
# Deliverable 5.2

## A COMPREHENSIVE SET OF QUALITY AND ACCESSIBILITY INDICATORS FOR TRANSPORT SERVICES

***Publishable summary***


**Coordinator:**

Professor Andree Woodcock, Coventry University

Tel.: +44 (0) 2476 158349 Email: A.woodcock@coventry.ac.uk

**Author:**

Responsible partner: POLITO

Participants: INTECO, ITENE, ZHAW, VTM, FIA, RSM

Tel: +39 011 090 5638 marco.diana@polito.it


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**WEBSITE**

WWW.METPEX.EU


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## Summary & Purpose

The dataset originating from the implementation of the METPEX tools is analysed through **statistical techniques** (Cronbach's Alpha, PCA…)

Main goal:
develop **indicators** that can state, through a synthetic index, subjective viewpoint on different issues (mainly related on quality and accessibility) during the journey experience

## Approach (1)

- Definition of **classification schemes** of the variables in the dataset irrespective of where the corresponding question was actually asked within the questionnaire
- Creation of 5 main **classes**:

  Classification “C1” -> selection for a given **travel means**
  Classification “C2” -> selection for a given **user group**
  Classification “C3” -> based on the **quality components** (or “quality tags”) identified in METPEX D2.1
  Classification “C4” -> based on the specific **phase** of the traveller experience (pre-trip, on-trip or post-trip)
  Classification “C5” -> dealing with the **kind of measurement** implied by the variable (objective, subjective, satisfaction rating)

## Approach (2)

- Data **reduction techniques** applied to identify the components on several different subsets of variables:
  - 21 groups of Tier-2 variables
  - 10 groups of mode-specific questions
  - 11 groups of user-specific questions
  - Additional groups of variables clustered according to the previous classifications

- How many **latent variables** (factors) are needed to adequately represent the selected group of observed variables?
  - Check if one is sufficient => **Cronbach alpha**
  - Check how many are needed => Principal component analysis (**PCA**)

## Approach (3)

- When **one latent variable** is sufficient, the indicator is the summated rating scale of the standardised scores $Z_i$ (answers to satisfaction questions):

$$I = \Sigma_i \; Z_i$$

- In case of **several factors** k, the indicator is

$$I_k = \Sigma_i \; C_i \, Z_i$$

where $C_j$ are the component score coefficients from PCA

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## Findings

An **initial set** of the following indicators is defined:

27 indicators related to **perceived quality** of the whole journey experience
13 indicators that are specific to different forms of **public transport**
10 indicators that are specific to **active means** (pedestrian, bikes)
35 indicators that are specific to **different user groups**
7 indicators focusing on the views of **communication impaired** and **mobility restricted** using public transport
9 indicators focusing on different **phases** of the journey experience (pre-trip and during the trip).

## An example of indicator identification (1)

Example of indicator development focusing on the “low income” group: PCA is applied to the answer to questions of the dataset referring to this group

These are the resulting factors, along with their loadings

| low income<br>Variable definition | Variable code | Component | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| Transport availability was adequate for my needs | u19 | 0.761 | | | |
| The quality of pre-trip information before I started my journey was good | u11 | 0.723 | | | |
| The quality of transport infrastructure (e.g. whole transport service) during my journey was good | u12 | 0.710 | | | |
| Design of transport stops was adequate for my needs | u3 | 0.676 | | | |
| My passenger rights (e.g. able to access all transport services) were respected | u6 | 0.675 | | | |
| Design of stations was adequate for my needs | u1 | 0.674 | | | |
| The quality of my ride was good | u13 | 0.666 | | | |
| The different modes of transport I used worked well together | u5 | 0.664 | | | |
| Design of transport interchanges (main terminals) was efficient | u2 | 0.660 | | | |
| The city supported my mobility needs | u4 | 0.653 | | | |
| The quality of travel information available during journey was good | u10 | 0.640 | | | |
| Provision of information on arrivals and departures was adequate for my needs | u8 | 0.627 | | | |

