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Towards a More Informed Multimodal Travel Shopping

Mario Scrocca, **Marco Comerio**, Damiano Scandolari and Irene Celino
name.surname@cefriel.com

Cefriel
POLITECNICO DI MILANO

PROBLEM AND VISION

PROBLEM: Current travel planning applications provide only a limited support to users for an informed selection of travel solutions

- Travel solutions ordered according to their main characteristics (i.e., price, length in Km, and duration in hours)

VISION: The categorization of travel solutions could complement this basic information to support a more informed travel shopping and to create awareness

THE RIDE2RAIL PROJECT

RIDE2RAIL is a three-year project started in 2019 within the **Shift2Rail European program** and aimed at promoting an effective ride-sharing practice by citizens, as well as making it a complementary transport mode that extends ride and rail public transport services.

The RIDE2RAIL solution for intelligent mobility will support users to **compare and choose between different travel offers**, leveraging the capability to integrate and harmonise in real-time diverse information about public transport and ride-sharing in a new “social ecosystem”.

www.ride2rail.eu

THE REFERENCE TRAVEL SHOPPING PROCESS

- **Mobility request** created through a PA
- The Travel Solution Aggregator (TSA) composes travel solutions by invoking multiple Travel Experts (TE)
- TE return **itinerary offer items** defined as the relation between three concepts: a travel episode, the product, and the passenger(s) involved
- A set of travel solutions are displayed on the user's PA in the form of **trips** and **offers** (e.g., first class and economy offers for the same trip).
- RIDE2RAIL is enhancing the described flow with the **Offer Categorizer** to support a more informed travel shopping process

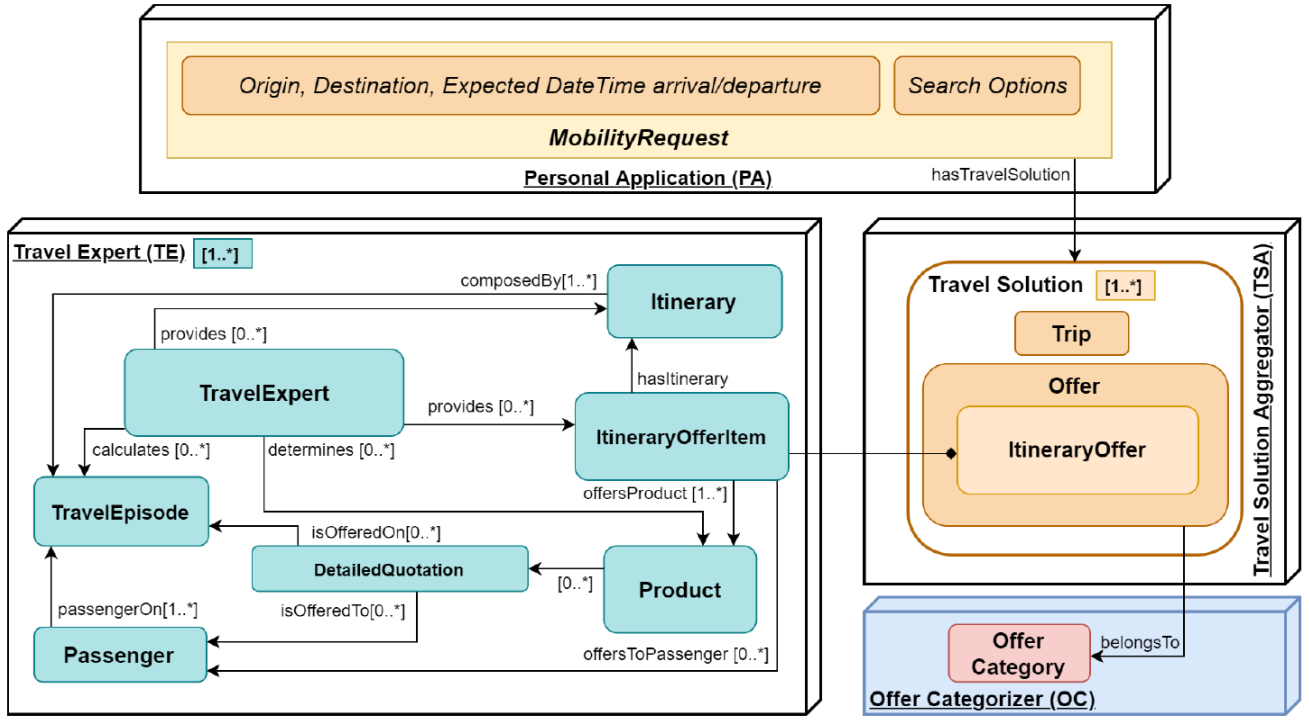


*Diagram based on the **Shift2Rail IP4 reference ontology***

THE APPROACH

- Analysis of the state-of-the-art on travel offer categories
- Conceptualisation of offer categories
- First list of categories from the state-of-the-art
- Survey for European travelers to validate the categories
- Final list of categories
- [Ongoing] Implementation of the Offer Categorizer
- [Next Step] Definition of an ontology for offer categories

