Proposing a Model for the Chart of Public Mobility Services

Antonella Longo, Marco Zappatore, Mario A. Bochicchio

Department of Innovation Engineering, University of Salento
via Monteroni sn, 73100 – Lecce (Italy)
(antonella.longo, marcosalvatore.zappatore, mario.bochicchio)@unisalento.it

Abstract. Member States of the European Union are becoming more and more involved into interventions aiming at improving local public transportation services. Several EU and national regulations define passengers’ rights and obligations as well as how to analyze service offerings from mobility service providers. A typical tool for ensuring the quality of such services on a local or regional basis is represented by the Chart of Services, who are proliferating in several countries. However, a unified model capable of finding easy application on a wider scale has not yet come to reality. In this paper we propose a first model for a unified chart of public mobility services addressing both the delivered and perceived service quality via indicators categorized into an ad-hoc taxonomy. These indicators allow to assess, compare and publish data about the available service offerings. The model has been tested in a real case, thanks to the collaboration of local authorities, citizens, local public transportation companies and trade unions.

Keywords: Local Public Transportation, Chart of Mobility Services, Passengers’ Rights, Service Quality Indicators, Taxonomy.

1 Introduction

Local and regional public transportation systems represent an extremely variegated yet interesting area of intervention in the European Union (EU). Several elements of diversity have to be considered when addressing issues related to Local Public Transportation (LPT), depending on the specific Member State and even on the specific city. Moreover, this scenario is also inherently related to two additional elements of analysis. On the one hand, the EU has already adopted proper legislations and policies regulating mobility and passenger rights [1], [2], as well as specific enforcement bodies to guarantee the application of such regulations in the Member States. On the other hand, LPT service providers from the various Member States are publishing and adopting regulations assessing service quality standards and the most significant principles about service offering and consuming. These kinds of regulatory documents are usually named Chart of Mobility Services (CoMS) and they aim at identifying and communicating all the featuring aspects of the services they are tailored to: users, functions, scopes, offering, ways of access, offered quality levels, perceived quality levels, planning, etc.
Such a variegated scenario represents a promising opportunity for the identification and subsequent adoption of a unified vision about service quality of LPT services. This approach can be considered as the basis for the definition of a Unified CoMS (UCoMS), capable of providing trustworthy indicators assessing service quality from the point of view of both service providers and service customers. By starting from such premises, in this paper we propose a model for a UCoMS based on the most recent EU and national regulations about LPT sector, in order to: 1) define in a rigorous way the entire LPT service lifecycle; 2) define passengers’ rights and obligations; 3) define LPT service providers obligations; 4) identify quality factors for the assessment of service quality; 5) identify and categorize quality indicators by producing a reference taxonomy. The proposed model has been also validated in a pilot scenario located in the Apulia region (Southern Italy) involving all the main stakeholders of the LPT service lifecycle.

The paper is organized as in the following: Section 2 overviews EU and national regulations about passengers’ rights. Section 3 depicts the scenario into which the UCoMS has been introduced. The model of UCoMS is thoroughly described in Section 4. Section 5 briefly sketches the pilot scenario. Conclusions are drawn in Section 6.

2 Passengers’ Rights and Charts of Mobility Services (CoMSs)

In the last decade, the EU has regulated obligations and rights for different typologies of passengers: travelers with reduced mobility, rail/air/bus/coach/ship passengers. In each Member State, the EU legislation is accompanied by a series of national and regional laws that complete the normative scenario. This Section is devoted to sketch briefly the most important contributions from EU and Italian norms as for LPT services.

The Regulation (EC) 1371/2007 on rail passengers' rights and obligations [1], applies to the consumers of rail services in the entire EU. In 2011, the EU Parliament released the Regulation 181/2011 [2], which assesses that all the "passengers, including those with a disability or reduced mobility, travelling by bus and coach, enjoy the same rights wherever they travel in the EU". The EU normative framework on passengers’ rights is completed by other regulations referring to passengers of sea and inland waterways (Reg. (EU) 1177/2010), airways (Reg. (EC) 261/2004). We will focus on [2], whose main purpose is to ensure an equivalent level of protection and assistance to passengers. On the one hand, it regulates long-distance services (i.e., routes ≥ 250 km) by addressing situations of overbooking, cancellation, delays or accidents in terms of: adequate on-site assistance (even for disabled persons and/or with reduced mobility); guarantees of reimbursement, compensation or rerouting; provisioning of information. On the other hand, (i.e., distances ≤ 250 km) we have aspects such as: non-discrimination of any category of passengers, minimum rules on travel information and mechanisms of complaint handling. In addition, the regulation requires Member States creating National Enforcement Bodies (NEBs) to verify that passengers are treated in accordance with their rights by transportation service providers and operators.
According to [1], the National Transportation Authority (ART) was created¹. This authority plays four important roles: 1) establishing minimum quality levels for transportation services depending on both national and local public service obligations; 2) defining minimum rights that user may require to LPT service operators; 3) regulating the competition across candidate providers for the allocation of transportation services by specifying also the selection criteria; 4) fostering the definition of conciliation and settlement procedures in case of disputing parties.

