SMRT’s Platform Screen Door & IT Technology

Hangjae Chung
Seoul Metropolitan Rapid Transit corp. (SMRT),
Manager, R&D headquarters
Seoul, South Korea
<table>
<thead>
<tr>
<th>Company</th>
<th>Seoul Metro</th>
<th>SMRT</th>
<th>Metro 9</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation Line</td>
<td>4 (Lines 1~4)</td>
<td>4 (Lines 5~8)</td>
<td>1 (Line 9)</td>
<td>9 Lines</td>
</tr>
<tr>
<td>Length (km)</td>
<td>135</td>
<td>152</td>
<td>27</td>
<td>314</td>
</tr>
<tr>
<td>Stations</td>
<td>117</td>
<td>148</td>
<td>25</td>
<td>290</td>
</tr>
<tr>
<td>Capacity (1,000 p/day)</td>
<td>3,972</td>
<td>3,236</td>
<td>625</td>
<td>7,833</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Line</th>
<th>Line 5</th>
<th>Line 6</th>
<th>Line 7</th>
<th>Line 8</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (km)</td>
<td>52.3</td>
<td>35.1</td>
<td>46.9</td>
<td>17.7</td>
<td>152</td>
</tr>
<tr>
<td>Stations</td>
<td>51</td>
<td>38</td>
<td>42</td>
<td>17</td>
<td>148</td>
</tr>
<tr>
<td>Passengers (1,000 p/day)</td>
<td>1,146</td>
<td>607</td>
<td>1,180</td>
<td>302</td>
<td>3,236</td>
</tr>
</tbody>
</table>
SMRT has grown as the center of Seoul transportation since its foundation in 1994.

Operation of 4 lines of 152km with 148 stations (Largest in Korea)

Transportation of 1.2 billion passengers in 2009

Korea's first & largest driverless possible automatic driving subway operator
Overview

1. **Budget saving of COST CENTER(PSD)** with NEW technology
   ➔ **NEW technology**=Modular construction method + IT

2. SMRT’s Infrastructure[including COST CENTER(PSD)] becomes a great **REVENUE PRODUCER** by IT business
   ➔ **SMRT mall business**

3. Efficient & budget saving Maintenance of SMRT’s Infrastructure by **mobile IT** [including COST CENTER(PSD)]
   ➔ **SMRT Talk & Flash(T&F)**
     ➔ **UTIMS(Urban Transit Infrastructure Maintenance System)**
## Benefits of SMRT Platform Screen Door (PSD)

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accidents/year</td>
<td>22 → 0</td>
</tr>
<tr>
<td>Air contamination</td>
<td>131 μg/m³ → 80 TR</td>
</tr>
<tr>
<td>HVAC Energy consumption</td>
<td>300 → 170</td>
</tr>
<tr>
<td>Ambient noise</td>
<td>78 → 70 dB(A)</td>
</tr>
</tbody>
</table>
At the end of 2009, all PSDs were installed (148 stations of Seoul subway lines 5,6,7 & 8)

Early problems
- Impossible to raise outside capital
  ➔ Basically within SMRT’s own budget (COST CENTER)
  - Seoul Metropolitan Government’s support:
    ➔ $24,272,098 (US $); Only 10% of total PSD construction cost

- Difficult technical problems
  - Interfaces among PSD, train & signal system
SMRT’s Strategy & Philosophy on PSD construction

- Minimum Construction & Maintenance costs
  - New technology development (including IT)
  - Shortest possible construction method

- Construction without any hindrance to passenger transportation
TRANSITECH
New Technology & Fastly Installed PSD

Station control system
- Station control system
- Platform operation unit
- Door control unit
- Driver operation unit

Integration part
- Integration control
- Stop location detector
- Driver monitor screen
- RF devices

Center control system
- Center computer
- Maintenance system
- Monitor system

Structure
- Build PSD with safety and reliability

Driving part
- Driving motor
- Locking device
- Door engine

Power supply
- Distribution panel
- Earth
- Power supply

Test Bench
Platform side

1. Platform operation unit
2. Railway gate
3. Power supply
4. ATO

Railway side

1. Test bench
2. Central Control System
3. Station control system
4. Door engine

Stop location device
Driver operation unit
Driver monitor screen
Train distance detector
Ground RF device
Car RF device

New Technology & Fastly Installed PSD
Central control

Remote Monitoring

Data recording

Reporting

Remote Emergency PSD control

Central Computer

Maintenance system

Monitoring system
TRANSITECH
New Technology & Fastly Installed PSD

New screw type driving unit development

Maintenance Free
Self Lubrication

Door Engine

30 year life time
Slim & Compact
No belt (No Adjustment)

Conventional Belt type (10 year life time)
Prevents wrong wiring by module harness job at the factory.
Just connector to connector connection completes the installation.
No error, no wrong wiring by module harness type.
SMRT PSD construction steps (Modular method)

