A Korea’s Approach on Integrated Mobility Services

Jaehyun (Jason) So, Ph.D.
Associate Research Fellow
National Transport Technology R&D Center | The Korea Transport Institute
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I  Background
II  Forthcoming Mobility Services
III  Approaches in Korea
IV  Conclusions
Background

Conventional approach
Urbanization and issues
Issues of Developing Countries
Potentials of Developing Countries
Systems/Services to be
Intelligent Transportation Systems (ITS) are advanced transportation systems that aim to advance, automatize the operation and management of transport systems, and thereby improve efficiency and safety of transport.
Urbanization and Issues

- Aged and single-person society

- Strengthen the emission regulations

Congestion  
Accident  
Pollution

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Urbanization and Issues (cont’d)

Top 20 Megacities in 2025

- 10 Cities from the developing economies.

Note: All figures are rounded; the base year is 2009. Source: Frost & Sullivan
Issues of Developing Countries

<table>
<thead>
<tr>
<th>Area</th>
<th>1,566,5000㎢ (almost Alaska)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>Approx. 3 Million (as of 2016)</td>
</tr>
<tr>
<td></td>
<td>(1.4 M in Ulaanbaatar)</td>
</tr>
<tr>
<td>Resource</td>
<td>Abundant mineral deposits of</td>
</tr>
<tr>
<td></td>
<td>Copper, Gold, Iron, Uranium,</td>
</tr>
<tr>
<td></td>
<td>even petroleum</td>
</tr>
<tr>
<td>GDP</td>
<td>$3627 / person (as of 2012)</td>
</tr>
</tbody>
</table>

Insufficient/aged Infrastructure
(Roads, public transits, etc.)
Highway from UB to Darkhan

Severe Congestion
Vehicle increases but not enough infrastructure

Air Pollution
2nd-ranked worst city in the world
Potentials of Developing Countries

Internet population 2007 vs 2012, a 2x increase in 5-y, mostly in developing countries

Data source: Internet World Stats

www.pingdom.com
Potentials of Developing Countries (cont’d)

Some (developing) countries are more than the global average.

**INTERNET PENETRATION IN SOUTHEAST ASIA**

The number of internet users in each country, compared to the total national population.

- **GLOBAL AVERAGE**: 50%
- **REGIONAL AVERAGE**: 53%

**Jan 2017**

- **Myanmar**: 26%
- **Laos**: 26%
- **Vietnam**: 45%
- **Cambodia**: 53%
- **Thailand**: 67%
- **Malaysia**: 71%
- **Singapore**: 82%
- **Brunei**: 86%
- **Philippines**: 58%
- **Indonesia**: 51%
- **Timor-Leste**: 33%

*Sources: InternetWorldStats, International Telecommunication Union (ITU), InternetStats, CIA World Factbook, Facebook, National Regulatory Authorities.*
Potentials of Developing Countries – Mongolian case

In Mongolia,

‘Mongolia ICT Vision 2021’ led by the Mongolian Gov.

2G/3G/4G-LTE services provided by multiple mobile Comm. service providers.

Mobile connection is possible in most areas as well as Ulaanbaatar.
Systems/Services to be…

We can offer as it was

Thinking… it’s

- Great!
- but, Expensive because it’s a H/W-oriented
- Benefits in a long-term

To make it AFFORDABLE

Systems to be deployed as…

- Cheaper
- Simpler
- Easier

Services to be provided as…

- Greener
- Smarter
- Safer
Forthcoming Mobility Services

Integrated Mobility
Service Example
Finland’s Case
E-Mobility
A Korea’s Approach on Integrated Mobility Services

Integrated Mobility

"Integrated Mobility"

A User-Centric Approach to Mobility-as-a-Service
Enabling real-time (on-demand), door-to-door, multi-modal transport services
Bringing convenience, time & cost savings to mobility users

Intermodal Transportation

ICT Technology
- e.g., wireless Comm., smart devices, (Big) data mining

New Mobility System
- e.g., e-Mobility, AV

(Frost & Sullivan, 2016)
Integrated Mobility Service Example

Everything is a SHARED mobility.

Origin

Cycling

Bus

Metro

AV Shuttle

Destination

Walk

Mobility Big Data Center

Journey plan @ Home

Journey plan @ Bicycle stop

Journey plan @ Bus stop

Journey plan @ Metro

Journey plan @ Shuttle stop

# of Plans

5
Integrated Mobility Service Example (cont’d)

Everything is a SHARED mobility.