Even before the creation of ART authority, in 2011, the Italian legislative scenario had been already significant, due to the contributions from the last two decades. Since 1994, indeed, several norms and laws have been proposed. The first one was about the definition of the basic principles on public service provisioning², in terms of: equality, impartiality and continuity, possibility of choice, engagement, effectiveness and efficiency. That rule also obliges public service providers to define and subsequently adopt “specific quantity and quality standards for services”. In 1995, the concept of Chart of Mobility Services (CoMS) has been defined³ as a general reference scheme for all the sectors of public mobility service provisioning. In 1998, another legislative intervention⁴ assessed that all public services must be provisioned “by promoting quality improvement, by guaranteeing citizens and users, by ensuring users’ participation to the procedures of definition and evaluation of quality standards”. Subsequently, the CoMS role has acquired even more centrality thanks to another regulation⁵ establishing that public authorities are obliged to require LPT operators the adoption of a CoMS defined by considering also the specifications from citizens, users, networks of enterprises. These CoMSs must also specify for the referenced service(s): quality and quantity standards, data access policies, guarantees for service final users.

On a regional basis, the Apulia region (Southern Italy), which has been selected as pilot site for testing our generalized model of CoMS, is promoting actions capable of fostering the improvement of mobility service quality as well as the definition of a regional CoMS⁶, according to an agreement between our University and the Regional Agency for the Mobility. The aspects briefly sketched so far demonstrate how the definition and adoption of a CoMS, even if on a regional scale, can assume a pivotal importance, as it will be clarified in the next Sections.

3 The Scenario

The LPT sector is populated by regulatory actions aiming at improving service quality levels and indicators, such as: ticket and fee integration; ticket annual revision and adjustment; limitation of fee payment evasion; efficient management of transport routes with low usage rates; coordination between tire-based and rail-based transports. The

² D.P.C.M. 27/01/1994
³ L. 11/07/1995, no. 273
⁴ D.Lgs. no. 286/1999
⁵ L. 244/2007
⁶ D.G.R. 24/07/2014, no. 1518
definition and adoption of CoMSs foster the integration of mobility services, the improvement of passengers’ security and access to information, the definition of new efficiency standards. Similarly, CoMSs also promote the adoption of novel technologies, such as the installation of sensors on LPT vehicles and infrastructures as well as the direct engagement of passengers via the development and adoption of mobile apps.

Another important aspect to be mentioned pertains to the ways service quality in public passenger transportation can be defined, targeted and properly measured. The UNI EN 13816:2002 [3] represents the current EU standard for: 1) detecting service quality types of LPT companies, 2) defining quality level objectives, 3) establishing indicators and measurement policies. The norm can be also integrated with the majority of business process control systems (e.g., ISO 9001, ISO 14001, OHSAS 18001) and it applies to all LPT systems. Its core idea is to examine both the service customer’s and the service provider’s point of view about the service quality, in the so-called service quality lifecycle, as depicted in Figure 1.

Fig. 1. The service quality lifecycle according to the Regulation UNI EN 13816:2002.

The expected service quality represents passengers’ expectations as a result of their personal evaluation of specific criteria (e.g., security, timeliness, etc.). The programmed service quality has to be defined depending on established service level objectives, available resources and environmental conditions. The delivered service quality is an objective evaluation parameter for service quality level actually offered by LPT operators and it has to be measured according to the service provider’s point of view. The perceived service quality represents a subjective evaluation parameter for service consumers and it is strictly related to how passengers have experienced the service.

Several criteria are defined in [3] for assessing the overall quality of LPT services; they can be grouped into eight categories: 1) availability; 2) accessibility; 3) information; 4) time; 5) attention to the client; 6) comfort; 7) security; 8) environmental impact. Each of these criteria has additional sub-criteria. The norm also details three different methods for evaluating customer’s satisfaction and provider’s performance: 1) customer analyses, in order to measure passengers’ perceived service quality and their expectations; 2) mystery shopper analyses, which involves trained observers behaving as customers for evaluating the delivered service; 3) performance direct measures, which monitor the delivered service quality.

