Influence of ICT on Mode Choice and Public Transport User Behavior: Korea

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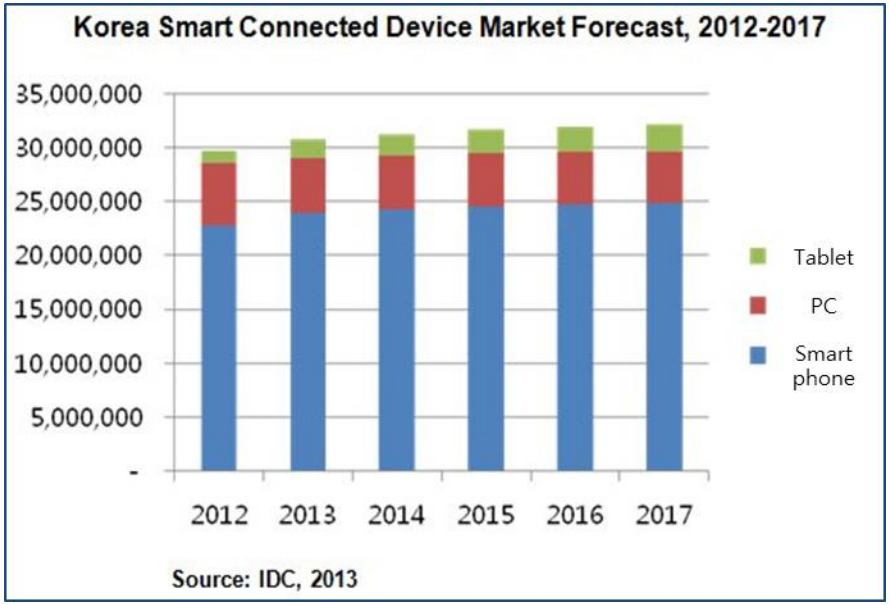
This presentation is based on Sungwon Lee, Gyeng Chul KIM, Seungkook Wu and Jieun OH (2014)

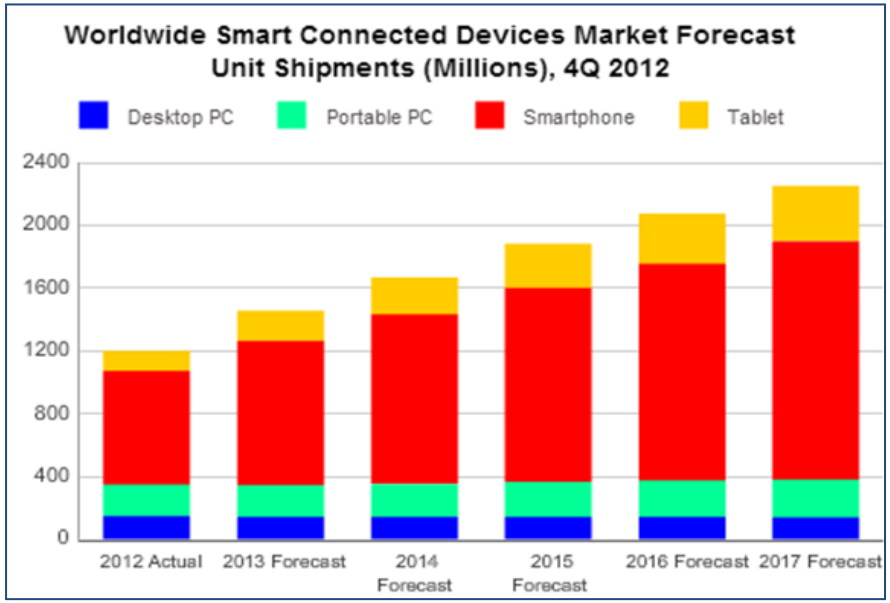
CONTENTS

ICT Connectivity and Transport

Advances in ICT and its Implications

- Proliferation of ICT devices in Korea and in the world
- The world is becoming more and more connected





Changes in our lifestyle and its implications for transport

- ✓ Intelligent multi-purpose devices with ICT convergence
- ✓ Provide various transport services integrated with ICT

Literature Review

- Advances in ICT and travel demand models

  - Travel costs and travel time are the main attributes in modal choice models
  - A number of studies found that Information technology development and penetration of ICT devices (like smartphone) change the life, challenging the notion about travel (Lyons and Urry, 2005) and the disutility of transit modes.
  - Sustainable Development Commission (2010) reported that "the ability to stay connected and turn travel time into productive work time can be a significant attraction for business travelers.

