'Shucle’ and the Potential of Urban Demand-Responsive Transport

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Smart mobility technology of HMC
for Improved Quality of Life

Urban Air Mobility

Mobility Hub

Autonomous Vehicle

Smart Mobility Solution Provider for Human-Centered Cities

출처 = HMG 저널 https://news.hmgjournal.com/Group-Story/?p=161756
9 Out of 10 Koreans Live in Urban areas

https://population.un.org/wup/

https://ourworldindata.org/urbanization
52.5 Mil. USD Yearly Traffic Congestion Cost in the Seoul Metropolitan Area

- **462,000 USD** National Average Traffic Congestion Cost/km
- **3.6 Mil. USD** Average Traffic Congestion Cost in Seoul/km
- **1.17** Average Vehicle Occupancy (Metropolitan Cities)

Korea Transport Institute (KOTI), 2018

News on 2021.7.15: joongang.co.kr/article/24105798#home

![Average Vehicle Occupancy and Single Drivers](Image)

- **Single Drivers 86.2%**
- **Singe Drivers 11.3%**
- **7.4%**

2010 year

2016 year

Average Vehicle Occupancy

Singe Drivers(%)
Neighborhood-Oriented Urban Visions,

Sustainable & Easily Accessible Urban Transportation System in Neighborhood-Oriented Urban Planning for Improved Community Infrastructure & Better Quality of Life

Ville du quart d’heure
(15minute-city / Anne Hidalgo, Mayor of Paris, 2020)

Urban infrastructure offering all everyday-life facilities within a 15-minute walking distance from the residence
Thus eliminating automobile travel in the city, replaced by walking, cycling, and public transit

Long Trip Time & Declining Share of Public Transit

With the nationwide average trip time at 29.2 minutes, car is the most used of all modes of transport (excl. walking), and the share of public transportation is declining every year.

(MOLIT, 2020 Public Transportation Investigation, 2021)

### < Average Trip Length by Travel Purpose >

### < Domestic Transport Modal Share >

<table>
<thead>
<tr>
<th>Mode</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car</td>
<td>54.8</td>
<td>55.1</td>
<td>55.6</td>
<td>55.6</td>
<td>56.1</td>
</tr>
<tr>
<td>Taxi</td>
<td>12.2</td>
<td>12.1</td>
<td>12.0</td>
<td>10.9</td>
<td>10.6</td>
</tr>
<tr>
<td>Bus</td>
<td>20.5</td>
<td>20.2</td>
<td>20.0</td>
<td>18.2</td>
<td>17.9</td>
</tr>
<tr>
<td>Rail</td>
<td>12.3</td>
<td>12.4</td>
<td>12.2</td>
<td>15.1</td>
<td>15.3</td>
</tr>
<tr>
<td>Air</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Maritime</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
<td>0.1</td>
</tr>
</tbody>
</table>

2018 National Traffic Survey - Domestic (2019, MOLIT-KOTI)

### < Modal Share >

Excl. walking

- Car/Van: 13.5
- City Bus: 0.6
- Intercity Express Bus: 3.2
- Other Bus: 10.6
- Subway / Light Rail: 0.3
- Rail / KTX: 1.9
- Taxi: 2.0
- Bicycle: 3.6
Residents in New Towns with Inconvenient Public Transportation System Tend to Rely on Cars

The biggest traffic problem in the new city:
- Lack of public transportation 36.4%
- Parking difficulty 23.7%
- Traffic congestion 22.2%

Problems when using the new city subway:
- Long distance to the station 42.4%
- Long waiting time 17.5%
- No connection between buses 12.6%

Preference for policies to improve public transportation systems in new cities:
- New bus route 30.2%
- Subway network expansion 26.4%

Shucle’s Target Population Group:
Residents in New Towns with Inconvenient Public Transportation System Tend to Rely on Cars

< Seoul Modal Share >
- Car 24.4%
- Bus 25.1%
- Subway 39.9%
- Etc. 4.1%
- Taxi 6.5%

