Impact of Mobile Technology on Development

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Today, we live in the world dictated by Economics

- Is there a correlation between GNI Per Capita and economic development of a country ?
- What is the contribution of mobile technology for GNI Per Capita?

World Bank Analysis

- World Bank has studied more than 200 + countries in the World and has divided economies into four groups based on the economies of GNI—gross national income--per capita (formerly it was called GNP (gross national product).

World Bank Analysis by Groups

- The four groupings are:
  - Low income: $995 or less
  - Lower middle income: $996-$3,945
  - Upper middle income: $3,946-$12,195
  - High income: $12,196 or more

Some examples of High Income Economies (2005-2010)

-	2005	2006	2007	2008	2009	2010
Australia	30,400	34,300	37,140	41,890	43,770	N/A
Austria	37,020	39,140	42,280	46,350	46,850	47,060
Canada	33.430	36,850	40,430	43,490	42,170	43,270
Denmark	48,250	51,830	54,420	58,550	58,930	59,050
Germany	35,050	37,300	39,370	42,800	42,560	43,110
Italy	30,350	31,950	33,390	35,230	35,080	35,150
Japan	38,910	38,540	37,700	37.930	37.870	41,850
United Kingdom	38,920	41,160	44,140	46,150	41,520	38,370
United States	44,030	45,410	46.890	48,190	47,240	47,390

Some examples of Upper Middle Income Economies (2005-2010)

Country	2005	2006	2007	2008	2009	2010
Argentina	4,460	5,160	6.040	7,190	7,570	8,620
Mexico	8,090	8,730	9,400	10,000	8,920	8,890
South Africa	N/A	N/A	5,770	5,860	5,730	6,090
Turkey	6,200	7,150	8,090	8,890	8,730	9,890
Uruguay	4,820	5,420	6,510	8,020	9,360	10,590
Venezuela	4,950	6,100	7,510	9,170	10,150	11,590

Some examples of Lower Middle Income Economies (2005-2010)

Country	2005	2006	2007	2008	2009	2010
China	1,760	2,050	2,490	3,060	3,590	4,270
India	750	850	990	1,080	1,180	1,330
Pakistan	720	790	790	950	1,020	1,050
Uzbekistan	530	610	730	910	1,100	1,280
Vietnam	620	690	780	910	1,010	1,160

Some Examples of Low Income Economies (2005-2010)

Country	2005	2006	2007	2008	2009	2010
Benin	550	570	610	700	750	780
Burundi	100	110	120	140	150	170
Chad	440	470	490	540	610	620
Ethiopia	160	190	220	280	330	390
Kenya	520	570	660	730	770	790
Nepal	290	320	350	400	440	N/A
Niger	260	270	280	330	340	370
Rwanda	250	290	330	410	460	520
Sierra Leone	240	250	280	320	340	340
Uganda	300	340	370	420	460	500

Evolution of Computer Technology

- How technology evolution led to mobile technology?

Technology Evolution

- Analog and Digital
- Hardware basics: processing, storage, internal communication, external communication
- Software basis: system software, programming software
- Operating system (OS) Device (Driver's instruction to computers)
- Computers and Interpreters (translate source code)
- Application software: allows to use computer hardware for sophisticated applications
- Networking principles

Technology Evolution (contd)

- Internet was coined in 1962. ARPA and ARPANET
- Network components: Bridge, (protocol) Hub (multiport hardware device), Switch (functions of a bridge and hub)
- Router (examines destination addresses and forwards)
- Segment (cable connecting nodes in a network)
- Node (endpoint in a network)
- Network Architecture—How the nodes are related in a client-server network
- (Based on Networking standards)

Technology Evolution (contd)

- Internet: Internet Protocol Suite (TCP/IP)

  Cloud computing

  2nd generation computers (1956-1963) solid state technology

  3rd generation (1964-1971) With integrated circuits

  4th generation 1971-using microprocessors –supported—gradual migration of computing processing power from the central mainframe to smaller computers

- Pervasive computing in everyday objects like cell phones—awareness of geographic location
- Cloud computing system began in 2001: Amazon, Google, IBM in 2005
- User pays the amount of service used, dividing the expenses of purchasing, and maintaining the hardware and software—convenient
- Computer security: Backdoor, password, encryption, substitution, firewalls, virtual private networks

