Smart Cities in India
Branded or brain-dead?

Track 1: Limitless cities and urban futures
1.7: Planning for megacities - Efficiency

Vaishali Aggarwal
analysing the transformation of Delhi and contextualizing the existing issues of mobility systems, innovative influences for smart mobility and seek what can accelerate this adoption on urban patterns impacting the socio-economic, technical, environmental, spatial, political and cultural parameters in order to build the strategies for the future patterns of movement within the city.
Smart city
The next buzzword - or the next opportunity?
Megatrends

1. **Urbanization**
   Increase of global urban mobility demand by 68% by 2050

2. **Climate change**
   80% reduction in global emissions needed by 2050

3. **Changing demographics**
   Aging population with changing structure of households

4. **Energy & Resources**
   Global resource use will be tripled to 140 billion tons/year by 2050

5. **Technology convergence**
   50 billion things are expected to connect with mobile data users to 4.3 mn by 2020
Trends influencing India

1. Urbanization
   Demographic transition from rural to urban, 600 million population by 2030 will contribute 40% India's population

2. Rapid motorization
   Highest vehicle population causing 71.8% environmental damage

3. Decreasing share of NMT
   Transportation budget increased by 50% per household
Why Delhi?

Demographics  |  Economic profile  |  Government complexities

(source: data—world bank & DDA 2015; drawn by author)
Scenario in Delhi

overall problems in public transportation in Delhi
- lack of modal integration, poor asset management, unable to leverage citizens on management of infrastructure, inefficient business processes, inefficient workforce & resource management

mass transit system
- lack of public transport usage
- low overall capacity, low peak capacity, lack of accurate demand projections, equipment aging, poor maintenance & lack of funding.

backbone infrastructure
- planning of backbone infrastructure, low capacity
  - lack of high ridership corridors, low overall capacity, low peak capacity, lack of accurate demand projections, lack of funding, aging infrastructure, insufficient audits during construction, lack of funding.

last mile connectivity
- low walkability, use of bicycles & more private transport
  - improper urban planning, poor maintenance, improper urban design, safety, Poor quality of internal roads, no lane demarcation

traffic management
- improper traffic management
  - less traffic management staff, system breakdown, lack of accurate traffic projections & real time data, less staff for law enforcement

transit
- lack of appropriate physical infrastructure, & online information
  - inadequate parking spaces, less multi-modal transit hubs, lack of real time information, asset management, improper routing options

consumer
- high travel demand
  - higher number of trips, longer distances

problems in the existing public transportation of Delhi; Source: data- Accenture NASSCOM report, drawn by author
SAFETY

1,850 death every year on roads of Delhi, 23% of total roads accidents in India, on avg 4 out of 5 deaths on avg are pedestrian and two wheelers.

14%
On-street parking

40%
Pollution by private vehicles

0.70
Metric tons/person- carbon footprint

DATA SOURCE
IIT Delhi (2015)
There is no data to suggest that odd-even scheme has any impact on decrease in vehicular pollution, the fluctuations in PM10 & PM2.5 is due to changes in weather & wind patterns - Central pollution control board (CPCB)

Buses get a bad rap and are always seen as the second, or third best option. What we’ve learned through our work is that rebranding the whole service has helped – Dasgupta WRI

1. Policy
2. Failure in controlling pollution
3. Inconvenience for masses
4. Police under pressure

why failed?

1. Design issues- lack of planning, bad design, wrong location, unsafe
2. Operations- traffic enforcement, bus operations, traffic signals, supportive infrastructure
3. Transportation bureaucracy & approach
4. Media influence

Scarapped after 6 years
Barriers

1. **Governance**
   - Political instability, lack of cooperation, institutional gap

2. **Economic**
   - Shortage of high IT infrastructure, unpredictability of global economy

3. **Social**
   - Lack of citizen participation, inequality, changing lifestyles

4. **Technology**
   - Lack of technological knowledge and access to technology, privacy and security issues

5. **Environmental**
   - Growing population, urban sprawl, carbon emissions

6. **Legal & ethical**
   - Cultural issues, lack of women safety, issues in openness of data and lack of transparency
8 key technologies