FROM THE STATE-OF-THE-ART ON OFFER CATEGORIES

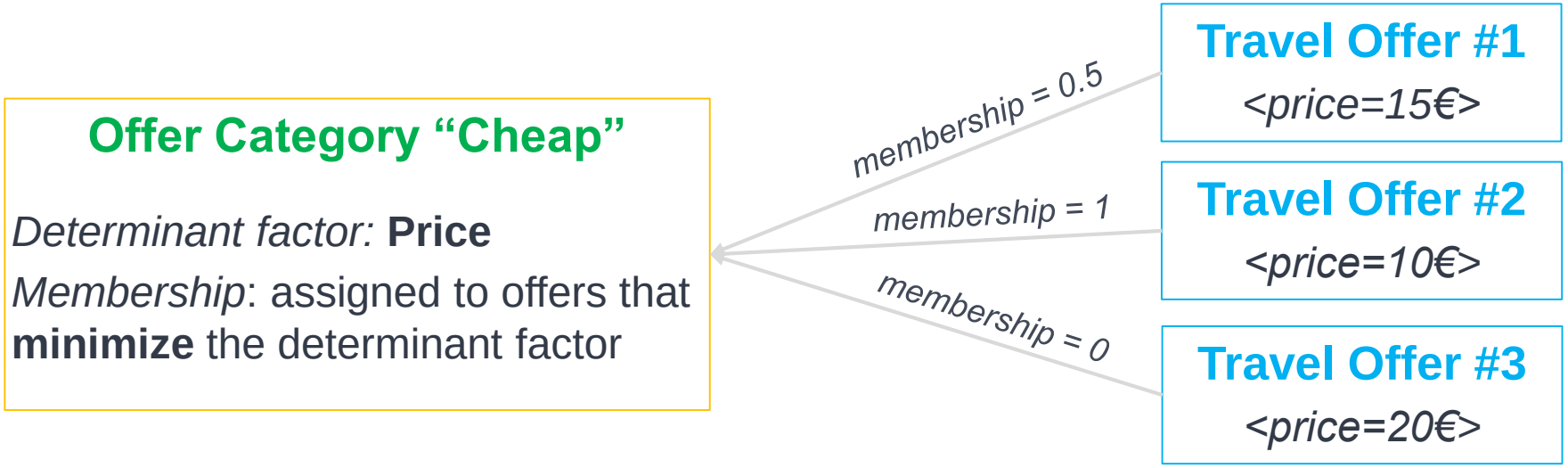
- Different types of variables for describing a multimodal travel offer:
  - **Instrumental**: *objective* variables related to the measurable characteristics of the travel solution (cost, time, etc…)
  - **Perception**: *objective* variables related to the users' perception while travelling (comfort, safety, etc…) evaluated through e.g., feedback collected from an adequate statistical sample of users
  - **Symbolic**: *subjective* variables related to the personal value attributed by a user to a specific travel solution (prestige, status, etc…)

- Objective variables represent potential **determinant factors** for an offer category, i.e., the variables that can be used to determine the membership of an offer to an offer category

CONCEPTUALISATION OF OFFER CATEGORIES

- **Offer Feature**: the value associated to an objective variable that describes a travel offer
  - E.g., *<transportation mode=train>*, *<price=15€>*

- **Offer Category**: it identifies a set of travel offers having specific shared characteristics. The membership of a travel offer to an offer category is computed considering the offer features and the *determinant factors* for that offer category