Step 1: Conveyance by motor car
Step 2: PSD on platform
Step 3: Upper structure
Step 4: Finishing panel
Application of wind pressure resistance appropriate for underground character

- Solution of high cost of construction
  - Wind pressure measurement at maximum speed
  - Joint research with domestic technical institute

- Slimmed, light weight structure
  - Elegant appearance
  - Reduction of construction cost and period

→ **Weight reduction: 1 ton / station**

※ Patent Right
Newly developed modular method

- UNIT assembly at the factory
  - Homogeneous quality
  - Cost reduction by line production

- Conveyance by motor car & construction on the same day
  - No piling up of materials
  - No inconvenience to passengers
  - No hindrance to train operation

**per 1 station**
SMRT’s PSD Budget savings

Total: 106,257,745 (unit: US $)

- Joint technical development fee: 721,075
- Exemption of Value Added Tax for subway: 15,118,458
- Maintenance cost: 9,939,239
- In-house Supervision: 13,640,700
- Construction cost: 66,835,417
New Business based on IT

**SMRT**
- Advertisement zones (Station + Train)
- Commercial zones (Display + Sales)

**Business enterprise**
- Advertisement, e-shop Distribution
- System construction

**Customer**
- On/off line shopping
- Public information

**Infrastructure**
- Guarantee + Commission

**Pleasant station surroundings**

**Revenue producing + Public information**
New Business based on IT
New Business based on IT

IT Station

20,184 LCDs

(Gate, Lobby 560EA)

(Path 184EA)

(Platform 6,576EA)

(Train 12,864EA)
New Business based on IT

- **Unified broadband network**
  - [10Gbps TCP/IP]
- **Station server**
- **Wireless transmission system**
  - 18GHz wireless Mesh
- **Public Information** (train schedule, etc.)
- **Commercial information**
  - (Advertisement, shopping information, etc.)
- **Contents server**
- **e-shop Advertisement server**
- **IT management center**
- **Multimedia display**

- **Contents server**
- **e-shop Advertisement server**
New Business based on IT

**Revenue Producer (Rental fee)**

- **57,956,066 US $**
  - IT system construction: 52,481,955 US $
  - Portal system: 1,955,137 US $
  - Advertisement LCD display installation: 3,476,377 US $

**System construction period**: 1 year (NOT business period)

- **Basic guarantee**: 122,020,867 US $ / 10 years
- **Sales Commissions**: percentage of total sales
  1. **Advertisement**
     - 2010: 8.70%
     - 2011: 11.74%
     - 2012: 14.02%
     - 2013: 16.80%
     - 2014: 19.30%
     - 2015: 21.12%
     - 2016: 39.56%
     - 2017: 39.56%
     - 2018: 39.56%
     - 2019: 39.56%
     - 2020: 39.56%
  2. **Internet Shopping Mall**: 3.5%
  3. **Internet Shopping Mall Advertisement**: 10.5%

- 25% of basic guarantee (30,507,292 US $

- When the 10-year contract expires, all the installed business facilities shall be reverted to SMRT.
SMRT Talk & Flash
S T&F Maintenance System/UTIMS - Urban Transit Infrastructure Maintenance System

Real-time maintenance management by mobile technology regardless of time • space

- SMRT computing system + Real-time processing of facility maintenance by mobile device

- WORK ALL AT ONCE!!!

- NO PAPER WORK!!!
SMRT Talk & Flash

S T&F Maintenance System

Real-time One-Stop work process

239 check lists of all technical fields in one mobile device

Mobile work support system

- S T&F Log In
- Opening Page
- Field Selection
- Mobile Check
- Mobile Repair
TRANSITECH
S T&F Maintenance System

Real-time processing of Facility check/Information inquiry of repair work order, etc.
Real-time processing by all 6,500 staff members

Malfunctioning Contact Center
(13 senior analysis experts)

- Technical staff (equipment trouble)
- Station staff (station facility)
- Driving staff (train control)
- Rolling stock staff (train condition)
- Passengers (all the staff) (citizens)

APTA
AMERICAN PUBLIC TRANSPORTATION ASSOCIATION

PUBLIC TRANSPORTATION TAKES US THERE
economy • environment • energy • quality of life
Extension of system link

Hand-held computer network ⇒
Increased work efficiency ⇒
High quality customer service

Mobile work support system
- Any where
- On the spot
- Any time

Material Management
Train management
Driving management
Revenue management
Smart (groupware)
1. Identification of Equipment
2. Fault & Repair history
   - ex) “READ/WRITE” fault
3. Preventive Maintenance history

===================
* Real-time Fault notice
* Check & Repair report...

[Available Bar Code Data]

Automatic Fare Collection
part SMRT T&F
SMRT can do and is constantly Evolving for the future!!!

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