- automated vehicles
- connectivity using ICT
- big-data intelligent user app
- Internet of things
- Sensor innovative material
- User-centered
- Pricing & payment
- Public-private innovation
<table>
<thead>
<tr>
<th></th>
<th>Persona</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Regular car user</td>
</tr>
<tr>
<td>2</td>
<td>City dweller</td>
</tr>
<tr>
<td>3</td>
<td>The snail pace</td>
</tr>
<tr>
<td>4</td>
<td>The roadie</td>
</tr>
<tr>
<td>5</td>
<td>Weekend warrior</td>
</tr>
<tr>
<td>6</td>
<td>The tourist</td>
</tr>
<tr>
<td>7</td>
<td>Occasional user</td>
</tr>
<tr>
<td>8</td>
<td>Informal user</td>
</tr>
<tr>
<td>9</td>
<td>Alternative walker</td>
</tr>
<tr>
<td>10</td>
<td>The dependent</td>
</tr>
</tbody>
</table>
Rajesh Tiwari, 40
Deprived
Labour, Retail shop, Delhi

Lower income
“In this city, a cycle is a symbol of poverty hawk eyes and cat moves”

Tanya Gupta, 33
Seeker
School teacher, Primary school, Delhi

Middle income
“Will I ever reach to work on time?”

Rahul Singh, 45
Striver
Businessmen, Private owner, Delhi

High income
“If you have a car, you are treated like a king. If you come by bus or metro, then you are a second-grade citizen.”
## User Journey

<table>
<thead>
<tr>
<th>User Profile</th>
<th>Emerging Trends</th>
<th>User Journey</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sanchit, 18</strong></td>
<td>Intelligent system &amp; real-time data interaction</td>
<td>6:30 am</td>
</tr>
<tr>
<td>- School student, have cycle</td>
<td>- sensitive to time</td>
<td>- gets notification on smart watch about the traffic on the road for safer and quicker travel</td>
</tr>
<tr>
<td>- depends on parents</td>
<td>- mobile &amp; seamless interaction</td>
<td>- through intelligent &amp; social networking, his family got notified that he reached school Integrated &amp; quick journey to reach destination</td>
</tr>
<tr>
<td>- seamless integrated mobility information</td>
<td>- uses social network</td>
<td><strong>Rahul, 28</strong></td>
</tr>
<tr>
<td>- fast &amp; convenient lifestyle</td>
<td>- eco-economic shift &amp; measurable consumption</td>
<td>- plans her travel from home using phone &amp; with the help of internet of things for seamless &amp; efficient user experience</td>
</tr>
<tr>
<td>- sensitive to time</td>
<td>- sharing economy</td>
<td>- through intelligent connectivity, predictive pattern &amp; anticipated needs empowers decisions &amp; incentives. Shift to user ship, seamless payment</td>
</tr>
<tr>
<td>- tech freak</td>
<td><strong>Max, 30</strong></td>
<td>8:00 am</td>
</tr>
<tr>
<td>- moderate sensitive to price</td>
<td>- privacy threats &amp; customized experience</td>
<td>- takes train after reaching airport for the hotel where accommodation preferences are notified on the phone</td>
</tr>
<tr>
<td>- healthier living</td>
<td>- logistics impact</td>
<td>- reaches hotel where the future disruption gets notified on smart watch for safe, customised, efficient &amp; connected travel to mini/macro stress</td>
</tr>
<tr>
<td><strong>Prem, 80</strong></td>
<td>Ageing society &amp; digital gap &amp; algorithmic intelligence</td>
<td>1:00 pm</td>
</tr>
<tr>
<td>- living on pension</td>
<td>- social point of view using public sharing transportation</td>
<td><strong>Prem, 80</strong></td>
</tr>
<tr>
<td>- prefers comfort over price</td>
<td>- ageing society</td>
<td>- reaches hotel where the future disruption gets notified on smart watch for safe, customised, efficient &amp; connected travel to mini/macro stress</td>
</tr>
<tr>
<td>- less income, uses mobile on demand &amp; enjoys personal mobility</td>
<td>- digital gap &amp; algorithmic intelligence</td>
<td><strong>Prem, 80</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- pays for the Uber via phone after reaching to the doctor and books his next travel after one hour to go to restaurant</td>
</tr>
</tbody>
</table>
## Future scenario

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Road ahead</td>
</tr>
<tr>
<td>2</td>
<td>Living glocal</td>
</tr>
<tr>
<td>3</td>
<td>Digital divide</td>
</tr>
</tbody>
</table>
This scenario is notable by the lower per capita travel and the high use of digital substitution of ICT, user applications and internet of things for travel. Changes in the environmental and social behaviour for travel demand is visible with focus on uplifting the informal transportation. Increased employment and last mile connectivity. In this scenario, automation is not widely adopted by the public.