Origin

Cycling

Walk

Destination

AV Shuttle

Bus

Metro

Mobility Big Data Center

Journey plan @ Home

Pick-up 8:00 AM

Stop 8:15 AM

Stop 8:35 AM

Stop 8:50 AM

# of Plans

1

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Finland’s Case

All transportation modes

Single journey plan to a destination

Comparison of journey alternatives

Monthly payment or pay-as-you-go

In 2030, vehicles decrease by 97%
Public parkings decrease by 95%
Emissions decrease by 37%
Travel expense decrease by 50%

A tram in Helsinki, Finland Benjamin Horn: Flickr/Creative Commons
# e-Mobility

## e-Micro Mobility

<table>
<thead>
<tr>
<th>Type</th>
<th>Model</th>
<th>Year</th>
<th>Max Speed</th>
<th>No. of Seats</th>
<th>Travel Distance</th>
<th>Travel Time</th>
<th>Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-Bicycle</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>E-Motorcycle</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Smart-Mobility</td>
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</tr>
</tbody>
</table>

## e-Vehicle

<table>
<thead>
<tr>
<th>Model</th>
<th>Year</th>
<th>Max Speed</th>
<th>No. of Seats</th>
<th>Travel Distance</th>
<th>Travel Time</th>
<th>Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>EV, FCEV, Hybrid</td>
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</tbody>
</table>

## Automated e-Transit

<table>
<thead>
<tr>
<th>Model</th>
<th>Year</th>
<th>Max Speed</th>
<th>No. of Seats</th>
<th>Travel Distance</th>
<th>Travel Time</th>
<th>Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Automated e-Shuttle</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**EasyMile**
- Model (Year): EZ10 (2016)
- Max speed: 40km/h
- No. of seats: 8
- Travel distance: 80km
- Travel time: 12hours
- Systems: Lidar, Camera, GPS

**IBM-Watson IoT**
- Model (Year): Olli (2016)
- Max speed: 58km/h
- No. of seats: 6
- Travel distance: 3.48km/kWh
- Travel time: -
- Systems: Lidar, Camera, GPS

**2getthere**
- Max speed: 36km/h
- No. of seats: 12
- Travel distance: 75km
- Travel time: 6hours
- Systems: Detector

**WEpods**
- Max speed: 40km/h
- No. of seats: 6
- Travel distance: 100km
- Travel time: -
- Systems: EZ10 + Radar, Laser

**Navya**
- Max speed: 45km/h
- No. of seats: 11
- Travel distance: -
- Travel time: 13hours
- Systems: Camera, Laser, GPS

**Robosoft**
- Model (Year): robuCITY (2014)
- Max speed: 32km/h
- No. of seats: 8
- Travel distance: -
- Travel time: -
- Systems: Lidar, Camera, GPS
Approaches in Korea

Seoul Metropolitan City

Jeju Special Self-governing Province

Sejong Special Self-governing City
Approaches in Korea (I) – SEOUL Metropolitan City

Mobility Integration

Jurisdictional Integration

- Ministry of Land, Infrastructure and Transport
- City of SEOUL
- City of INCHEON
- Korea Railroad Corporation
- Province of Gyeonggi (Cities)

Internet (Web)
Smart Phone
Mobile Phone
ARS
KIOSK
Integrated Journey Plan

Gwangmyung KTX Station

10.5 km

Korea Agency for Infrastructure Technology Advancement (KAIA)

Integrated Journey Plan:

1. **Gwangmyung KTX Station**
   - Walk to KTX Bus Stop
   - 1 min, 118m
   - Take a Bus #12
   - Remaining 1m 55s
   - 21 min, 13 stops
   - Arrival at Anyang Station Bus Stop

2. **Anyang Station**
   - Walk to Anyang Station
   - 5 min, 276 m
   - Take a Metro Line #1
   - Heading for Myunghak Station
   - Fast Transfer at Platform #9-2
   - 5 min, 2 stops
   - Transfer at Geungjeong Station
   - Heading for Beomkye Station
   - 5 min, 2 stops

3. **Myunghak Station**
   - Arrival at Pyeongchon Station
   - 4 min, 225 m
   - Exit a station through Exit #2
   - Walk to KAIA

Card payment 1,350 KRW

 KAIA
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Toward Integrated Mobility

Increase the green transportation mode share to 80%

2010 70% > 2020 75% > 2030 80%

*Green transportation mode includes public transit, walking, and cycling.