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# An example of indicator identification (2)

| low income<br>Variable definition | Variable code | Component | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| The overall accessibility of my journey was adequate for travellers with additional needs | u7 | 0.623 | | 0.426 | |
| Support for intermodal (e.g. different forms of transport during same journey) travel was provided | u15 | 0.617 | | | |
| My safety and security while travelling was good | u14 | 0.597 | | | |
| Vehicle design was suitable for my needs | u20 | 0.595 | 0.520 | | |
| Time the journey took was as promised | u18 | 0.591 | | | |
| Easiness of connections with other modes of transport | v29 | 0.532 | | | 0.472 |
| Service coverage across city | u128 | 0.531 | | | |
| Recognition of the needs of motorised vehicle users | u16 | 0.519 | | | |
| Reliability of services | v62 | 0.467 | 0.443 | 0.444 | |
| Respect shown by public transport staff | v63 | | 0.661 | | |
| Public Transport Staff were receptive to my needs | u9 | 0.463 | 0.632 | | |
| Fines for incorrect tickets | v35 | | 0.588 | | |
| Service availability at all times | u127 | | 0.569 | 0.401 | |
| Safety and security at transport stops | v64 | | 0.537 | | |
| Ticket purchasing process was easy to follow | u17 | 0.469 | 0.516 | | |
| Behaviour of other passengers | u126 | 0.406 | 0.431 | 0.401 | |

# An example of indicator identification (3)

| | | | | | |
|---|---|---|---|---|---|
| Level of noise | v44 | | | 0.755 | |
| Level of crowding | v43 | | | 0.752 | |
| Air temperature and ventilation inside vehicles | v8 | 0.453 | | 0.591 | |
| Cleanliness of vehicles | v20 | | | 0.566 | |
| Notification on timetabling changes | v48 | | | 0.507 | |
| Level of assistance available during journey | v42 | | 0.462 | 0.501 | |
| Availability of affordable services | u125 | | | | 0.732 |
| Range of fares offered | v60 | | | | 0.726 |
| Ability to buy one ticket which covers different forms of transport | v1 | | | | 0.699 |
| Availability of preferential prices | v12 | | | | 0.676 |
| Value for money of services was good | v73 | | | | 0.600 |
| Comprehensibility of ticketing structure | v23 | | | | 0.462 |

## An example of indicator identification (4)

It is possible to identify four different factors, that could be better described and labelled as:

| Factor # | Description | Factor Name |
|---|---|---|
| Factor 1 | Describes variation with variables related to the quality of city support, information and integration | Quality City Support, Information and integration |
| Factor 2 | Describes variation with variables related to frequency of the service and staff helpfulness | Low cost services issues |
| Factor 3 | Groups comfort aspects | Comfort |
| Factor 4 | Indicates service value´s for money, ticket structure and range of fares issues but also the ability to buy integrated tickets and availability of preferential prices | Convenience |

Three of these four factors could be retained for our analysis (Factor 2, 3 and 4)

