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The Transformative Economic Impact of Digital Technology

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The Transformative Economic Impact of Digital Technology

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Digitization is the capacity to use digital technologies to generate, process, share and transact information

- At the most basic level, digitization is the process of converting analog information into a digital format
- In a broader context, digitization is defined as the social transformation triggered by the massive adoption of digital technologies to generate, process, share and transact information
- Digitization builds on the evolution of network access technologies, semiconductor technologies, and software engineering
- Leverages the spillover effects resulting from their use (common platforms for application development, e-government services, e-commerce, social networks, and availability of online information)
To achieve a significant impact, digitization has to be widely diffused within the economic and social fabric of a nation

- Adopted at three levels
  - Utilized by individuals, economic enterprises and societies
  - Embedded in processes of delivery of goods and services
  - Relied upon to deliver public services

- For this condition to occur, digitization has to fulfill several conditions
  - Affordable to allow scalable impact
  - Ubiquitous reaching most population of a national territory
  - Accessible by multiple fixed and mobile voice and data devices
  - Reliable, providing sufficient capacity to deliver vast amounts of information at speeds that do not hinder their effective use
A composite index comprising 25 indicators was developed to measure the level of digitization of a given country.

**DIGITIZATION INDEX**

<table>
<thead>
<tr>
<th>Components</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Affordability</strong></td>
<td>Residential fixed line tariff adjusted for GDP per capita</td>
</tr>
<tr>
<td></td>
<td>Residential fixed line connection fee adjusted for GDP per capita</td>
</tr>
<tr>
<td></td>
<td>Mobile cellular prepaid tariff adjusted for GDP/capita</td>
</tr>
<tr>
<td></td>
<td>Mobile cellular prepaid connection fee adjusted for GDP per capita</td>
</tr>
<tr>
<td></td>
<td>Fixed broadband Internet access cost adjusted for GDP per capita</td>
</tr>
<tr>
<td></td>
<td>Smartphone broadband Internet access cost adjusted for GDP per capita</td>
</tr>
<tr>
<td></td>
<td>UBS/dongle broadband Internet access cost adjusted for GDP per capita</td>
</tr>
<tr>
<td><strong>Infrastructure</strong></td>
<td>Mobile investment per telecom subscriber</td>
</tr>
<tr>
<td><strong>Reliability</strong></td>
<td>Broadband investment per telecom subscriber</td>
</tr>
<tr>
<td></td>
<td>Fixed line investment per telecom subscriber</td>
</tr>
<tr>
<td><strong>Network Access</strong></td>
<td>Fixed Broadband penetration</td>
</tr>
<tr>
<td></td>
<td>Mobile Phone penetration</td>
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<tr>
<td></td>
<td>Mobile Broadband penetration</td>
</tr>
<tr>
<td></td>
<td>PC population penetration</td>
</tr>
<tr>
<td></td>
<td>Mobile cellular network coverage</td>
</tr>
<tr>
<td><strong>Capacity</strong></td>
<td>International Internet bandwidth (kbps/user)</td>
</tr>
<tr>
<td></td>
<td>% Broadband connections higher than 2 Mbps</td>
</tr>
<tr>
<td><strong>Usage</strong></td>
<td>Internet retail volume</td>
</tr>
<tr>
<td></td>
<td>E-government usage</td>
</tr>
<tr>
<td></td>
<td>% Individuals using the internet</td>
</tr>
<tr>
<td></td>
<td>Data as % of wireless ARPU</td>
</tr>
<tr>
<td></td>
<td>Dominant Social Network Unique Visitors per month Per Capita</td>
</tr>
<tr>
<td></td>
<td>SMS Usage</td>
</tr>
<tr>
<td><strong>Human Capital</strong></td>
<td>% Engineers in labor force</td>
</tr>
<tr>
<td></td>
<td>% Skilled Labor</td>
</tr>
</tbody>
</table>
The 2013 Digitization Index was calculated for 150 countries, indicating four developmental stages:

- **Limited**
  - Turkménistan
  - Nepal
  - Nepal
  - Syria
  - Iraq
  - Gambia
  - Nigeria
  - Cuba
  - Tajikistan
  - Angola
  - Guinea
  - Equatorial Côte d'Ivoire
  - Libya
  - Congo
  - I. Marshall
  - Tuvalu
  - Zimbabwe
  - Vanuatu
  - Senegal

- **Emerging**
  - Rwanda
  - Mauritania
  - Djibouti
  - Micronesia
  - Zambia
  - Palau
  - Guinea
  - Lesotho
  - Afghanistan
  - Somalia
  - Ethiopia
  - Tanzania
  - Angola
  - Benin
  - Santo Tomé y Príncipe
  - Sierra Leone
  - Cameroon
  - Nauru
  - Is. Salomón
  - Mali
  - Myanmar
  - Haiti
  - Burundi
  - Togo
  - Niger
  - Chad
  - Burkina Faso
  - Madagascar
  - Comores
  - Kiribati
  - Papua New Guinea
  - Mozambique
  - Malawi
  - Eritrea
  - Central African Republic

