DISRUPTIVE TRENDS IN TRANSPORT – SMART CITIES, CITIZENS AND INTELLIGENT CONNECTIONS

The Transport and ICT Global Practice
Smart Connections for All

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Milestones of the Internet

Two original protocols of the internet protocol were invented in 1973. It was just several decades ago...

- **Internet of Data**
  - **Vint Cerf and Robert Kahn**
  - TCP/IP protocol allowing data to be sent from one computer to another

- **Internet of Content**
  - **Tim Berners Lee**
  - The World Wide Web allowed for content to be shared between computers on a network

- **Internet of Value**
  - **Satoshi Nakamoto**
  - Blockchain allows value to be shared in a Trustless environment
The internet plays an integral role in boosting growth, expanding opportunities, and improving service delivery. It promotes development through three main mechanisms.
Fourth Industrial Revolution (Industry 4.0) is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres.*

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<th>2nd</th>
<th>3rd</th>
<th>4th</th>
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</thead>
<tbody>
<tr>
<td>Mechanization, water power, steam power</td>
<td>Mass production, assembly line, electricity</td>
<td>Computer and automation</td>
<td>Cyber Physical Systems</td>
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* Source: World Economic Forum
Industry 4.0 [cont’d]

Technologies tested and perfected in Industry 3.0 will all be fully in operation in Industry 4.0.*

In Transport and Logistics, the following key findings for Industry 4.0 have been identified:**

• Industry 4.0 has moved from talk to action.
• Digitization is driving quantum leaps in performance.
• Deepening digital relationships with more empowered customers.
• Focus on people and culture to drive transformation.
• Data analytics and digital trust are the foundation of Industry 4.0.
• Robust, enterprise-wide data analytics capabilities require significant change.
• Big investments with big impacts and rapid returns.

* Source: Adeniran (2016)  
** Source: PwC, “Industry 4.0: Building the Digital Enterprise, Transportation and logistics key findings” report
Disruptive Technologies (1)
Effective Utilization of Data

Data, at the heart of Industry 4.0, can improve transport sector in many ways: effective infra design and asset management, convenience to the public, better safety.

Data Continuum:

• Data generation through IoT devices and sensors
  o Real time view of the condition of physical transport infra and its usage. Need for data standards

• Data capture
  o Need for IoT Platforms (ex. South Korea and Netherlands LoraWan networks.)

• Data storage (Cloud/Edge computing)

• Data security
  o Vulnerability to cyber attacks: onboard control systems on vehicles and traffic lights may be affected

• Data sharing (Open data, interoperability)

• Data analytics
  o Ex. congestion pricing, simulation, modeling, predictive analytics, visual analytics

• Cognification of data
  o AI can help in every aspect of transportation.

To be discussed more in Section Two.
The blockchain technology is a digital ledger of transactions that is distributed, verified and monitored by multiple sources simultaneously. Beyond Bitcoin, it can be used especially for supply-chain purposes.

**Examples**

- **IBM-Maersk:** tracking containers
- **Rotterdam Port:** Logistics
- **Walmart:** tracking pork in China
- **Insurance:** IBM, AIG, Standard Chartered
- **Trade Finance:** Deutsche Bank, HSBC, KBC, Natixis, Rabobank, Société Générale and UniCredit
- **Dubai:** all government transactions by 2020
The blockchain technology can also enhance sharing economy.

Ownership and exchange of smart assets using Blockchain technology.

- Smart assets represent entities of value (smart property)
- Ownership and exchange can be managed via distributed ledger technology
- Smart assets in conjunction with smart contracts are relevant to urban transportation
- Smart contracts: formalized rules of ownership and exchange implemented by a distributed ledger platform
Disruptive Technologies (3)
3D Modelling (Digital Twin)

The blurring of the physical and digital worlds with the virtualization of every object, person, process and place has significant implications for transportation planning.

This helps cities optimize sustainable multimodal mobility operations and services, and enables:

- Enhanced commuter experiences
- Reduced travel time and cost
- Integrated planning and operations
- New business models and opportunities

Source: 3DEXPERIENCity
Disruptive Technologies (4)
3D Printing

3D printing is an additive manufacturing process that applies layers of materials (typically plastic) to develop an object that is made up of thinly sliced horizontal layers. It can make big impact on logistics.

Although conventional manufacturing technologies will not be replaced by 3D printing, in segments where it is applied (such as spare parts production) it will significantly impact some logistics services as well as volumes.*

• The need to procure parts from multiple sources around the globe could be significantly reduced.

• Different models for logistics and supply chain should be explored.