It is important to point out how the regulations provided by [3] do not establish specific values or service quality levels, but only the rules needed to define objectives and evaluate results. This is why we deem as extremely important the definition of a reference model for a Unified CoMS (UCoMS) suitable to be applied on a European scale.
4 A model for the Unified Chart of Mobility Services (UCoMS)

In the last decade, the typical approach in benchmarking the LPT sector has been represented by the evaluation of its operators’ performances via several sets of indicators pertaining to both effectiveness (i.e., how are the provided services) and efficiency (i.e., how the provided services have been achieved) [4]. In order to make this approach more unified and rigorous, we have defined a model for establishing the UCoMS. It is based on the core concept the UCoMS represents a shared agreement, guaranteed by the local authorities, between foster service operators and service customers, pertaining the service typology, quality and provisioning modalities. According to this core principle, the entire mobility service lifecycle has to be examined depending on a series of parameters: transparency, which will allow customers to monitor service quality; simplification, for rendering procedures and processes simpler; quality, for guaranteeing minimum levels and foster customers’ positive behavior towards the transportation system; communication, in order to improve the exchange of information between all actors. The LPT sector is indeed an ecosystem involving three different actors: citizenships, local administrative authorities and foster service operators.

4.1 Service Lifecycle Model for the Local Public Transportation (LPT) Sector

By starting from such premises, we have defined the LPT service lifecycle model in a multi-stakeholder point of view: the service provider delivers passengers with the mobility service, the service customer, who acquires the mobility service, according to the service quality and rules declared by the provider, the guaranteeing authority (i.e. the local public administration) which must govern the scenario, trying to fill the gap between the delivered quality and the perceived quality. The service is split in three sequential phases: pre-journey, journey and post-journey. This approach allows us to achieve a structured and systematic view of the service. We can examine the service as the output of n different processes involving all the stakeholders and producing outputs on their own, which represents specific sub-services of the main service (Figure 2).

For the sake of brevity, in this context we will not examine all the subservices and the correspondences with the stakeholders but, for instance, the guaranteeing administrative authority plays a monitoring role throughout all the three service phases, whilst the different service operators will be in charge of different sub-processes (e.g., passenger support, vehicle configuration and maintenance, passenger transportation, baggage transportation, etc.) depending on their area of intervention. Similarly, the service customers will be involved in their normal activities (for instance, during the pre-journey phase they will be engaged in the journey planning and in ticket buying).

4.2 Taxonomy of Quality Areas and Indicators

According to our model, the guaranteeing local authority has to establish the minimum service quality and operational process performance levels for service operators in order to provide customers with final services. Therefore, we have borrowed the defini-
Applying a top down approach, firstly a series of Quality Factors (QF) are defined for each phase of the service lifecycle, according to [1] and [3], the UCoMS model has to contemplate. We have identified the following factors:

- QF#1, journey security;
- QF#2, passenger personal and patrimonial security;
- QF#3, service regularity and timeliness;
- QF#4, vehicle cleanliness;
- QF#5, passenger comfort and additional services;
- QF#6, services for passengers with reduced mobility;
- QF#7, information to passengers;
- QF#8, communications between operators and passengers;
- QF#9, environmental awareness.

For each quality factor, several indicators have been defined, thus achieving a meaningful categorization. It is also worth to point out that a specific attention has been paid to the communication aspects to be introduced in the UCoMS model, since they directly impact on the perceived service quality: easiness of identification for the personnel of the service operating company; propriety and respectability of the personnel’s behaviors and dressing code (by complying to the possible behavioral codes of the public administration employees, wherever already adopted).

Then, we have defined the taxonomy of indicators, which are quantitative parameters helping stakeholders in measuring both the delivered and the perceived service quality.

**Indicators for the Delivered Service Quality.**

Each indicator I is defined as a set: \( I(QF, tt, n, d, N, D, G, Tht, Thv, R) \), where: \( QF \) is the corresponding quality factor; \( tt \) is the transport type (i.e., rail or coach/bus); \( n \) and \( d \) are the name and the short description; \( N \) and \( D \) are the numerical quantities at the numerator and denominator; \( G \) is the time granularity; \( Tht \) is the threshold type (e.g., the allowed values can be greater/lower than the threshold); \( Thv \) is the threshold value and \( R \) is the reference period. Threshold values are defined according to the specifications supplied by the guaranteeing authority and on the bases of the analysis performed by service operating companies. Some thresholds values have not been defined since
they are not required or the foster companies involved in the pilot experience (see Section 5) did not have adequate tools for measuring the corresponding indicators, thus demonstrating that the model can be improved further by leveraging novel pilot experiences, possibly in different EU areas. Once each indicator has been specified, it is possible to compare and publish service offering by adopting a unified and shared semantics, thus paving also the way for the dissemination of open data on service quality.