< Gyeonggido Modal Share >
- Car 50.7%
- Bus 27.4%
- Subway 12.4%
- Etc. 9.6%
- Taxi 6.5%
A New medium for short-distance travel, a community mobility service

Anywhere in Town, Free, Safely, and Comfortably

Pleasant and Safe Trips for Kids and Seniors Alike

Smart, Quick Trips via Optimal Routes w/ AI Technologies

Comfort in Company, the More, the Cleaner

Flexible daily travel within a 2km radius living space

Short waiting time, optimal routes, and comfortable travel service

Real-time, demand-responsive ride-pooling service based on virtual stops with AI-created routes

Future urban mobility service with optimized operation, environmental friendliness, autonomous driving, etc.
**User-Centric Flexible Transportation System, DRT**

*On-Demand service is acknowledged as a new possibility for urban public transportation, substituting conventional public transit with frequent dispatch intervals, convenient transfer, and better accessibility, as a first/last-mile mode connected with the conventional public transit network, and as a feeder service to mass transportation modes.*

Ferro, Muñoz, and Behrens 2015; Alpkokin et al., 2016

* On-Demand : Immediate provision of goods and services in the forms desired by the consumer through mobile network or online marketplaces

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**< Operation Methods of Demand-Responsive Transit >**

<table>
<thead>
<tr>
<th>Step</th>
<th>Itenary</th>
<th>Stop</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lv.1</td>
<td>Fixed</td>
<td>Fixed</td>
<td>Similar to the Conventional Public Transit (On-demand)</td>
</tr>
<tr>
<td>Lv.2</td>
<td>Fixed</td>
<td>Fixed</td>
<td>Detour Available (Selective Stops)</td>
</tr>
<tr>
<td>Lv.3</td>
<td>Unspecified</td>
<td>Predefined</td>
<td>Connecting Transportation Hubs (in connection with public transit)</td>
</tr>
<tr>
<td>Lv.4</td>
<td>Unspecified</td>
<td>Unspecified</td>
<td>Similar to Taxis</td>
</tr>
</tbody>
</table>

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**< Potential future public transit systems >**

<table>
<thead>
<tr>
<th>Core, High Capacity Network</th>
<th>Interchange Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Publicly Managed Investments</td>
<td>Private Investments</td>
</tr>
<tr>
<td>Demand-responsive transit routes</td>
<td>Taxis, on-demand chauffer services, ridesharing, car sharing Autonomous (self-driving), electric cars</td>
</tr>
<tr>
<td>Bike share</td>
<td>Light rail</td>
</tr>
<tr>
<td>Pedestrian realm improvements, cycle networks</td>
<td>Bus rapid transit Strategic/ targeted local bus routes</td>
</tr>
</tbody>
</table>

Bellini et al., 2003

McLeod et al., 2017
Tech-Driven Real-Time Demand Responsive Transport Service

Everyday Life Easier

Shucle.
New Public Transportation Mode in New Towns with Limited Mass Transit Accessibility

Sejong City

Paju-Unjeong New Town

Seoul-Eunpyeong New Town

Smart City Regulatory Sandbox Approval*

Starting from Sejong Living Sphere 1, recently expanded into Dajeong-dong, 2021. 4. 13. ~, 18 Vehicles

Limited Transportation Accessibility Areas

In operation in Paju Unjeong New Town District 3 as one of the first public transportation modes in the area upon development for convenient mobility within District 3 and to/from Districts 1, 2, and Gyoha

2021. 3. 9. ~ 2022.4.14, 6 Vehicles

Smart City Regulatory Sandbox Approval*

1-Year Pilot Service in Jingwan-dong, Eunpyeong-gu, Seoul

2021. 12. 18. ~, 9 Vehicles

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Number of Shucle Users Constantly Increasing with Time

- Registered members: 88,810
- Total Requests: 964,307
- Total Ridership: 949,975

Data on 2023.1.18.
High **Satisfaction** and Recommendation Rate

**Usage Status**

*Sejong City*

- **Intention to Recommend Shucle**
  - Strongly agree: 56%
  - Agree: 26%
  - Somewhat agree: 14%