Mobile Technology

- Development of Mobile technology

Development of Mobile Technology

- In the last 15 years, there is an unprecedented increase in access to mobile phone services
- The growth has been driven by wireless technologies and liberalization of telecommunication markets
- In 2012, an estimated 6 billion mobile phones was in use globally

Mobile Technology Applications

- Mobile communication has had a bigger impact on mankind in a shorter period of time than any other invention in the human history
- The number of mobile phones have sky rocketed from less than 1 billion in 2000 to more than 6 billion in 2012
- The mobiles (with multiple subscriptions) may outnumber the world's population in the near future

- In 1973, first introduced by Dr. Martin Cooper of Motorola (weighed 1 kg)
- In 1983, the DynaTAC 8000x was the first commercially available mobile phone
- Simultaneous launch in Denmark, Finland, and Sweden around the same time
- In 1991, the second generation (2G) was launched in Finland
- In 2001, the third generation (3G) was launched in Japan
- In 2011, the fourth generation (4G) has emerged with increasing abilities
- From 1990-2011, worldwide mobile phones grew from 12.4 million to over 8 billion with high penetration in developing countries

Types of Mobile Phones and Benefits

- Feature Phones
- Smart Phone
- Mobile phones have a broad socio-economic and environmental benefits
- They help in connecting farmers to markets in agricultural supply chain, finance and education transforming the society' landscape

Manufacturers of Mobile Phones

- Five top manufacturers in 2010:
  - NOKIA
  - SAMSUNG
  - LG ELECTRONICS
  - ZTE
  - APPLE
  - The last three replaced RIM, Sony Ericsson, and Motorola who were in the top five list before.

Sales of Mobile Phones

- Worldwide sales:
  - In 2010, 1.6 billion units (increase of 31.8% from 2009)
  - Mobile phones have expanded faster than any other technology
  - In developing countries, poor have access to information through mobile phones where land lines are not available
  - Sharing mobile phones is common in the rural environment (a small remote village may have one mobile phone for use by everyone)

Development of Mobile Technology

- The growth has been more rapid in developing countries
- The impact is more severe in rural areas where nearly one-half of the world's population live and accounting to 75% of the world's poor
- Declining roll out costs of wireless technologies and innovative approaches of mobile operators are benefitting the rural population

Mobile Technology in Various Sectors

- Mobile technology can be applied to almost all sectors, such as agriculture, health, education, and financial services

Role of Mobile Technology

- In financial services activities such as low cost and convenient access to mobile banking
- In health services, especially in the rural areas, improving the infrastructure to provide quality health care
- In educational services, access to information and learning by alternative methods
- In trade, focusing on areas such as agriculture providing information to farmers on harvesting and marketing

Agricultural Sector: Impact of Mobile Services

- Market access through information via mobile phones are extremely valuable in the field of agriculture: In Ghana, mobile offers more than 80 commodities from 400 markets; In India, fisherman to respond faster to market demand; In Niger, mobile information has addressed disparities in grain markets

Finance Sector: Impact of Mobile Services

- In Banking Sector, mobile phones have made an impact: After having the legal framework in place, banking and payment services through mobile phones can bring many more people into the formal financial system (World Bank, 2007)
- In Sierra Leone, workers in the cities can cut intermediaries and transfer money instantly to relatives in remote villages
- In some countries, opening a bank account by mobile "app" is becoming popular

Health Sector: Impact of Mobile Services

- In Health Sector, as experimented in India, Peru and Rwanda, mobile phones account for budgetary expenses, track service delivery, establish accountability, manage patients for better health outcomes and do the drug inventory management

Examples in Health Sector

- Sending updates on diseases via SMS
- In South Africa, doctors are informed whether patients are taking their tuberculosis medicine
- In Uganda, a survey (multiple-choice quiz) was sent to 15,000 subscribers enquiring HIV/AIDS
- In Brazil, health workers filled in surveys on the incidences of mosquito-borne dengue fever
- In Mexico, a medical hotline set up for patients to send medical questions via SMS

The Mobile Services

- Voice
- Text Messaging
- Photo
- Audio
- Video
- Email through Internet
- Access to websites through Internet
- Other “Smart” phone applications