Literature Review

- Advances in ICT and its implications for travel
  - Travel time can be productive with ICT Lee-Gosselin and Miranda-Moreno (2009)
  - A survey of Chicago Transit Authority train riders suggests that the riders use time and money in better way than drivers (Frei and Mahmassani, 2011)
  - Connolly, Caulfield, and O'Mahony (2009) found that multitasking is extremely common while traveling by rail and smartphone users would benefit from internet connection in trains
  - Gamberini et al. (2012) found that even if the travel length is relatively short, train riders engage in several activities especially for those using mobile ICT devices

ICT amenities in public transport in Korea

Information Utility in Intracity Bus

City/Province	Wi-Fi availability in Bus
Seoul	◦ 97×× Bus ◦ Metro Bus, Gyunggi Province Bus
Busan	◦ 63 bus lines
Daegu	◦ 11 bus lines
Incheon	◦ Circular 7 Lines ◦ Metro 18 Lines
Gwangju	◦ 17 lines
Daejeon	◦ Kyungick Bus KT Wi-Fi available ◦ Other lines SK Wi-Fi available
Ulsan	-
Gyeonggi-do	◦ Gyunggi buses ◦ Metro Bus
Gangwon-do	-
Chungcheongbuk-do	◦ Woojin and Dongil Bus KT Wi-Fi available
Chungcheongnam-do	-
Jeollabuk-do	-
Jeollanam-do	◦ Gyangyang City Bus KT Wi-Fi available ◦ Mokpo City KT Wi-Fi available
Gyeongsangbuk-do	◦ Gumi City KT Wi-Fi available
Gyeongsangnam-do	◦ Machang and Dongyang Bus KT Wi-Fi partial
Jeju	◦ 12 Bus lines

*Source: http://gall.dcinside.com/board/view/?id=bus&no=266582

Figure 1 Seongnam City Bus Wi-Fi

Figure 2 Wi-Fi users in bus

ICT Amenities in Rail

- KTX (Express Rail)
  - KTX provides free wifi service
  - KTX car number 5 and 13 have PC's for internet

Figure 3 KTX Wi-Fi (Left) and KTX-Sancheon business room (Right)

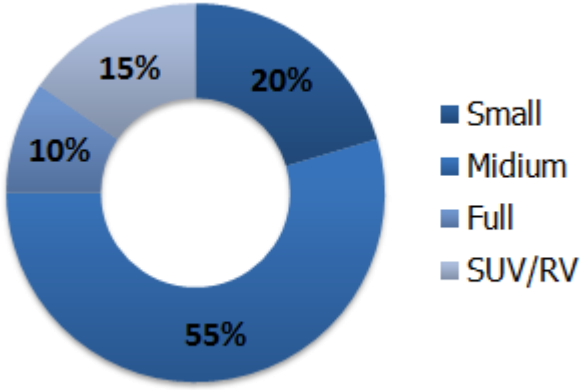
- Subway
  - Metro rail stations and vehicles provide Wi-Fi services (SKT and KT)

Figure 4 Wi-Fi use case in subway(Left) and Wi-Fi equipment in passenger car (Right)