11,000 new e-rickshaws are expected to ride on the streets of Delhi every month by 2021 where annual sales are supposed to increase by 9 percent, $1.32 billion market (Economic times, 2018). Demand of informal travel will be increased with affordable technology by 2040.

E-mobility is shaping the informal transportation for Delhi with the increased use of e-rickshaws, thelas, etc. which play a significant role for enhancing the last mile connectivity and thus improving the air quality of Delhi. Trends like electrification, shared mobility & connectivity would be disruption in this scenario. However, due to several loopholes, initiatives have to be taken by the government to improve the informal transportation sector (Down to earth, 2018).

Though the travel will be much more expensive by 2040 in this scenario for informal sector due increased road pricing, digitalisation, higher travel demands but a change in the acceptance and commuter’s behaviour would be visible due to improved technological advancement in transportation industry with rise in ride-sharing apps, travel information applications with increased user’s experience for seamless travel.
Rising demand for self-driving cars and power sources like biofuels, electricity and hydrogen cells then the traditional fuels is expected to bring a revolution with game-changing possibilities for the future in the transportation industry. According to Gace (2012), it will not just be enough to sell personal transportation with the rising demand of personalized driving experience from people which keeps them connected to everything significant to them like friends, schedules, music, information, etc and therefore suggested that the mobile phones and data networks should be embedded and connected in the car modules that allows controlling the functions remotely with more efficient travel management, capturing of real-time traffic data and managing the traffic flow using intelligent transportation system, latest communications and computer controls for the seamless and integrated vehicle-grid system.

1. Linking the smartphones with cars might also get outdated soon within couple of years, so will the consumers still would prefer wireless module of cars which allows connectivity and communication with the cars?
2. What type of user applications or software would be developed to ensure standardized interest of driving?

1. Combination of various vehicular communications on a single platform
2. Addressing the concerns of security
3. Resolving the privacy issues
4. Development in the connectivity and ICT standards
Transportation industry is moving towards the notion where services will no more be priced statically due to widespread of mobile technology, location-based services, and predictive forecasting will allow to pay actual costs of the services used where the price (supply) would be based on the demand which will allow the users to make better decisions about their travel as per their needs to optimize the increased efficiency in the transportation system. This will allow the commuter to choose their between the lowest cost and quickest routes with the help of real-time reporting traffic conditions for their final destination.

1. Who would be in charge to determine the difference between the benefits, losses or negative impact of the system where the providers have set the prices according to the demand, congestion, availability and other considerations of the services on their own? What will be the overall impact for setting the prices as per demand which would create the economic divide on the basis of congestion and freedom to drive?
2. Should there be a potentially competitive market for the mobility as a service or should the pricing be dependent on the community or economic back ground of the social group for the commuter?

How to get there?

1. By exploring new payment business models
2. Promoting digital payments
3. Predicting about the needs and desires of the future transportation market
Existing transportation systems lack in connecting all the various transportation systems directly but with the rise of networked cars, awareness, social network, the future of transportation will be based on socially informed decisions of the communities, government, traffic controllers, real-time travel conditions, people’s advice and community values from people who have already used it for experiential travel. Creating gamified experience which encourages fitness, saves money and provide business benefits and loyalty with the users to the services.

**Concern**

1. Difficulties in getting a holistic view as information would be scattered and based on the decisions of various people.
2. Might create differences with the people who will not be able to attend the network or lack the ability to influence or engage to become second-class inhabitants. Will these people be able to take the benefit of such social network system?

**How to get there?**

1. Analysing the changing behaviour and designing user-centric solutions.
2. Providing social points as incentives and creating a gaming experience for users which allows to compare their social points for changed travel behaviour.
Conclusion

- Concern is not about trip to work and back but having desirable multiple journeys to sustain the lifestyle without the exaggeration of issues in commuting (multiple modal shift)
- inclusivity and adaptability along with the consideration of the dynamic socio-cultural background (scale, demography, class and religion)
- technology can improve the effectiveness and efficiency and increase the capacity of the existing transportation network and with the New business models
- absence of ‘self-reflexivity’ and attitude to merely ‘get things done’ rather than highlighting the ‘indigenous modernity of Delhi’ contributes to the ignorance of the potential of leveraging the transformation of social and economic aspect of the city.
- Improvement with new choices for individual trip-making, better information for smarter decision making and system optimisation for utilizing the infrastructural efficiency, unified service of seamless travel, safe and sustainable travel experience.
- Technology will only enhance the future of smart mobility if the technology works around the ‘existing behaviours’.