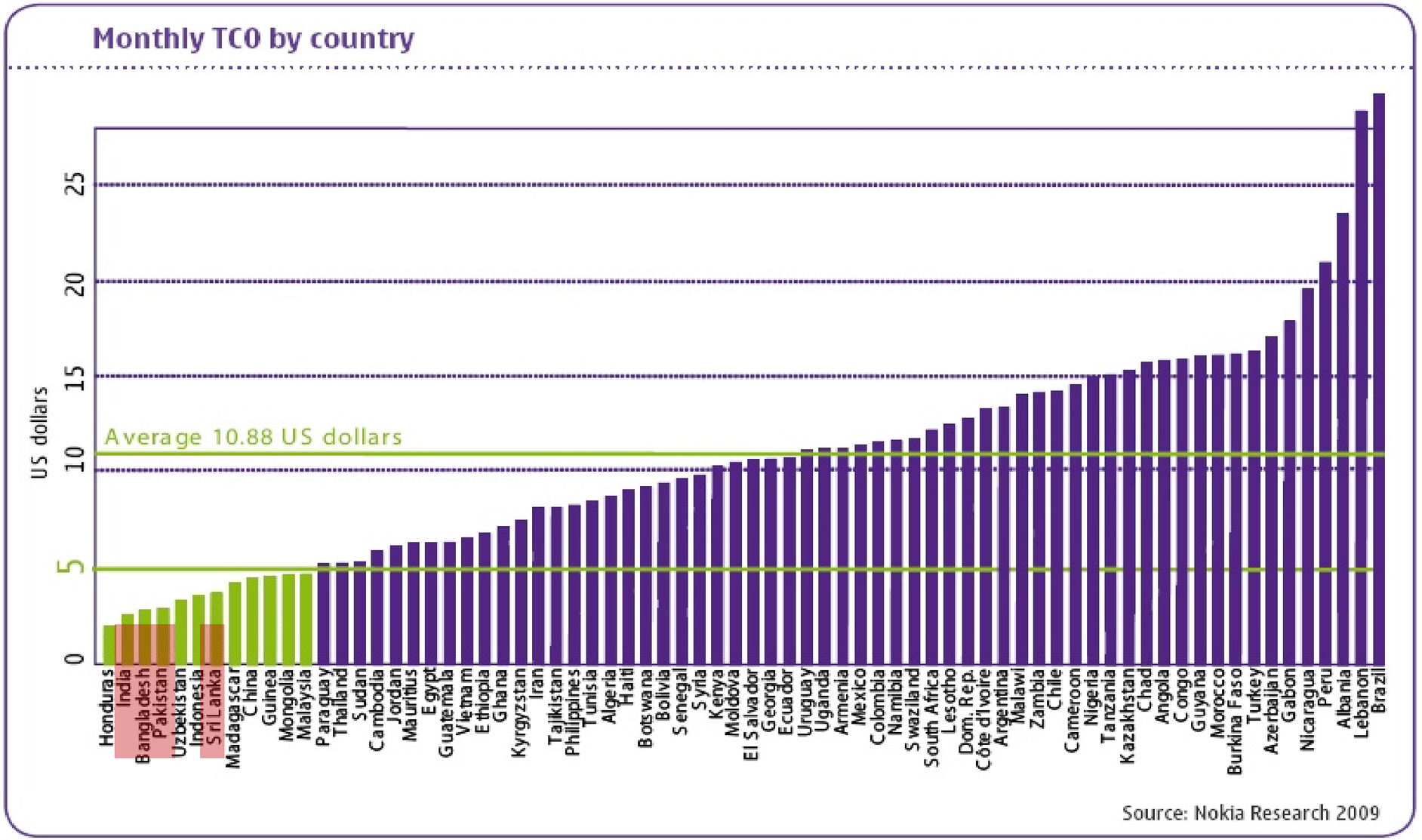
- Firms are about making money. Development is not their prime objective.
- Development occurs or is hindered by many actions including, but not limited to, what firms do.
- But these kinds of metaphorical extensions are not uncommon and may even be described as a manifestation of the cross-fertilization that occurs when disciplinary boundaries are transcended.