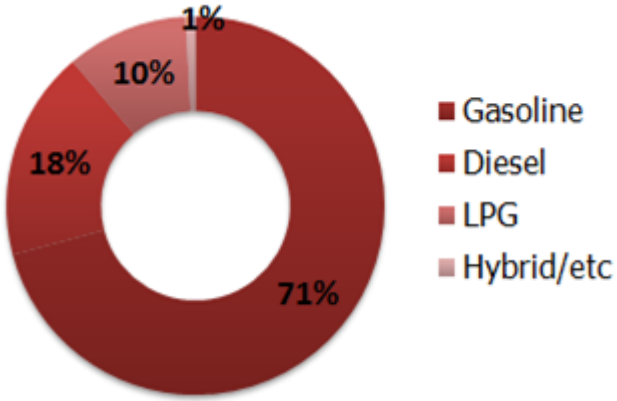
Base Statistics

Car User Characteristics

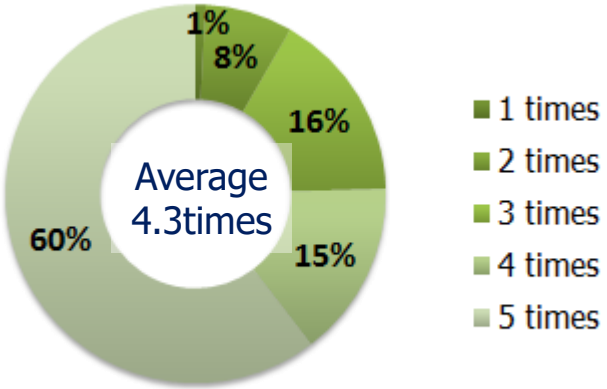
- Vehicle characteristics



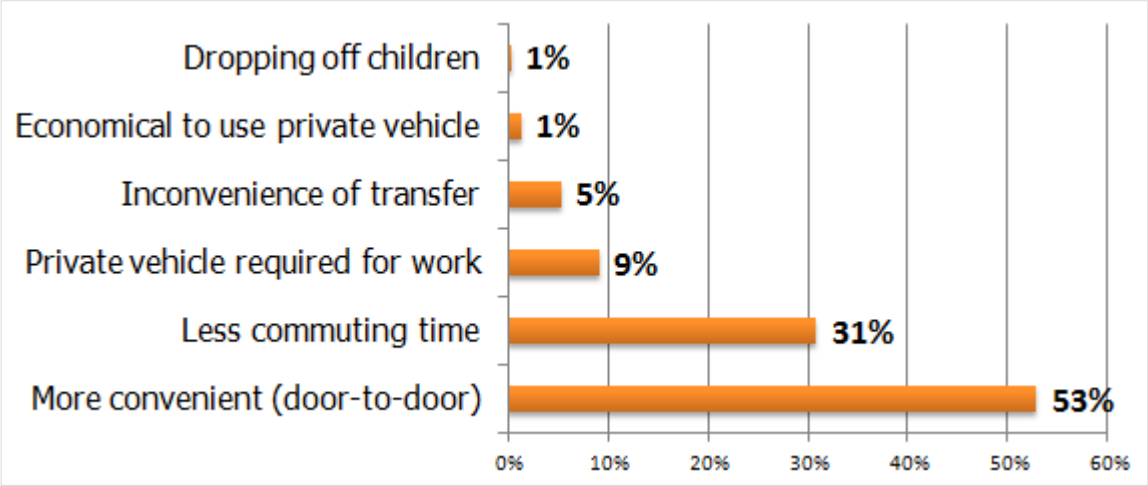
- Types of fuels



- Frequency of using private vehicle for commuting

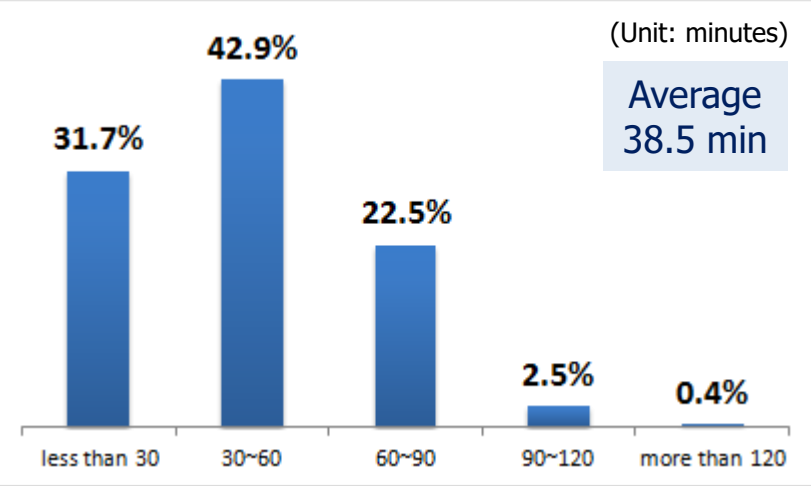


- Reasons for using private vehicles

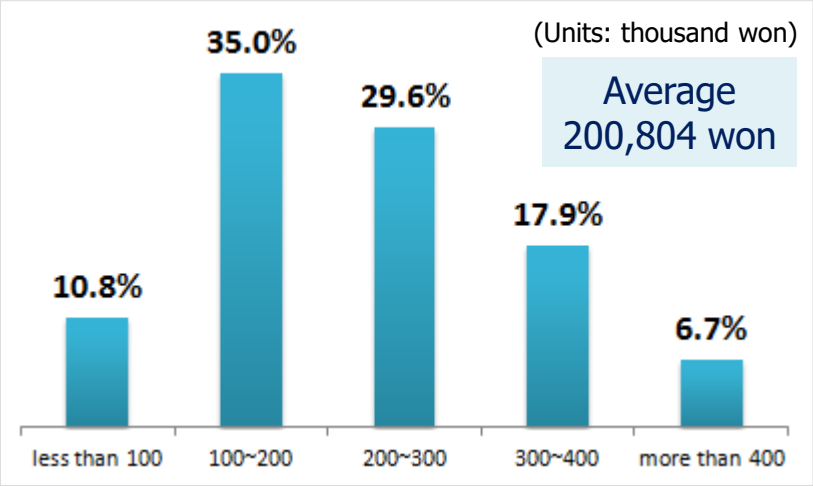


Commuting Travel Behavior

