ITS SOLUTIONS

VISION OF TRI-CITY INTELLIGENT
TRANSPORTATION SYSTEM

TRISTAR

in TRI-CITY

Dr Jacek Oskarbski

Gdansk University of Technology
**Intelligent Transportation System (ITS)**—tools help to manage transport infrastructure and travellers service effectively.

**ITS = intelligent infrastructure + intelligent vehicles**

**Intelligent infrastructure** — transportation infrastructure equipped with telematics devices

**Intelligent vehicles** — vehicles equipped with telematics devices

Experiences of many European, Japan and US towns have proven the effectiveness of ITS tools in quality improvement of transportation systems operation.
Why ITS?

Benefits – by using ITS we can:

• reduce expenditure on transport infrastructure (30 – 35%)
• increase by as much as 20% the efficiency of transport systems
• significantly reduce the number of accidents and casualties
• reduce travel time
• significantly reduce emissions
• increase demand for public transportation
• better manage all elements of the transportation system
• better manage the roads
• improve systems for informing drivers and travellers about traffic conditions.
Transportation problems in the Tri-City Agglomeration

A diagnosis of the Tri-City Conurbation transportation systems identified a number of transportation problems:

- **high level of congestion**, in particular during peak times, negatively affecting the conditions and quality of travel both for individual and public transportation, loss of time and poorer quality of life of the community and negative impact on the environment

- **lack of parking guidance system**, in particular in downtown areas, leading to congestion caused by driving in search of parking spaces

- **high costs of accidents** and high costs incurred when traffic is stationary as a result of road incidents

- **rescue operations are affected** because of the difficulty with identifying the scene of the incident, reaching it and providing help

- **lack of information about traffic and driving conditions** both before and during travel

- **lack of prioritization of public transport in traffic** (trolleys, buses, trams)
CONGESTION IN GDYNIA
Critical intersections (current and forecast)
Accidents and detectors location on OT
The Tri-City ITS should include:

• **all elements of the Tri-City Agglomeration transportation system** which need to be co-ordinated between the industries, areas and organisations providing the service and organisations using the system

• **the requirements and needs of the local systems** and ensure co-operation between them and ways to integrate them

• **national and international needs** and allow for the involvement of a number of companies and organisations, become part of international programmes and gain access to international funding

Before work on the system begins, standards of procedures and equipment were developed.
System Architecture

TRISTAR

- Integrated traffic management system
- Integrated public transportation management system
- Integrated rescue management system
- Integrated transportation information system
- Integrated goods traffic management system

METROPOLIS AREA – logic, hardware, functional structures
System – TRISTAR
TRI-CITY AGGLOMERATION - 1.2 mln inhabitants

Tri-City - 0.75 mln inhabitants
ROAD NETWORK OF TRI-CITY AGGLOMERATION

LEGENDA:
- red lines: roads in the urban area
- red dash lines: roads in the suburban area
- green lines: roads in the rural area
- black lines: expressways
- orange lines: motorways

GDYNIA

SOPOT

OT expressway No 6

GDANSK

Motorway A1
Target stage of integrated traffic and transportation management system

- URBAN TRAFFIC MANAGEMENT SYSTEM IN GDYNIA
- URBAN TRAFFIC MANAGEMENT SYSTEM IN GDANSK
- FREEWAY TRAFFIC MANAGEMENT SYSTEM
- NR TRAFFIC MANAGEMENT SYSTEM
- URBAN TRAFFIC MANAGEMENT SYSTEM IN SOPOT
- COORDINATION CENTRE
- PUBLIC TRANSPORT MANAGEMENT SYSTEM IN GDYNIA
- PUBLIC TRANSPORT MANAGEMENT SYSTEM IN GDANSK
- CITY RAIL MANAGEMENT SYSTEM
System wizualizacji ściennej

Konsola operatora

Konsola operatora

Serwer bazy danych
(archiwizacja)