Case 1: Budget Telecom Network Model

Budget Telecom Network Model

- New business model allowed South Asian telcos since 2005-06 to make excellent (if volatile) returns by serving “long-tail” markets of poor people by
  - Dramatically reducing transaction costs primarily through prepaid
  - Allowing poor people to pay for services when they need it and when they have money (as opposed to fixed monthly payments)
  - Controlling operating expenses through business-process innovation
  - Focusing on revenue-yielding minutes rather than ARPUs
- Akin to Budget Airline Model that allows Air Asia to make profits while conventional airlines flounder
- Downsides
  - Patchy quality of service for consumers
  - Volatile returns; increased risks for suppliers

Total cost of mobile ownership in 77 emerging economies in 2009

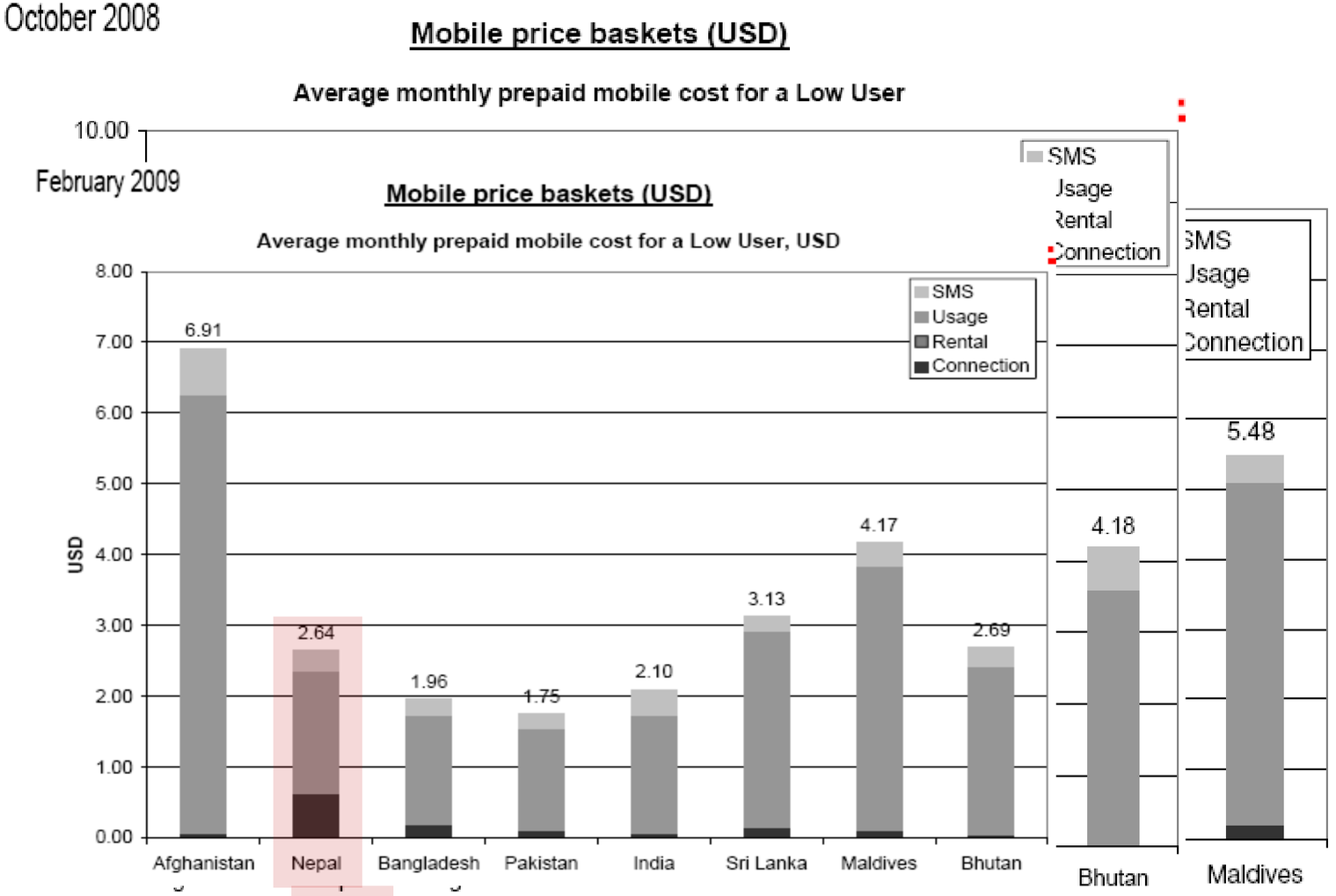


Competition as the necessary condition

- Despite being similar to Bangladesh, India, Pakistan and Sri Lanka, Nepal had high prices until 2009
  - Backdoor entry to mobile space by “fixed” CDMA operators was the explanation for prices dropping in 2009