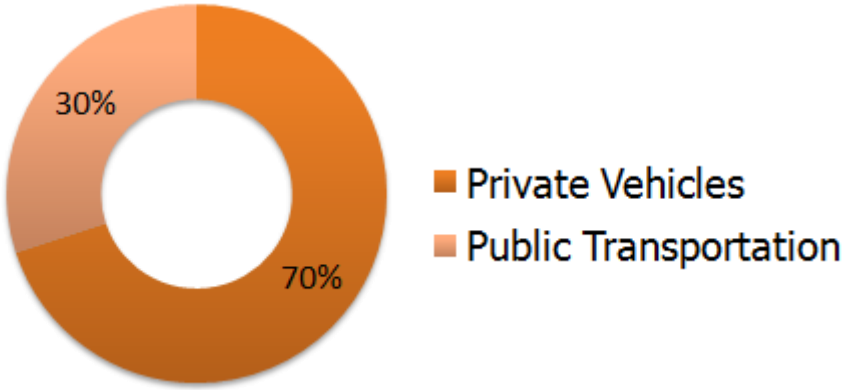
- Average time required for commuting



- Average travel cost per month

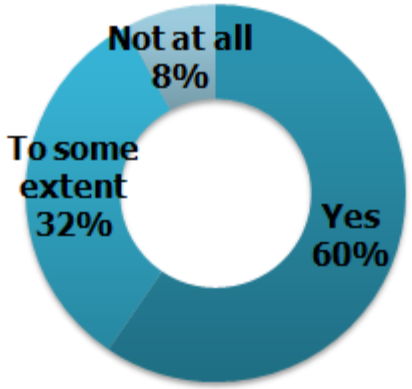


- Modes of transportation seperate from commuting

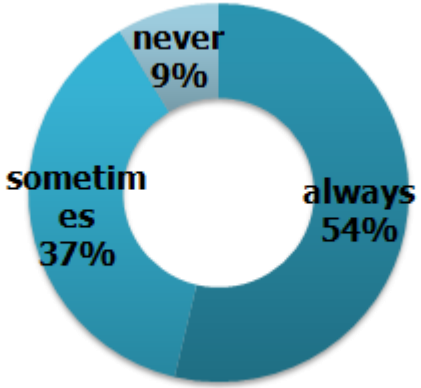


ICT Device Usage in Public Transportation

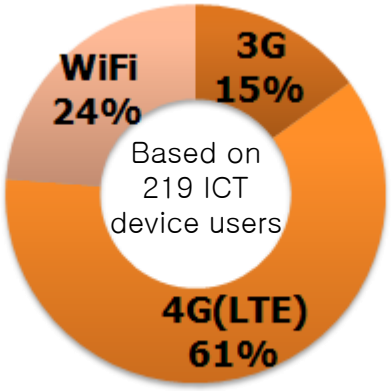
- Recognition of free Wi-Fi service in public transportation