Table 1 summarizes the identified indicators, by specifying the corresponding quality factors and whether thresholds values are available or not. Table 2 provides an excerpt of indicators, in order to allow the reader to better understand the scope of the indicators (the description field d has been omitted from the tuple of each indicators, in order to make the table more readable). For the sake of brevity, only the indicators pertaining to the journey security quality factor are reported, as for the rail transport only (i.e., 1# average vehicle age; 2# number of blocking failures; 3# accident rate).

<table>
<thead>
<tr>
<th>Quality Factor</th>
<th>QF#1</th>
<th>QF#2</th>
<th>QF#3</th>
<th>QF#4</th>
<th>QF#5</th>
<th>QF#6</th>
<th>QF#7</th>
<th>QF#8</th>
<th>QF#9</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. indicators</td>
<td>3</td>
<td>5</td>
<td>15</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 2. Excerpt of delivered service quality indicators (quality factor: journey security).

<table>
<thead>
<tr>
<th>Tuple element</th>
<th>#1</th>
<th>Indicators #2</th>
<th>#3</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>Avg vehicle age</td>
<td>No. of blocking failures</td>
<td>Accident Rate</td>
</tr>
<tr>
<td>N</td>
<td>No. of trains with age ≤ 20 yrs</td>
<td>No. of blocking failures</td>
<td>Tot. no. of train accidents</td>
</tr>
<tr>
<td>D</td>
<td>Tot. no. of circulating trains</td>
<td>Tot. distance covered by all trains during R</td>
<td>Tot. distance covered by all trains during R</td>
</tr>
<tr>
<td>G</td>
<td>Ø1 year</td>
<td>From January to December</td>
<td>1 year</td>
</tr>
<tr>
<td>Th, Th</td>
<td>Ø≥ 36.00%</td>
<td>Specific for each month</td>
<td>≤ 1.61%</td>
</tr>
<tr>
<td>R</td>
<td>Yearly</td>
<td>Monthly</td>
<td>Yearly</td>
</tr>
</tbody>
</table>

Indicators for the perceived service quality.
This set of indicators refers to the three methodologies proposed in [3] for evaluating perceived service quality. We have also considered EU reports about passengers’ satisfaction for urban [5] and rail [6] transportation services. The model encompasses five macro-dimensions describing passengers’ perceptions and expectations about LPT services: 1) tangible aspects (i.e., infrastructures, personnel, equipment and vehicles); 2) reliability (i.e., providing timely and trustworthy services); 3) answering capability (i.e., help and support to customers); 4) reassuring capability (i.e., relation between the staff from the service providing company and the customers); 5) empathy (i.e., availability of careful and personalized assistance to passengers). From these elements, we have identified several indicators, for each of the QFs specified in Section 4.3. For instance, the indicator for QF#2 (personal and patrimonial security of the passenger) is the effectiveness of surveillance and deterrence actions performed by service providers.
5 Pilot Case: the Apulian Regional UCoMS

The proposed UCoMS model has been applied to the LPT service at Apulia Region for the years 2013-2015 as validating pilot scenario. This action has involved LPT companies fostered by the regional administration, passengers, the regional agency for the mobility and our University, trade unions and consumers’ protection associations. After having examined all the contracts and agreements that were available for the LPT service providers in the region, we have involved three foster LPT service companies (operating both on rail and coach/bus areas), which voluntarily contributed to validating the UCoMS model by providing monitoring data about the indicators and public visibility to the collected data. This pilot phase has contributed to highlight several operational aspects necessary to realize an effective management of the UCoMS. A significant contribution is represented by the identification of the thresholds values for the indicators, thanks to the efforts spent by the regional administrative authority.

6 Conclusions

In this paper a model for a Unified Chart of Mobility Services (UCoMS) for the Local Public Transportation (LPT) providers has been presented. The legislative EU and national scenarios have been presented, as well as a brief analysis of current regulations about passengers’ rights and obligations. The proposed model has been defined in order to offer mobility service providers, service customers and guaranteeing local administrative authorities a tool for identifying trustworthy indicators capable of evaluating the delivered and perceived service quality in LPT sector. These indicators are categorized into a taxonomy that can be adopted to evaluate all characterizing aspects in the LPT sector. The taxonomy is compliant with EU and Italian regulations and laws as well as international standards in local mobility domain. The proposed model has been tested and validated in a pilot experience in Apulia, an administrative region of the Southern Italy and it aims at becoming a reference on an EU scale, since the quality factors and indicators that have been considered are based on current EU regulations and can be applied to each of the Member States with no significant customization efforts.

References

5. EC, Europeans’ Satisfaction with Urban Transport. Flash Eurobarometer 382b (2014)