# An example of indicator identification (5)

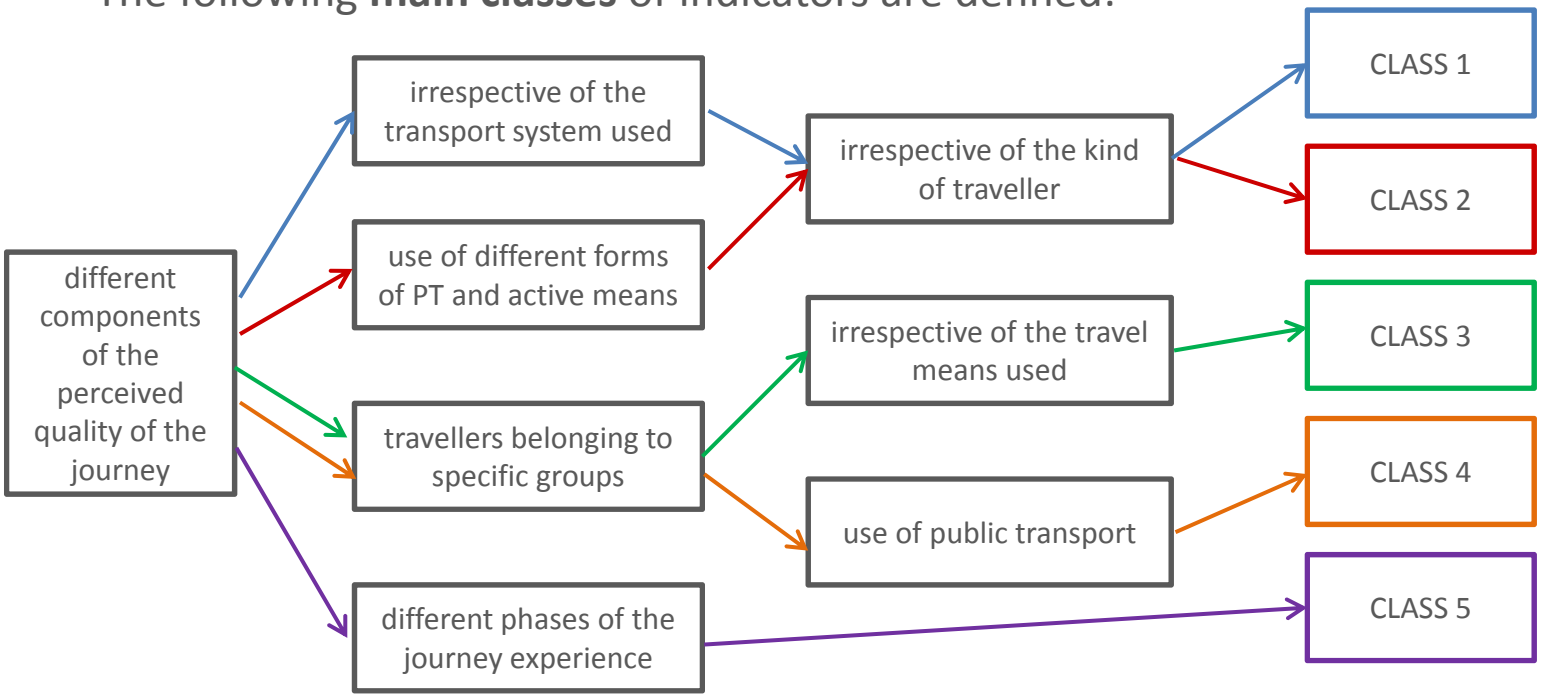
| LOW1 | Low cost services issues | $C_i$ |
|---|---|---|
| v63 | Respect shown by public transport staff | 0.297 |
| u9 | Public Transport Staffwere receptive to my needs | 0.276 |
| v35 | Fines for incorrect tickets | 0.264 |
| u127 | Service availability at all times | 0.211 |
| v64 | Safety and security at transport stops | 0.181 |
| u17 | Ticket purchasing process was easy to follow | 0.208 |
| u126 | Behaviour of other passengers | 0.108 |

| LOW2 | Comfort | $C_i$ |
|---|---|---|
| v44 | Level of noise | 0.340 |
| v43 | Level of crowding | 0.343 |
| v8 | Air temperature and ventilation inside vehicles | 0.209 |
| v20 | Cleanliness of vehicles | 0.177 |
| v48 | Notification on timetabling changes | 0.171 |
| v42 | Level of assistance available during journey | 0.135 |

| LOW3 | Convenience | $C_i$ |
|---|---|---|
| u125 | Availability of affordable services | 0.293 |
| v60 | Range of fares offered | 0.290 |
| v1 | Ability to buy one ticket which covers different forms of transport | 0.324 |
| v12 | Availability of preferential prices | 0.268 |
| v73 | Value for money of services was good | 0.221 |
| v23 | Comprehensibility of ticketing structure | 0.116 |

## Results (1)

The following **main classes** of indicators are defined:



## Results (2)

Uses of the indicators defined:

- Help for the policy makers to understand what are the **underlying factors** that have the highest impact on the way in which travellers evaluate transport services and options, and how those factors compound to form an overall judgement
- Help for the analyst that, starting from the very long survey done in the METPEX tools (WP 4), could
  **select** the indicators that better cover the issue s/he wishes to consider
  take note the **variables** used to build them and only include these latter in the survey tool

## Conclusions & Further Study (1)

Despite the richness of the dataset and the large number of available observations, the exhaustiveness concerning all quality aspects for all user groups and travel means is **still not reached**

Suggestions:

- Revise the experimental design when administering the tool to achieve a **larger number of observations** for given combinations of modal usages and users groups

## Conclusions & Further Study (2)

Activities that should be carried out to complete the analysis (tasks 5.3 and 5.4):

- **Validation and confirmation** of the factor scores coefficients, including an assessment of their stability when changing the values of the baseline questions (socioeconomic characteristics of the respondent and travel attributes).
- Indicators will be evaluated through **SWOT** (Strengths, Weaknesses / Limitations, Opportunities, and Threats) analysis and assessing to what extent they are **SMART** (Specific, Measurable, Achievable, Realistic and Time-bound).
- **Benchmarking** exercises will be envisaged in order to see how their values change across the different METPEX test sites and to inform their presentation in the final manual (i.e. the METPEX Deliverable 5.4).