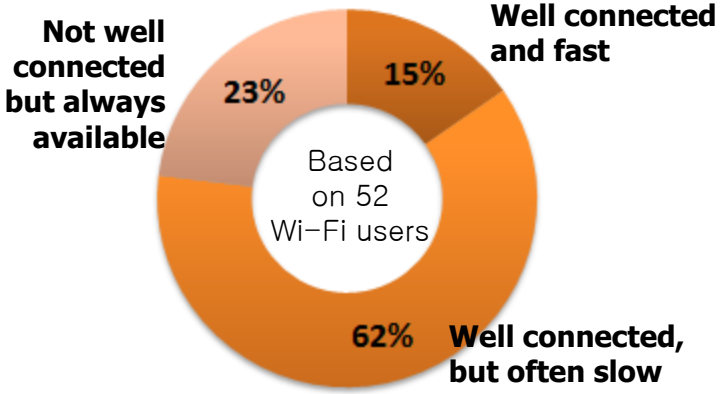
- Use of ICT devices on public transportation



- Network services when using ICT devices on public transportation

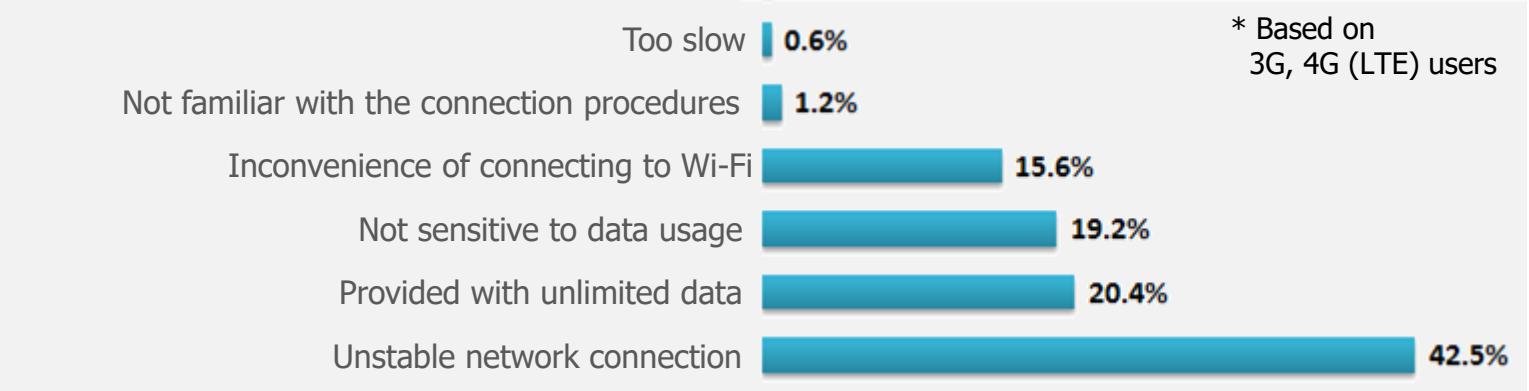


- Wi-Fi condition of ICT devices on public transportation

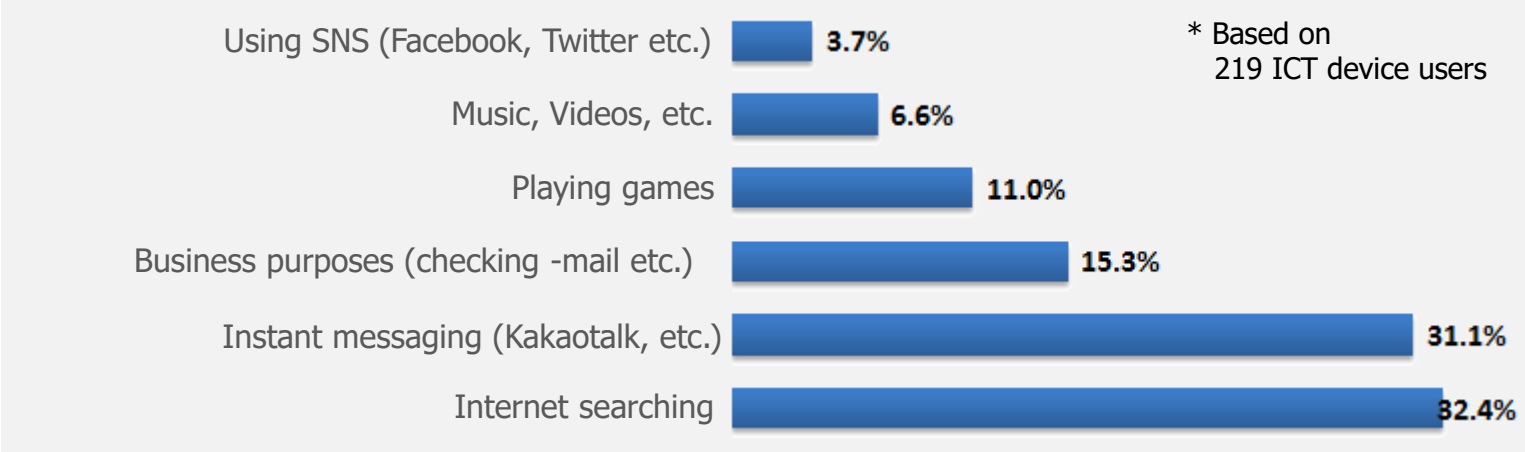


ICT Usage Behavior in Public Transportation

- Reasons for not using Wi-Fi on public transportation



- Purposes of using ICT devices on public transportation (Multiple responses)



Stated Preference Analysis for ICT's Impact on Travel Behavior

- Stated preference methodology for impact analysis of hypothetical transport policy measures

  - Bases for scientific transport policy intervention

- Econometric testing of transport policy related hypotheses

  - Perceived vs. real cost of transport

- If variables are too numerous and too widely varied

  → impossible to create all possible sets of SP questionnaires
- Use fractional factorial plan which analyzes only main effects and guarantee the orthogonality of variables following Kocur et al. (1982) and Hensher (1994)
- SP design of mode choice between passenger cars and alternative modes of bus and subway
- Explanatory variables

  → travel expense, travel time, and service levels (ICT amenity levels: free Wi-Fi and etc.)

Utility functions

$$U_{car} = \alpha + \beta_1 \cdot Cfuel + \beta_2 \cdot Ctime$$

$$U_{mass} = \beta_3 \cdot Mict + \beta_4 \cdot Mtime$$

where ***mass = bus or subway,***

- **Surveyed on 240 car users → binary choice with multiple levels of attributes → 3,840 effective data points**

Coefficient Estimation for Respondents Who Declared Bus as Alternative

	Coefficient	Standard Error	Prob. |z|>Z*
CFUEL	-.14258D-05***	.4319D-06	-3.30
CTIME	-.04316***	.00761	-5.67
MICT	.33463***	.06910	4.84
MTIME	-.04156***	.00666	-6.24
A_CAR	.25930	.17834	1.45

Note: nnnnn.D-xx or D+xx ⇒ multiply by 10 to -xx or +xx.
Note: ***, **, * ⇒ Significant at 1%, 5%, 10% level