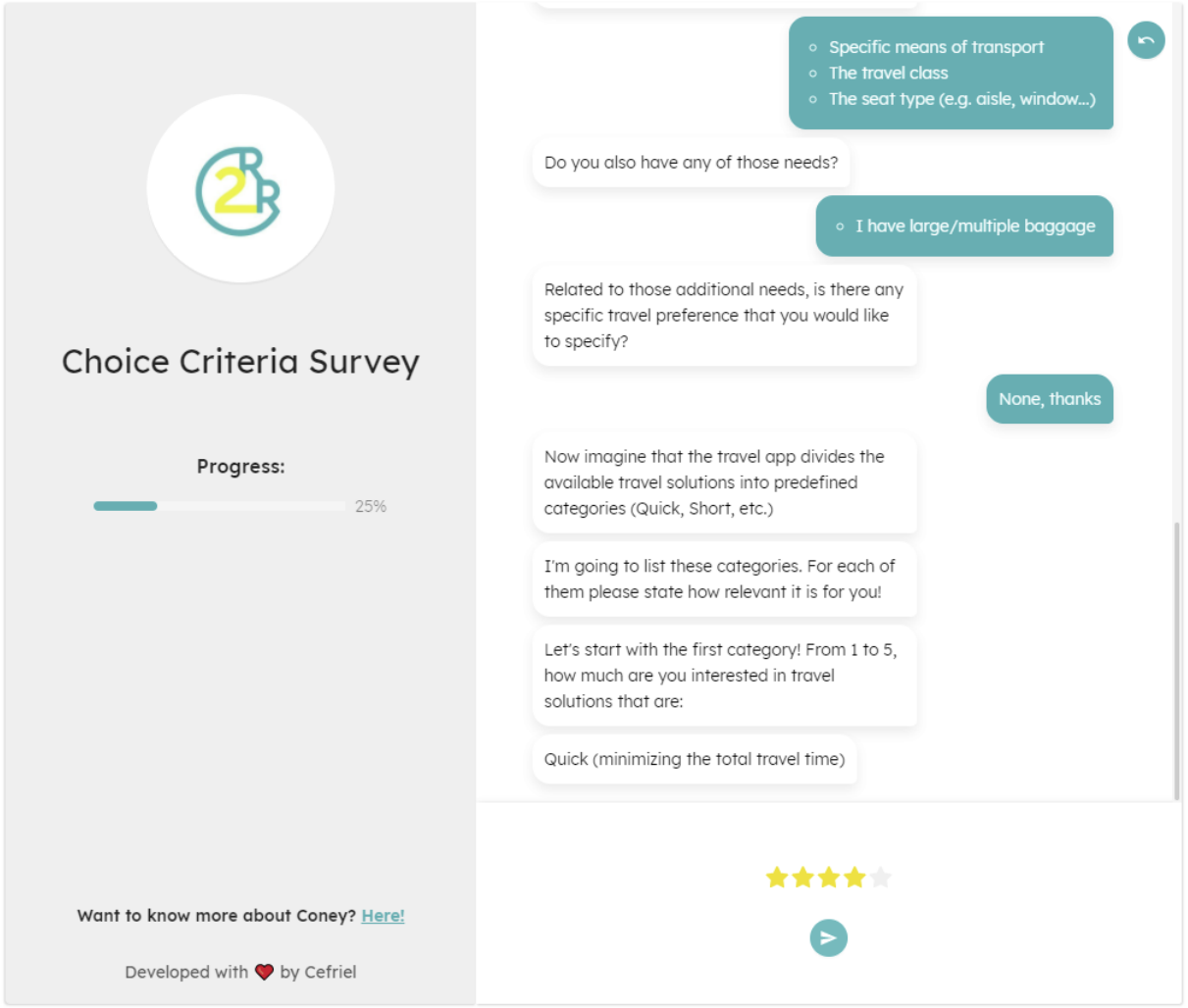
A FIRST LIST OF 10 OFFER CATEGORIES

1. **Quick** (minimizing the total trip time)
2. **Short** (minimizing the distance covered)
3. **Reliable** (minimizing the chances of delays, breakdowns or last-minute changes)
4. **Cheap** (having the lowest price)
5. **Door-to-door** (minimizing the segments of the trip that are not covered by the solution)
6. **Social** (facilitating new acquaintances)
7. **Multitasking** (maximizing the possibility to perform other tasks while travelling: productivity, enjoyment, etc.)
8. **Environmentally-friendly** (minimizing the trip's impact on the environment, such as NOx, CO2 emissions, energy consumption, etc.)
9. **Philanthropic** (involving donations to charity or volunteering organizations)
10. **Comfortable** (maximizing your comfort during the trip)