* Source: DHL
Blurring the lines between the digital and physical worlds, Augmented Reality (AR) will provide new perspectives in logistics planning, process execution, and transportation.

Key features include:

- Hands-free operation (e.g., barcode recognition) results in higher efficiency and error-free processes
- Shorter warehouse handling times
- Reduces costs while simultaneously improving quality and performance
- Faster training due to user-friendly interface and language flexibility

Source: DHL
Disruptive Technologies (6)
Drones

Unmanned aerial vehicles (also known as Drones) can be utilized in multiple development fields.

Survey Drones in Tanzania.

Medical supply delivery in Rwanda.

World’s first drone port for medical supply

- **Survey Drones in Tanzania:**
  - **Redline:**
    - Wingspan: 3m
    - Range: 50km
    - Payload: 10kg
    - Capacity: 100ml
    - Quantity: x20
  - **Blueline:**
    - Wingspan: 6m
    - Range: 100km
    - Payload: 100kg
    - Total: 10 Litres
    - Quantity:
      - x200
      - x50
      - x1.54

- **Medical supply delivery in Rwanda:**
  - Provide medical supplies
  - Efficient in remote areas
These disruptive technologies, used concertedly, help cities convert themselves into smart cities.

- Smart cities are defined as one that “uses of ICT to enhance its livability, workability and sustainability”.*
- It encompasses multi-sectors: transport, water, energy, etc.
- Based on the continued growth of urban populations, Smart Cities will be one that invests in technology and transport to best manage passenger flows and cater to demand for commuting options.

* Source: Hitachi

* Source: Smart Cities Council
These disruptive technologies can enable citizen centered participation

- Create contents, contributing to data generation and service feedback
- Aggregate demand
- Utilise design thinking
- Generate new business models
- Establish start-ups

Important Concepts

- **Digital Disruption** refers to changes enabled by digital technologies that occur at a pace and magnitude which disrupt established ways of creating value within or across markets, social interactions and, more generally, our understanding and thinking.

- **Disruptive intermediation** occurs when a third party enters an industry and provides new digital services that challenge established business models and changes the way in which value is created or distributed. Such businesses that cause such disruption are called Digital Disruptive Intermediaries (DDIs).

* Source: Mikko Koria

Source: Capgemini
Way Forward

How can the disruptive new technologies be effectively utilized in the developing world?

• Showcase the new technologies
  o Accumulate, enumerate, and disseminate cases successfully put in place in well-developed countries
  o Seek partnership with leading governments, global ICT companies, telecom providers, logistics companies, academia
  o Explore financing models for effective implementation

• Underscore the new technologies in high-level agenda (ex. National Transport Strategies)

• Enhance collaboration between Transport and ICT sector in and outside of WBG

• Build common fundamental platforms effectively
  o Cloud computing
  o Broadband infrastructure (backbone, last-mile)

• Establish enabling environment
  o Legal, regulatory, policy on data privacy, and security
How ICTs can help Transport sector (1)

What can ICTs do in order to promote the disruptive new technologies, especially in terms of deployment of common fundamental platforms?

- **Coordinate** with Min. of ICT, telecom regulator, telecom operators, ICT industry.
  - Appropriate frequency allocation for these technologies and applications
  - Engage telecom operators for better connectivity through mobile or fiber infrastructure
  - Support the entire ecosystem

- Promote **cross-sector/inter-agency integration** to deliver bigger development impacts and convince client countries
  - Proactive implementation of shared infrastructure (optical cables, passive infrastructure such as ducts)
  - Downstream data utilization with other sectors (disaster risk management, green growth, social services)
  - Link to national Open Data agenda
How ICTs can help Transport sector [cont’d]

• Provide technical advice in core (or lower-layer) **ICT infrastructure and architecture** which support Transport-related applications/solutions.
  
  o Platforms/Middleware/Registry (ex. MIS, database management)
  
  o Data centers, cloud computing --> cloud-based delivery of transport related applications and services
  
  o Ensuring technological neutrality (Open standards to ensure system interoperability, no vendor lock-in)
  
  o More broadly, Enterprise Architecture (design of ICT infrastructure, based on analysis of business structure, processes, and strategy)

• Address **cyber security**

• **Harmonize standards**: reaching out to Standards Setting Organizations (ex. ITU, ISO, CEN (European Committee for Standardization), IEEE), especially from sector-wide/inter-agency standpoints.
  
  o ITS standards (ex. V2V, V2I)
  
  o Metadata standards for probe data, generated by vehicles about their current position, motion, and time stamp, etc.
Thank you for listening.
Questions?