Mobile Support

- Mobile platforms are transforming the society's landscape and is helping to meet the challenges to alleviate poverty
- Mobile services can connect farmers to markets (helping in agricultural supply chain), finance, health and education sectors
- Assists in removing the information asymmetry

Mobile Support: Explicit Knowledge

- Explicit Knowledge

  Use and Reuse
  - Codified knowledge (explicit knowledge) effective in reuse—documentation, procedures, etc.
  - Tremendous savings, decreases costs, and improvement in overall quality

Mobile Support: Tacit Knowledge

- Tacit Knowledge
  - Uncodified
  - -does not lend itself to reuse
  - -managing and sharing is challenging
  - -real time access

Mobile Technology in India

- Area: 3,287,263 Sq Km
- Population: 1.21 billion (20ll census—50% below 25 years)
- Urban population 29%; rural population 71%
- States: 28 States and 7 Union Territories
- Languages: 22 different languages
- Literacy: 74.04 % (Men 82.14%; Women 65.46%)
- Internet users: 100,000,000 (8% penetration)
- Land phones: 35.77 million (October 2011)
- Mobile phones: 881.40 million (October 2011--71% mobile penetration)
- Monthly cell phone addition: 7.79 million (October 2011)

Sector performance: 2000-2007

- Telephone line per 100 people was 3.2 in 2000 and stayed the same in 2007
- Mobile subscriptions per 100 people was 0.4 in 2000 and was increased to 20.8 in 2007
- Internet subscribers per 100 people was 0.3 in 2000 and increased to 1.2 in 2007
- Personal computers per 100 people was 0.5 in 2000 and increased to 3.3 in 2007

India and Mobile Industry

- India could become the first mobile digital society
- Bottlenecks:
  - Regulatory inefficiencies
  - Corruption

    Transmission networks

    Infrastructure to handle data capacity

    Disparity between haves and have nots

USA

- Covers 9.83 million sq miles
- Comprised of 50 states with over 314 million population
- World's most ethnically diverse and multicultural nations
- Economy is both in manufacturing and service sectors
- Literacy is hundred percent

USA (contd)

- In 2009, U.S. had 141 million land phones and 286 million mobile phones.
- Increase is due to data-centric and smart phones
- Verizon is the leader with 35.7% wireless revenues, followed by At& T with 34.8% and Sprint and T-Mobile are the next two contributing members

SWOT Analysis for Mobile Services

INTERNAL ANALYSIS

Here, we address research questions such as:

- What strengths do these countries have as an advantage in the mobile phone industry?
- What are the tangible and intangible attributes within the control of the country?
- How does the country perceive strengths internally?
- How do outsiders perceive strengths of the country?
- What are the disadvantages for mobile phone industry in these countries relative to others?
- What are the distractions, from the country's perspective, to attain the desired goal?
- What are the negative characteristics and disadvantages? What are the weaknesses perceived by the country?
- What do outsiders consider weaknesses of the country?

SWOT Analysis for Mobile Services (contd)

EXTERNAL ANALYSIS

Address questions such as:

- What opportunities exist for these countries to make the mobile phone industry a success in their own environment as well as in the outside environment?
- What opportunities exist for the country to grow and sustain?
- What areas exist as opportunities?
- What factors block the opportunities and progress?
- What external elements could cause problems in these countries for the mobile phone industry?
- What factors are beyond the control of the country?
- How is the ICT sector influencing the mobile phone subsector?

USA: SWOT

- Strengths:
  - Mobile market is dominated by pre-paid customers
  - Healthy competition among four national players and several regional players
  - Smart phones have helped to boost 3G and 4 G service usage—data in addition to voice

USA: SWOT (contd)

- Weaknesses:
  - Less room for regional players
  - Market is split between CDMA & GSM technologies

USA: SWOT (contd)

- Opportunities
  - Expansion of mobile networks, especially 3G and 4G networks
  - Significant growth opportunities
  - Largest economy focusing on innovation, and high R & D,
  - Legal system is friendly to business and entrepreneurial activities

USA: SWOT (contd)

- Threats
  - Intensified competition from China
  - Other low wage economies are high threat
  - Consolidation of service providers may create a monopolistic environment—drives up costs and reduces innovation