THE CONVERSATIONAL SURVEY

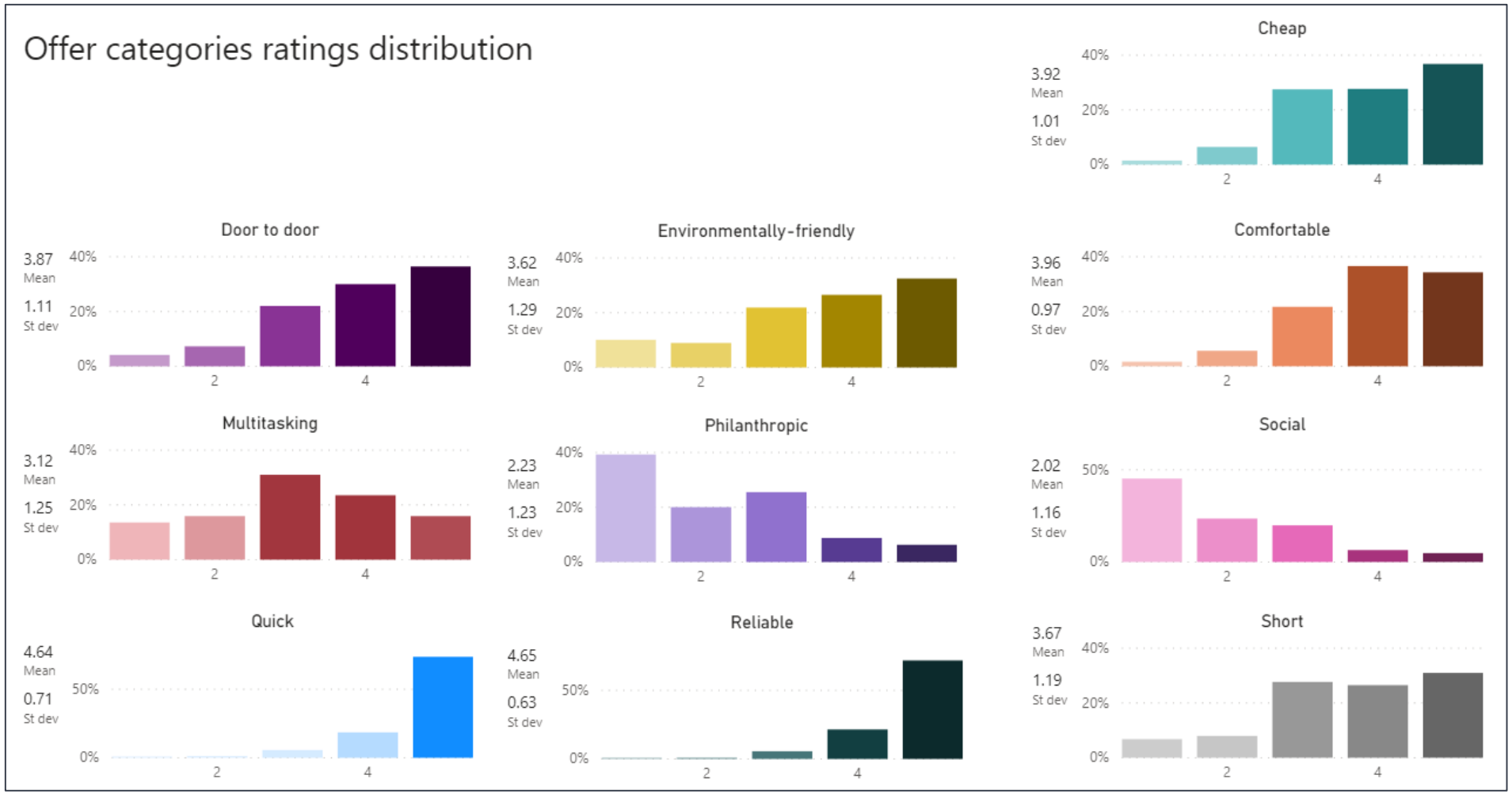
- The list of 10 offer categories has been validated through a survey
  - defined using **Coney**, the Cefriel's solution to design and administer conversational surveys
  - translated into **11 languages** and distributed at European level
  - more than **600 European Travelers** involved

- Objectives:
  - check the **completeness** of the list
  - check the **interest** in having that specific categories in a travel shopping application



https://coney.cefriel.com/

THE CONVERSATIONAL SURVEY: RESULTS



Collected Data and Analysis:
https://doi.org/10.5281/zenodo.4593471
(D2.4) https://ride2rail.eu/resources-library/

SURVEY RESULTS

- The analysis of survey supports the identification of the following four main groups:
  1. **Quick, Reliable, Cheap**: the most important for users when asked to pick their top three choices
  2. **Comfortable, Door-to-Door, Environmentally Friendly, Short**: above the average
  3. **Multitasking**: average relevance for the users but a lower number of preferences score in the direct comparison with other categories (top-three choices)
  4. **Social, Philanthropic**: the less relevant for respondents

ANALYSIS OF THE SURVEY RESULTS

- Considering the low scores registered for Social and Philanthropic, the two categories have been merged into a unique **Social** offer category taking into account both the possibility of socializing with other people and to contribute to social causes.