2030 Triple30

Reduce passenger car travel by 30%
Reduce average commute time using public transit by 30%
Proportion of green transportation area 30% increase

GHG emissions
Reduce by 0.2t/y
Energy consumption per citizen

2010 1.2t CO₂/y
0.5t CO₂/y

2020 0.95t CO₂/y
0.4t CO₂/y

2030 0.8t CO₂/y
0.3t CO₂/y

The combined effect of GHG reductions and energy conservation is equivalent to planting 86 pine trees in 2020 and 146 pine trees in 2030. (Such positive impact is the result of changes in the transportation mode share, improved fuel-efficiency, and introduction of eco-friendly vehicles.)

Source: Seoul public transportation (Seoul metropolitan government, 2014)
Approaches in Korea (II) – **JEJU**

**Jeju Integrated Mobility Service (JIMO)**

- BIS-connected integrated service platform and unit devices
- CALM wireless communications
- Mobility center
- Service s/w and smartphone application
- 500 buses, 250 micro-mobility vehicles, 100 Car sharing vehicles, Electric vehicles (private & rent)
Motivations of Jeju

Various Trip Needs & Modes
- Residents & visitors
- Domestic & foreigners
- Tour & business
- Bus, Taxi, Rent-car, e-Bicycle, e-Motorcycle, e-Vehicle

Eco Energy
- Smart Grid test-bed from 2009
- Goals on power supply
  - Up to 50% by wind & solar by 2019
  - 100% of demand by 2030

Public Initiatives
- Vision 2030
  - Heeryong WON
  - Provincial governor of Jeju
- International Electric Vehicle Expo
  - Annually from 2014 to the present
Integrated Mobility in Jeju Island - JIMO

- Schedule Management
- Trip Time Information
- Navigation
- Mobile All Transit

- Mobile App

- Sharing / Reservation (EV, Bicycle...)

- Real Time Transportation Information

- Green Mileage

- Departure Notice

- Origin

- Personal Car
- Car Sharing
- TAXI
- Bicycle Sharing
- Bus
- Airplane
- Rental Car
- EV Rental Car

- Destination

- Micro Mobility

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Approaches in Korea (III) – **SEJONG**

- **Located in the heart of Korea**
  - Approximately 120km (75 miles) from Seoul

- **To promote balanced regional economic development**

- **Established in July 2012**
  - Relocating Korea’s ministries and executive offices from Seoul to Sejong
  - The Korean government designated Sejong as a center of administration, research, education, and high-tech industry.
Auto.-shuttle operations
- 2 routes
- Transfer center
- 11 Stops (entrances of Ministries)
- 10 AM – 5 PM to minimize fractions from surrounded traffic

Northern Line (2.8km)
General Information Room/MOLIT → MOF/MAFRA → MOSF → FTC → OPM → FTC → MOSF → ME → General Information Room

Southern Line (3.3km)
General Information Room/MOLIT → MPVA/MOHW → MOEL → MOTIE → MCST → MOE → MPVA/MOHW → General Information Room
Conclusions

Potentials
Challenges
Concluding Remarks
Integrated Mobility for Developing Countries

Transportation (modes & facilities) has been provided for a while.

Smart device is currently an everyone’s necessity.

Communication Infra. is almost everywhere.

Affordable Solution for Developing Countries

S/W-oriented

Economical but Effective

Toward ‘Integrated’ by ‘connected’
How Much Affordable?

1) Investment on WHIM by Mobility-as-a-Global Co.
2) Investment on GPS+Comm modules in buses (Mongolian case)
Challenges

However,

- **Multimodal transportation system is a base.**
  - Connectivity can be achieved on top of various transportation alternatives.

- **Business models are yet convincing.**
  - Convinced business models that can create values lead active participation of a private sector

- **Localization of S/W (operations and algorithms)**
  - Personalization and customization
  - Effective resource management and users’ satisfaction

- **Not enough experience and conviction on e-mobility and AVs.**
  - Most of e-Mobility systems are just unveiled, and AVs are yet feasible.
Key Messages

Integrated Mobility is an affordable solution not only for developed countries but also developing countries.

- S/W oriented solution
- Relatively low investment (2.2 M Euros for WHIM in Finland)
- Leading a full utility of existing resources

Korea is pushing toward integrated mobility

- Seoul, Jeju, Sejong are running toward integrated mobility based on Korea’s ICT technologies.
- **KOTI is supporting integrated mobility by integrated knowledge.**
Thank you.

KOTI enriches the future by securing harmony among people, the environment and transport

Jaehyun (Jason) So, Ph.D.

Associate Research Fellow
National Transport Technology R&D Center
The Korea Transport Institute
Office: + 82.44.211.3243
Email: jso@koti.re.kr