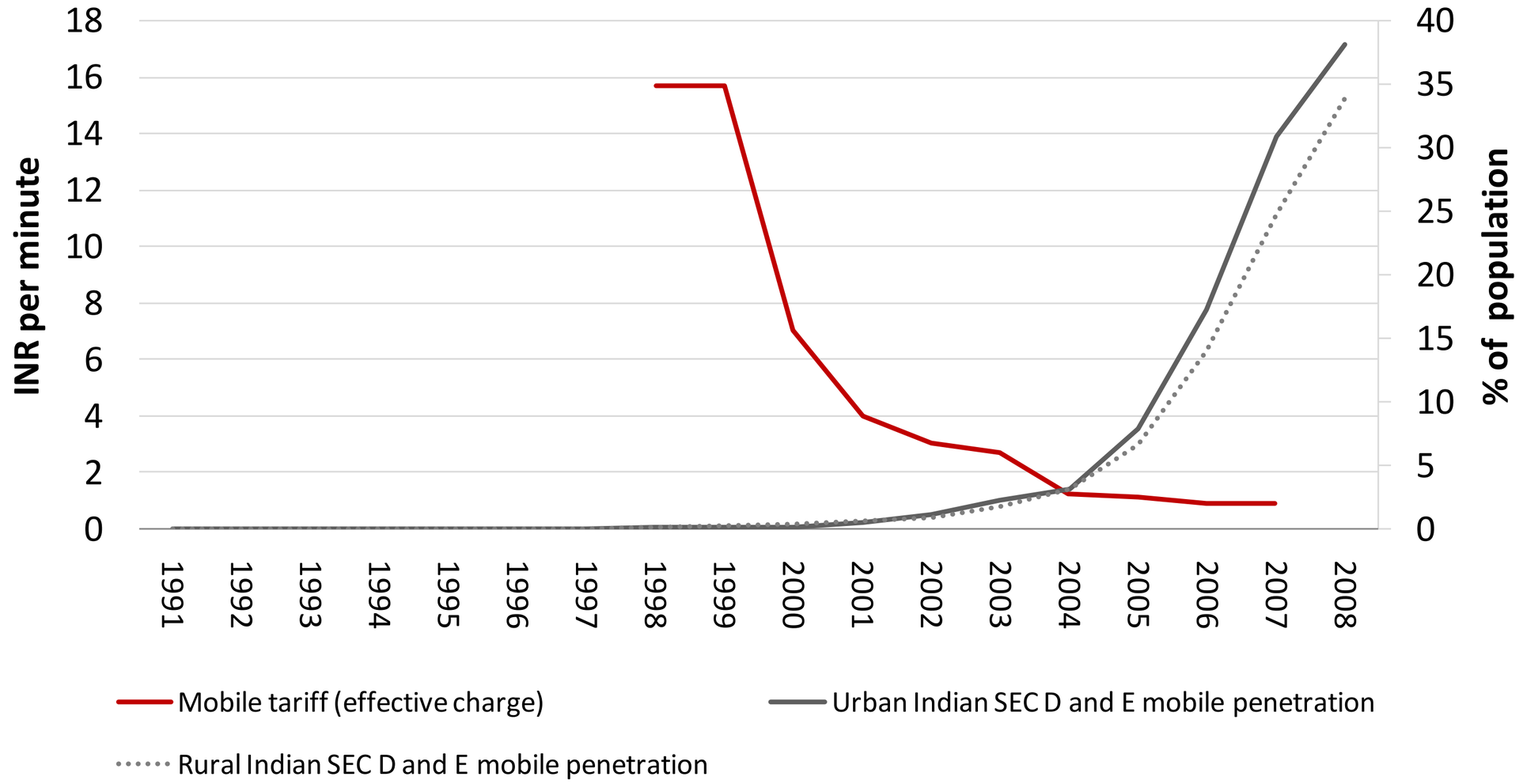
- Governments created the necessary condition

October 2008



Source: http://lirneasia.net/projects/2008-2010/indicators-continued/benchmarks/

Low prices ➔ greater participation by the poor (urban and rural)