- **Satisfaction**
  - Score: 88

- **Continuous Usage Intention**
  - Score: 94

- **Recommendation willingness**
  - Compared to last year: ▲ 14%

*Paju-Unjeong New Town*

- **Intention to Recommend Shucle**
  - Strongly agree: 49%
  - Agree: 18%
  - Somewhat agree: 25%
  - Neutral: 14%

- **Satisfaction**
  - Score: 84

- **Continuous Usage Intention**
  - Score: 92

- **Recommendation willingness**
  - Compared to H1: ▲ 2%

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High Female Customer Ratio and Diversity in User Age Group

User Gender Ratio

<table>
<thead>
<tr>
<th>Gender</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>69%</td>
</tr>
<tr>
<td>Male</td>
<td>31%</td>
</tr>
</tbody>
</table>

User by Age Group

**Sejong**

- **Youngest User**: 9 years
- **Oldest User**: 100 years

**Paju**

- **Youngest User**: 10 years
- **Oldest User**: 100 years

- Data as of late January, 2023

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Similar pattern to the public transportation peak time periods in the commuter rush hour

< Temporal trip distribution: Weekdays in Sejong >

< Temporal trip distribution: Weekdays in Paju >

* Data on weekdays from 2022.12.1 ~ 12.31.
Even Temporal Distribution and High Ratio of Teenagers

expected to be intra-neighborhood travels to private tutoring centers, etc. based on teenager travel characteristics.

< Temporal trip distribution : Weekends in Sejong >

< Temporal trip distribution : Weekends in Paju >
Various Travel Demand Reflecting Urban Characteristics

Sejong Living Sphere 1

Boarding Stops in the Last Month

Paju-Unjeong New Town

Data on 2022. 1. 17.
Various Travel Demand **Reflecting Urban Characteristics**

**Sejong Living Sphere 1**

**Paju-Unjeong New Town**

**Boarding point variation**
by time on weekdays

Data on 2022. 1. 17.
Better Accessibility Compared to Public Transit and Similar Travel Purposes

Walking time to the stop

<table>
<thead>
<tr>
<th>Traffic Purpose</th>
<th>Public Transit 7.8 min</th>
<th>Shucle 3 min</th>
<th>Sejong 2.4 min</th>
<th>Paju 3.6 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Commute 28.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Leisure 26.9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Shopping 16.7%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Business 13.4%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. School 11.9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Private Educational Institute 2.4%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2020 National Traffic Survey - Domestic (2021, MOLIT)

Shucle User Survey (Dec. 2022)
Better Convenience Compared to Public Transit

Reasons for Choosing Shucle

1. **No bus routes** to the destination or **inconvenient transfer**

2. **Available at any time** I want

3. **Faster travel** via optimal route

4. **Better walking accessibility** to stops

5. **Designated seats & comfortable in-vehicle experience**

n=357, '22. 12.
No Restrictions in Daily Life for Everyone,
Voices of Shucle Service Users

“I’m very satisfied with Shucle’s dynamic routing system helping me save time~”

“It is very convenient to get to places without my own car. I feel eco-friendly, too.”

“It is much easier to take my children to the doctor’s office, thank you Shucle~”

“My range of activities has expanded.”
Preparing for the future while Smartly solving today's Urban problems

- Optimized Vehicles for Comfortable Mobility
- Visual AI Technology-Based Boarding Recognition
- Self-driving shuttle pilot service
Smart Mobility for the **Future of Urban Public Transportation**

- **UAM Service Flow**

Departure: Ride Request → Pick-up → Drop-off → Vertiport Transfer → On-Boarding

Destination: Drop-off → Pick-up → Take off → Vertiport Transfer

**Integrated Mobility Service Platform, Shucle**
‘Integrated Mobility Service Platform’ as an Urban Infrastructure in Smart Cities Connected to Diverse Future Modes of Transport
E.O.D