Serwer sieciowy
archiwizacji
i zbierania danych

Serwer internetowy

Urządzenia peryferyjne

Drukarki

Skanery

Serwer łączności
i sterowania
(komputer systemowy)

WYŚWIETLACZE
KOMUNIKATÓW

ZNAKI
ZMIENNEJ
TREŚCI

STEROWNIKI
SYGNAŁIZACJI
ŚWIEţLNEJ

KAMERY
CYFROWE

TRIPPLANERY

STACJĘ
DETEKTOROWE

Konsole operatora w centrum zarządzania
Gdańska, Sopot, OT
System Ruchu i Transportu Drogowego
Centrum Zarządzania Transportem Zbiorowym

TRAFFIC MANAGEMENT CENTER
Urban Traffic Management System

- Traffic Monitoring System
  - Traffic parameter measurement unit
  - Parking filling unit
  - Video monitoring over traffic unit
  - Meteorological condition measurement unit
  - Noise level measurement unit
  - Air pollution level measurement unit

- Traffic Control System
  - Traffic and pedestrian control unit
  - Priorities for public transport vehicles and rescue vehicles unit

- Traffic Strategic Management System
  - Traffic guidance to alternative routes unit
  - Traffic management between junctions unit
  - Speed management unit
  - Urban logistic unit
  - Traffic planning unit

- Road Safety Management System
  - Automated surveillance over drivers behaviour unit
  - Incident management unit
  - Incident detection unit

- Access Control and Parking Management System
  - Parking management unit
  - Access control unit

- Information System
  - Road information unit
  - Information in vehicle unit
  - Media information unit
### TRISTAR
**Gdańsk - Gdynia - Sopot**

#### 1st-2nd Stage

**Priority street sections and junctions**

<table>
<thead>
<tr>
<th></th>
<th>GA</th>
<th>SP</th>
<th>GD</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Junctions</strong></td>
<td>60</td>
<td>14</td>
<td>59</td>
<td>133</td>
</tr>
<tr>
<td><strong>Video monitoring</strong></td>
<td>20</td>
<td>6</td>
<td>39</td>
<td>65</td>
</tr>
<tr>
<td><strong>Red light cameras spots</strong></td>
<td>15</td>
<td>4</td>
<td>16</td>
<td>35</td>
</tr>
<tr>
<td><strong>Speed cameras spots</strong></td>
<td>8</td>
<td>2</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td><strong>VMS</strong></td>
<td>14</td>
<td></td>
<td>13</td>
<td>27</td>
</tr>
<tr>
<td><strong>Streets length km</strong></td>
<td>22.0</td>
<td>6.2</td>
<td>47.2</td>
<td>75.4</td>
</tr>
</tbody>
</table>

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**Legend:**
- **Ciągi uliczne:**
  - **Priorytet PCI**
  - **Priorytet PCII**
  - **Priorytet PCIII**
  - **Skrzyżowania:**
    - **Priorytet - PSI**
    - **Priorytet - PSII**
Video monitoring over traffic
– camera location

1st and 2nd stage

TRISTAR
Gdańsk - Gdynia - Sopot

Video monitoring over traffic
– camera location

1st and 2nd stage
Variable Message Signs

ZATOR - AL. ZWYCIEZSTWA DO SOPOTU PRZEZ DROGE GDYŃSKĄ

GA – 19 tablic
SP – 0 tablic
GD - 36 tablic
Priorities

Absolute:
Emergency services vehicles

Conditional:
Public transport vehicles - delayed (2 – 5 min)

GA – 50 junctions
SP – 9 junctions
GD – 53 junctions
Parking Management System

TRISTAR
Gdańsk - Gdynia - Sopot
Parking management system areas – 1st and 2nd stage

GDYNIA CENTRUM

<table>
<thead>
<tr>
<th>Location</th>
<th>TP</th>
<th>ZP</th>
</tr>
</thead>
<tbody>
<tr>
<td>BATORY</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>UMGDYNIA</td>
<td>00</td>
<td></td>
</tr>
<tr>
<td>GEMINI</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>DWORZEC PKP</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>GA</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>SP</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>GD</td>
<td>10</td>
<td>25</td>
</tr>
</tbody>
</table>
Information for PT passengers
Information on traffic conditions

Congestion DETECTION
Accidents

Weather conditions
Road works

Traffic Management Center

Regional Traffic Management Center
(in the future)

On-trip information

Pretrip information

-To the vehicle
-VMS**

From road

-Telephone,
-Radio,
-Internet.