What telecom for all makes possible

- Telecom is an increasingly important element in all value chains
  - Tourism, banking, apparel, etc. depend on availability of high-quality and low-cost telecom
  - Exports, jobs, wealth will increasingly depend on performance of telecom sector
- Telecom is a major driver of economic growth in countries where reforms have occurred
  - Also, a major contributor of tax revenues
- People need to stay connected: communication is a basic need
  - Everywhere telecom has been reformed, pent-up demand has exceeded expectations
- Ability to assume electronic connectivity makes many innovations possible

Example: Modern rationing scheme for fuel

- Within a period of weeks, over six million vehicle owners registered for a flexible, non-location-specific, and convenient rationing scheme that eliminated vehicle queues that were bringing the country to a standstill and reduced outlays for fuel
- Could this have been done without
  - Access to connectivity?
  - Fuel station workers able to manage a QR code-based system?

Example: Gates Foundation 2011 Innovation Awardee Bangladesh's Dr Asm Amjad Hossain

- Raised immunization rates in 2 districts from 67% and 60% in 2009 to 85% and 79% in 2010
- How did he do it?
  - Registered pregnant women (date of delivery, location, and phone number) so vaccinators knew when children were born, where they were, and could contact their mothers
  - Established annual schedules for vaccinations
  - Had vaccinators put phone numbers on immunization cards, so parents with young children could get in touch with a health worker

Are these innovations disruptive?

- Does it matter?
- It’s innovation
- Does it change the way rationing in managed and vaccinations are administered?

Machine learning for flood warning

Problem

- Sri Lanka has recently become more prone to inclement weather patterns that have resulted in rain-induced flooding and landslides, leading to large losses in life and infrastructure. The May/ June 2017 floods (rather than the 2004 Tsunami) were the most devastating natural disaster in Sri Lanka in monetary terms.
- Evacuation messages must be as specific as possible. Advances in hazard detection and monitoring, including modeling, have made it possible to make such predictions. If detailed predictions are broadcast to all and sundry, even relevant warnings may get ignored.
- Therefore, it is important that the public-warning authorities use modern technologies such as cell broadcasting now available on mobile networks to provide location-specific warning messages. Those in Hanwella should get one message giving specific information about water levels and time; those in Kaduwela another.

Why no solution so far?

- Models that include water levels in the upper reaches of a river + rainfall + barriers, if any, to water reaching the sea or uninhabited lowlands can be used to predict floods
- But Sri Lanka does not seem to have adequate stream gauges that can give real-time data upstream
  - Even rain gauges that can be used as proxies are not available at required levels of geographical distribution
- But for precise, location-specific warnings, topological data would also be needed so that inundation maps can be prepared
- Sri Lanka's mobile networks are equipped to provide location-specific warnings via cell broadcasting in all three languages

A prior partial attempt at disruption

- At the core of a mobile network are base transceiver stations that connect via fiber or microwave links. The technical feasibility of the solution lies within the subset of BTS that communicate with each other via microwave links that operate at the 7-26 GHz frequency range. The raindrop size as well as rainfall rate affect radio signal propagation.
- Mobile Network Operators choose power settings for their microwave links that would account for losses including those due to potential inclement weather. The ITU-R's recommendation for different regions is used as a guide in setting the loss for a given rain rate (20dB for a rain rate of 90mm is current being used). However, the anomalies caused by rain fade are known to the network and can be captured by the MNO's element management system (EMS).
- It is proposed to use these variations to correlate with readings from the weather stations that we will install and predict rainfall that can feed into flooding and inundation models. ·
- Theoretical, empirical, and statistical models already exist to compute the microwave link attenuation due to rain. The basic feasibility of this approach to predict rainfall has already been tried in Netherlands and Israel.

The real disruption: managing with sparse data; adding inundation mapping

- Google's Research team has developed the technology to do both high-resolution inundation mapping (leveraging Google's hi-res digital elevation maps and government partners' stream gauge measurements and forecasts) as well as machine learning-based hydrological modelling.
- This allows them, in close partnership with government partners, to deliver a comprehensive end-to-end suite of abilities - improving water level forecasts, improving inundation maps, and distributing alerts to millions of people, giving them crucial hours and potentially days to prepare for floods.
- The Flood Forecasting and Alerting Systems are currently live in India and Bangladesh, and an MOU was signed in October 2021 to launch the first iteration for Sri Lanka
  - MOU to implementation?

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