- Most attribute variables are statistically significant, except car constant
- Positive car constant → But not statistically significant: No intrinsic car preference
- Time related demand elasticity is much higher than cost related ones
- ICT amenity related elasticity is positive → Implying fairly positive role of attracting car users into public transport

Coefficient Estimation for Respondents Who Declared Subway as Alternative

	Coefficient	Standard Error	Prob. |z|>Z*
CFUEL	-.94589D-06***	.3209D-06	-2.95
CTIME	-.02434***	.00530	-4.60
MICT	.23738***	.06988	3.40
MTIME	-.02399***	.00463	-5.18
A_CAR	-.11309	.18785	-.60

Note: nnnnn.D-xx or D+xx ⇒ multiply by 10 to -xx or +xx.
Note: ***, **, * ⇒ Significant at 1%, 5%, 10% level

- Most attribute variables are statistically significant, except car constant
- Negative car constant → But not statistically significant: No intrinsic car preference
- Time related demand elasticity is much higher than cost related ones
- ICT amenity related elasticity is positive → Implying fairly positive role of attracting car users into public transport
- Similar result to Bus User case

Policy Implications and Conclusion

- Demand elasticity of ICT amenity lies just between cost and time variable

  → Implying higher response than price related policy options

- Providing higher ICT connectivity in mass transit could attract car users to MT by making travel time more enjoyable or productive

- Reducing travel time is still most powerful policy measure for modal shift towards MT

Policy Implications and Conclusion

- No intrinsic car preference in our survey unlike previous ones

- ICT revolution will change the way people travel

  → Riding MT could be productive

The Korea Transport Institute will take the initiative

In making transport policy to improve the quality of lives of the people

Thank you!

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