Impact of Mobile Technology

- A World Bank study shows there is a positive correlation between the use of mobile phones and socio-economic benefits (development)
- They provide Mobile Value Added Services (MVAS) with the digital empowerment to the Indian population.
- The Non-SMS services include ring tones, music, entertainment, gaming, and mobile browsing
- Penetration in urban areas is already 100% and rural areas is 23%. However, it is increasing fast in rural areas

Growth of Mobile Services

- Mobile emphasis on lower income segments of population:
  - Voice application
  - SMS application

Examples in Agricultural Sector

- In India, fisherman in Kerala, mobile phones decreased price dispersion and wastage facilitating the spread of information by getting timely price information and target for the market

Education Sector

- Mobile phones can help (PMO report):
  - Many do not have an elementary school in 1-3 km radius
  - 80,43,889 children ages between 6 and 14 years do not go to school
  - 1,48,696 govt. schools run without building
  - 1,14,531 schools have a single teacher
  - 1,65,742 schools do not have drinking water
  - 4,55,561 schools do not have toilet

Health

- Mobile Industry can assist in the state of health care:
  - Regular outbreak of epidemics
  - High prevalence of chronic diseases
  - Low vaccination rates
  - Inadequate access to health care

Value Added Tool for Women

- Mobile phones are useful in:
  - -Domestic violence
  - -Decision making autonomy
  - -Child caring
  - -Economic independence

SWOT Analysis in the Indian Context

- India is making strong strides with the improvement of economy and consumer sentiment
- Overall, total market for ICT products and services is expected to increase from $16.3 billion in 2010 to $34.3 billion in 2014 of which mobile industry is significant
- Considering the GNI of India is only $1,040 the ratio of landlines and mobile phones is significant (35.77 million landlines when compared to 881 million mobile phones)

Strengths

- Competition is healthy from manufacturers and users
- Many strategic investors from many countries on hardware and software
- Availability of skilled and technically qualified workforce with English language proficiency is an added value in the country

Weaknesses

- Indian mobile market is highly skewed towards prepaid users—as such high inactivity levels bring down revenue
- Some delays in licensing 3G and 4G implementation because of conflicts between the government and service providers
- Infrastructure in rural areas is limited

Opportunities

- Great push to expand 3G and 4G
- Govt. license fee will be cut by 33% to cover wider areas
- Further liberalization and deregulation could enhance the competitiveness of the industry

Threats

- Rising costs could slow growth
- Government's conservative measures may inhibit growth, licensing, and innovation
- Network capacity could struggle to keep up with the demand
- If migration were made easier, it would add pressure on operators to retain existing customers
- The global economic slowdown

Areas for Research

General:

- What are the differences and similarities in how individuals living in developed and developing nations use mobile devices, and how are they related to national culture?
- How are human values related to the design and use of mobile devices, and what specific similarities and differences are there in which mobile devices evoke which values?

Areas for Research (contd)

- Has mobile technology contributed to GNI and GDP?
- How important is the mobile technology research from the World Bank ?
- Is there a CI in practice for the manufacturers of mobile phones?
- What is the forecast for accessing mobile phones by all poor and underprivileged population, especially in rural areas?

Areas for Research(contd)

- What other sectors should be covered apart from the four analyzed: Agriculture, Education, Finance, and Health sectors to empower individuals with information?
- Will the SWOT analysis reveal the real issues in the mobile technology sector?
- Is there a special benefit for women with mobile technology?

Areas for Research (contd)

- While mobile manufacturers generally target urban areas the rural areas have surpassed expectations
- Demand is driven more by voice vs data to keep in touch with colleagues, family and friends

Areas for Research (contd)

- The role of governments in developing sound policies: working with service providers and manufacturers to develop appropriate business models; supporting research to develop low cost entry models to increase mobile coverage; developing an enabling environment for service providers and manufacturers to achieve goals

Areas for Research (contd)

- Has the mobile technology included in the country's strategic plan focusing on: applying mobile technology as important development tools; providing incentives for mobile investment (like tax breaks) and shared use; creating business climate fostering mobile technology to contribute to national objectives; and, encourage access by low income consumers.

Thanks for your attention.
Any questions?

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