G7 ITALIA 2024

MOST

POLITECNICO MILANO 1863

G7 Transport Academic Workshop

The role of digitalisation in preventive transport resilience policies

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Wednesday, 10th April 2024 - Aula Magna "Carassa e Dadda"
Politecnico di Milano, Bovisa Campus, Milan (Italy)

Objective

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To discuss on the role of data and digitalisation in preventive transport resilience policies

Outline

- Digital systems in transport
- Managing sudden disruption events
- Interconnected digital systems
- Conclusion

Digital systems in transport

High level user-oriented transport services rely more and more on **advanced digital systems**, addressing both:

- the organisation of transport activities (back-end)
- the services to the users (front-end)

Advancing and interconnecting these digital systems is highly beneficial during both:

- normal conditions
- disruption events

But before, during and after **disruption events**, transport digitalisation is much more critical to preserve transport systems efficiency and safety (infrastructure, operations, services, users, etc.)

Managing sudden disruption events

Fires, floods, earthquakes, storms, etc.

Data and interconnected digital systems are needed:

- **Before** the disruption event: get ready as early as possible
- **During** the disruption event: ensure efficient management
- **After** the disruption event: recover as soon as possible
- In disruptions with **long-term effects**: alleviate the effects

Managing sudden disruption events

Before the disruption event
Act as early as possible to:
- identify the time, place & size of the phenomenon
- alert the transport systems operators
- alert the transport users

During the disruption event
Ensure continuous:
- monitoring of the time, place & size of the phenomenon
- coordination of transport systems operators
- guiding of the users

After the disruption event
Act as soon as possible to:
- identify the place and size of the effects
- coordinate transport systems operators to start over
- informing the users

In disruptions with long-term effects
Assist to:
- predict the recovery period
- support transport systems operators
- accommodate users needs

Need for interconnected digital systems

1. Design and implement digital systems addressing and integrating both **back-end** (organisation of transport activities) and **front-end** (services to the users) systems
2. Design and implement **interconnection of digital systems**
   - at least of critical transport components
   - compulsory at least before, during and after disruption events
3. Develop algorithms for **optimisation of transport systems performance** in line with appropriate transport demand management, for different scenarios of disruption (before, during, after)

Fundamental principles

- Seamless **two-way flow** of data and information
  - between transport operators and users
  - between different transport operators
  - between transport operators & other systems' operators (health, energy, environment, etc.)
- **Support decisions** (static or dynamic) at all three management levels:
  - strategic (planning future changes)
  - tactical (preparing the resources)
  - operational (getting ready to operate)
- **Real time** data processing, integration and systems optimisation can boost performance but requires resources

Win-Win Business models

- The need for interconnected and highly performing digital systems is high both:
  - during disruptions (managing the crisis)
  - during normal operations (higher level of service)
  - with several bi-products

  One investment double benefit

- The digital systems integration requires appropriate **third-party integrators** (public or private or mixed), however there is need for:
  - legislative action facilitating integration
  - significant investments (expertise, technologies, systems)

Key barriers

- personal **data protection**
- **cybersecurity** at all levels

- significant **processing** power (costly)
- significant **budgets** for proper spatio-temporal coverage
- special **expertise**, especially for the integration (not available)

An Example

Extreme fires and floods in Greece, summer 2023

- 112 **SMS message** (alert & guidance) to all mobile phones in the areas affected (before, during and after)
  - casualties were zero or minimal
- **Operational coordination** of transport and other systems for quick recovery, with continuous flow of information from the various systems' operators
  - mostly through mobile phones - no systems' integration
- **Central coordination** and inter-connection was critical
  - Operators were fully available and users were informed on-time
- Great potential for **standardising and optimising the processes** and the data/information flow for future events (in progress)

Conclusion

- Transport is the **core support activity** to most other activities and resilient transport is the backbone for tackling disruptions
- **Integrated digital systems** is the backbone for the resilience of transport systems by design
- A **System Approach** is necessary for the efficient, safe and green performance of transport systems both during disruptions and during normal operations
- **Public Transport** and active travelling are the core transport system pillars both during disruptions and during normal operations

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