- **Transitional**
  - Paraguay
  - Sri Lanka
  - Botswana
  - Indonesia
  - Egypt
  - Belice
  - Cabo Verde
  - Argelia
  - Guyana
  - Sudan
  - Kyrgyzstan
  - Vietnam
  - Gabon
  - Bhutan
  - Namibia
  - Fiji
  - Bolivia
  - Palestine
  - Guatemala
  - Uzbekistan
  - Pakistan
  - Honduras
  - India
  - Nicaragua
  - Ghana
  - Cambodia
  - Kenya
  - Suaziland
  - Bangladesh
  - Yemen
  - Timor Oriental
  - Is. Virgin
  - Laos
  - Tonga
  - Samoa
  - Montenegro
  - Serbia
  - Argentina
  - St. Vicent and Granadine
  - Ucrania
  - Malasya
  - Turkey
  - Belarus
  - Georgia
  - Mauritius
  - Brunei
  - Kazakhstan
  - Aruba
  - St. Lucia
  - Armenia
  - Trinidad & Tobago
  - Suriname
  - Mongolia
  - Oman
  - Granada
  - Ecuador
  - Maldives
  - Macedonia
  - Bahamas
  - Tailândia
  - Dominica
  - Tunisia
  - Colombia
  - Azerbaján
  - Brazil
  - Seychelles
  - Bermuda

- **Advanced**
  - Luxemburo (1)
  - Switzerland (2)
  - Australia (3)
  - Canada (4)
  - Mexico (5)
  - Singapore (6)
  - Hong Kong (7)
  - Taiwan (8)
  - Ireland (9)
  - New Zealand (10)
  - United Kingdom (15)
  - Iceland (16)
  - France (17)
  - Israel (18)
  - Belgium (19)
  - Korea (20)

Source: Calculated in 2015 on Katz, Koutroumpis and Callorda (2013). The Latin American path towards digitization
The emerging world is primarily at the transitional, emerging and limited stages of development.

DIGITIZATION BY REGION (2013)

Source: Calculated in 2015 on Katz, Koutroumpis and Callorda (2013). The Latin American path towards digitization
Digitization has a larger contribution to GDP than stand-alone technologies.

**DIGITIZATION AND ECONOMIC DEVELOPMENT**

- **Contribution to GDP growth of 10 point increase in variable**

- **10 POINT INCREASE IN DIGITIZATION YIELDS 0.74% INCREASE IN GDP PER CAPITA**

- **Broadband Studies**

- **Mobile Studies**

- **This stipulates that full economic impact ICT is achieved through the cumulative adoption of all technologies, in addition to the assimilation and usage in the production and social fabric**

- **Achieving broadband penetration is only one aspect of required policies; maximization of economic impact can only be achieved through a holistic set of policies ranging from telecoms to computing to adoption of internet and eCommerce**

Source: Katz and Koutroumpis (2012). Maximizing the impact of digitization
Additionally, digitization exhibits increasing returns to scale, where economic impact increases after an index score of 30.

Countries with lower scores are often the ones that lack basic access, skills and usage that would prevent them from experiencing important effects on their economies.

On the other hand, the pattern of economic impact of digitization varies by region and sector.

High Digitization Regions

- High economic growth initially, diminishing over time ("supply shock" effect)
- New Economic Growth (innovation, new services)

Low Digitization Regions

- High stable economic growth ("catch up" effect)
- Capital/labor substitution limits employment growth ("productivity effect")

The economic impact of digital technology ranges from new business generation to productivity spillovers.

**LATIN AMERICA: NEW BUSINESS EFFECTS OF DIGITIZATION**

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>EMPLOYMENT</th>
<th>REVENUES (million US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Advertising</td>
<td>-</td>
<td>$3,291</td>
</tr>
<tr>
<td>E-Commerce</td>
<td>-</td>
<td>$5,630</td>
</tr>
<tr>
<td>Platform Applications</td>
<td>20,000</td>
<td>$788</td>
</tr>
<tr>
<td>Videogames</td>
<td>7,000</td>
<td>$237</td>
</tr>
<tr>
<td>Total</td>
<td>27,000</td>
<td>$9,946</td>
</tr>
</tbody>
</table>

**LATIN AMERICA: PRODUCTIVITY EFFECTS OF DIGITIZATION**

<table>
<thead>
<tr>
<th>COUNTRIES</th>
<th>SECTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>Agriculture, Electric utilities, gas and Water</td>
</tr>
<tr>
<td>Chile</td>
<td>Mining, Manufacturing, Commerce, Communications, Financial Services</td>
</tr>
<tr>
<td>Mexico</td>
<td>Agriculture, Construction, Communications, Financial Services</td>
</tr>
</tbody>
</table>

Source: Katz (2015). The digital eco-system in Latin America (under publication)
To sum up, the transformative economic impact of digital technology implies multiple effects

- The emerging world is primarily in the transitional, emerging and limited stages of digitization development
- Economic impact of digitization is much higher than stand-alone technologies (cumulative effects, accumulation of intangible capital)
- Economic impact of digitization indicates a return to scale (economic impact increases with level of digitization development)
- Economic growth and job creation varies by level of technology development of a country
  - Developed countries/regions (economic growth and job creation driven by new services, job creation restricted to selected industries)
  - Emerging countries/regions (“catch up” in economic growth, capital/labor substitution restricts employment growth)