-RDS – TMC*,
-GSM -,
-Short-distance highway radio,
-Satellite communication.
Benefits (TRISTAR stage I)

Benefits – estimated for Tri-City:
- increase by as much as 13% the efficiency of transport systems (in terms of capacity)
- increase the driving speed by as much as 32%
- reduction of delays at junctions by as much as 40%
- reduction of the fuel consumption by 19%
- reduction of the traffic costs by 19%

Implementation of Traffic Management System can cause the traffic costs reduction by 217 mln PLN (60-65 mln EUR) in 2014 (after implementation). The conclusion is that investment expenditures should be reimbursed within nearly one year.
FIRST STAGE OF TRAFFIC CONTROL SYSTEM IN GDYNIA – PILOT PROJECT

The first step to introduce ITS solutions (with priorities for PT)
## PILOT PROJECT
### RESULTS – Private Transport

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Unit</th>
<th>Start value</th>
<th>End value</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel time of vehicles</td>
<td>[min] during peek hours (14-18)</td>
<td>12,03</td>
<td>10,63</td>
<td>decrease-11,6%</td>
</tr>
<tr>
<td>Traffic volumes on crossroads along Morska street (average)</td>
<td>No. of vehicles/peek hour (15-16)</td>
<td>3150</td>
<td>3230</td>
<td>increase-2,7%</td>
</tr>
<tr>
<td>Traffic volumes on crossroads along Morska street (average)</td>
<td>No. of vehicles/day</td>
<td>43060</td>
<td>44620</td>
<td>increase-3,6%</td>
</tr>
</tbody>
</table>
## PILOT PROJECT
### RESULTS – Public Transport

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Unit</th>
<th>Start value</th>
<th>End value</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel time of PT vehicles</td>
<td>[min] during peek hours (14-18)</td>
<td>16,94</td>
<td>13,81</td>
<td>decrease - 18,5%</td>
</tr>
<tr>
<td>Number of bus passengers along Morska street</td>
<td>No. of passengers during peek hours (14-18)</td>
<td>14150</td>
<td>14990</td>
<td>increase- 5,9%</td>
</tr>
<tr>
<td>Number of PT vehicles equipped with computer</td>
<td>No. of board computers</td>
<td>0</td>
<td>50</td>
<td>-</td>
</tr>
</tbody>
</table>
CONCLUSIONS

The main problem which faced the authors of TRISTAR concept was lack of nationwide standards and national ITS architecture. Within TRISTAR project it was necessary to draw up regional ITS architecture as well as functional and equipment standards.

Many junctions were diagnosed to need modernization (additional lanes for left-turn movements first of all) to make system more effective. Additional costs should be invest to rebuild junctions.

Lack of educated staff to maintain and operate the system in the future is a factor which can slow down implementation process.
Preparing applications for financial assistance (national and international sources) is activity which started integration of Gdańsk, Sopot and Gdynia experts.

Experiences with pilot project show that road users including PT drivers (when priorities for PT vehicles are implemented) should be informed about functions and predicted results of system implementation.

It is very important to inform public on anticipated processes in street network and benefits of ITS implementation to get public approval (and after public – political).
Many problems appear in implementation process. Within TRISTAR the assumption was made to prepare detailed designs and documentation for the most possible scope of work as basis to implement system, to make possible to develop and maintenance the system in the future without additional costs to avoid dependence on one company – the contactor of the project implementation.
THANK YOU
FOR YOUR ATTENTION

joskar@pg.gda.pl