- Improvement of the definition of the **Comfortable** offer category focusing on four main features to be maximize: *cleanliness of the stations and vehicles, feeling of personal safety, having a comfortable seat, and a minimum number of interchanges*.

- Two new categories:
  - **Healthy** (maximizing the usage of walking or cycling and, therefore, taking into account the number of calories that can be burned);
  - **Panoramic** (maximizing the number of travel legs passing through beautiful landscapes, historical sites, monuments, and interesting spots).

FINAL LIST OF 11 OFFER CATEGORIES ORDERED ACCORDING TO RELEVANCE

Offer Category	Description of Determinant Factors
QUICK	The Quick category measures how convenient and efficient the solution is in terms of time-related issues, considering the total travel time, the waiting time between legs and the number of stops required. If the solution includes a segment on-road (e.g., bus/car) and real-time data on traffic congestion are available, also these data can be taken into account.
RELIABLE	The Reliable category concerns the likelihood of delays, traffic congestion, breakdowns or last-minute changes that could affect the travel time and comfort of the trip. Some solutions are inherently variable (e.g. traffic delays when crossing a city at rush hour), while other solutions might offer a small window to change the mode of transport that could cause massive idle times. For this reason, also the frequency of the service for involved solutions should be taken into account. Lastly, the influence of the weather on the trip is taken into account.
CHEAP	The Cheap category concerns the total price of a trip, the possibility of sharing part of it with others and the ease of payment, giving additional value to solutions that offer an integrated fare system and do not require the user to purchase different tickets from different platforms.
COMFORTABLE	The Comfortable category concerns objective factors such as the number of interchanges required or the possibility of having a comfortable seat but also covers a set of other elements about the quality of the trip that has to be evaluated through users' feedback. Relevant factors are the cleanliness of the stations and vehicles used and the feeling of personal safety.
DOOR-TO-DOOR	The Door-to-door category covers the distance of the user's start and endpoint from the beginning and destination locations of the solution provided. It is measured by the amount of walking or driving distance the user has to cover.
ENVIRONMENTALLY FRIENDLY	The Environmentally Friendly category covers the green aspects of the trip, taking into account at least the amount of CO_2 emissions measured per kilometre/traveller for each mean of transport included in the Offer and considering the distance covered and the number of passengers. If available, additional determinant factors can be considered as the energy consumption, the NOx emissions (nitrogen oxides) and the carbon footprint.
SHORT	The Short category focuses on minimizing the distance covered.
MULTITASKING	The Multitasking category concerns the extent to which the user can perform other tasks while travelling. These activities can regard productivity (personal or work), fitness, or enjoyment. This category considers the amount of space available, the presence of silence or business area, as well as whether the internet connection and/or plugs are provided. Lastly, the level of privacy might also influence the extent to which a person can work and could be considered as a determinant factor for this category.
SOCIAL	The Social category concerns the maximization of the number of people the user will share the trip with and his/her ability to network or socialize based on the context and means used. Moreover, it takes into account solutions that contribute to social causes or involves volunteering or charity activities (e.g., donations).
PANORAMIC	The Panoramic category promotes solutions passing through beautiful landscapes (like a particular village or a forest) or historical sites. This category also takes into account the usual sightseeing itineraries for tourists to promote solutions passing near monuments or other interesting spots.
HEALTHY	The Healthy category concerns the involvement of walking and/or cycling in an offer and, therefore, taking into account the number of calories that can be burned

NEXT STEPS

- The implementation of the **Offer Categorizer**: a component that implements a set of functions to compute the membership of an offer with respect to a set of given offer categories
    - Ongoing implementation: https://github.com/Ride2Rail
- The definition of **an ontology for offer categories** based on the proposed conceptualization that will support the provision of enriched interoperable descriptions of travel solutions
    - A semantic representation of offer categories can enable the **explainability** of how the membership has been computed by directly relating the score to the determinant factors influencing it

Thank you
for your attention!

Marco Comerio
marco.comerio@cefriel.com
Twitter: @comerioma
LinkedIn: https://www.linkedin.com/in/marcocomerio/