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Reviewing efficiency and effectiveness of interurban public transport services: a practical experience

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Abstract

This paper describes the methodology and the analysis tool developed for a study, carried out in 2012, aimed at the reorganisation of the interurban public transport services of the Piedmont region of Italy. Reorganization was necessary as a result of the reduction in funds allocated to public transport. We needed to work on a large dataset spanning different types of data, such as service provision, ridership, economic data, and geographical information. The size of the task warranted the effort to merge all those data into a single database and develop an analysis tool on purpose. Therefore we custom built a web-based visual analysis tool, using free web applications, including geo-referenced dynamic maps and allowing users to visualise and interact readily with the information in the database. This web GIS application was used to characterise public transport lines on the basis of combinations of indicators of interest (such as ridership, number of services and km produced by time unit), or on the basis of their characteristics (such as route overlaps, reference public administration, type of services, e.g. daily, for schoolchildren, market day only). Tables, charts and maps obtained from the web GIS were employed to compare the information we had with a set of criteria and identify instances of inefficiency or ineffectiveness of interurban public transport services.

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Keywords: Interurban public transport; reorganisation; decision support systems (DSS); efficiency; effectiveness; performance indicators; Web GIS application.

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1. Introduction

Due to the current economic downturn, public administrations are facing the tough task of providing adequate services with decreasing funds. Public transport is one of the most affected services. Under the pressures of urgency, lack of funds and limited knowledge of services' effectiveness, administrators may choose the easier and faster solution: undifferentiated service cuts. Smarter choices could be made using good data sources and analysis tools. The pressure to collect and use such sources and tools may also be taken as an occasion to develop or fine tune data collection methods and data exploration procedures.

This paper describes the method developed for a study on interurban public transport services of the Piedmont region of Italy. The study, carried out in 2012, assessed the efficiency and the effectiveness of public transport and characterised which services could be reorganised in order to increase the system's sustainability while preserving as much as possible the level of service provided. The content of this paper is based on the final report of the study by SiTI (2012), which the authors contributed to.

The focus of the paper is on the method used, the selection of performance indicators, and the analyses carried out. The next section begins by elaborating on the motivation and the context in which the study was carried out, as well as the limitations of the remit. Other work carried out on the same case application is reviewed in section 3, while section 4 offers a brief survey of the literature that this work builds upon. Section 5 describes some of the characteristics of interurban public transport provision in the case examined that are useful to follow the ensuing discussion on the method and its application (section 6). The final section draws some conclusions and outilines some further information on the study including the work described in the paper.

2. Motivation

Planning and contracting interurban public transport in Italy is the responsibility of the Regions and of the Provinces. Regions, each including several Provinces, are directly responsible for rail transport and for bus services of regional interest, which are typically those connecting the main urban centres of one region with those of another one. Provinces are responsible for interurban bus services within their area. Regions have also the remit of coordinating services' planning by Provinces. All services are subject to public service obligations and are subsidized. The distribution of responsibilities just outlined results from the provision of legislative decree no. 422/1997 -which transferred public transport responsibilities from the State to the Regions- as well as from the regional legislation and administrative acts that each Region issued to adapt the new setup to its own situation.

In particular, the Piedmont Region transposed national legislation on public transport into its regional law no. 1 of year 2000 and identified 9 contracting bodies responsible for planning interurban bus services within their area: 8 Provinces and the Metropolitan Transport Agency of Turin, Piedmont's capital city (AMM - Agenzia per la Mobilità Metropolitana). The remit of this Agency includes planning and contracting urban and interurban bus transport in the greater Turin area (over 1.5 million people living in the 32 city councils making it up, about 900,000 in Turin alone) and the Metropolitan Railway Services (Servizio Ferroviario Metropolitano), 5 lines whose services started in 2012.

Within this framework, our research institute developed for the regional administration a method and a tool to analyse interurban bus services with the aim to support their reorganisation. Such reorganisation is meant in steps, and has to comply with both a long term vision for the public transport system and a decreasing availability of funds for subsidies. Reorganisation of railway services had been formulated separately by the regional administration. Therefore railway services were taken as given in this work and considered as the system around which bus services should be organised. Interurban bus services were analysed as a single integrated system, independently of the contracting body responsible for them.

This has been the first time that such a big and complex system has been screened in such a detail to investigate efficiency and effectiveness of existing services, reviewing the possible reasons for the issues detected by using summary indicators (no ad hoc survey was carried out for this work).

The findings of this analysis, together with guidelines for the reorganisation of the services resulting from a benchmarking exercise, were passed on to all the contracting bodies in order to foster a common reorganisation process according to the same standards across the whole Region.

3. Other works on the same case application

The interurban public transport system of Piedmont had previously been reviewed in a study by the consultancy Notoria (2012) on behalf of the Regional administration. That study, delivered before the work described here began, covered both railways and interurban bus lines and aimed at characterising lines to be reorganised following subsidy budget reductions. It took a largely economic viewpoint and conducted the analysis by looking at load factors. Those are the ratio of passengers-km and seats-km by unit of analysis (line) and time interval (year). As explained below, the study described here departed from both the unit of analysis used in that study and the indicators chosen for the analysis. In fact it aimed at looking in detail at issues such as low ridership so as to suggest further investigations or alternative service organisation (e.g. services on demand).

Another investigation on the same subject was developed in parallel to the one described here. The consultancy LEM Reply (2012) carried out a study on behalf of the Piedmont branch of ANAV (the Italian National Association of Bus Transport Companies). They analysed again both railways and interurban bus lines in the Region. Their units of analysis were the lines and their main indicator was the number of passengers boarding, thus focusing the study on transport revenues. That study also included a number of actions that could be taken on the services.

4. Literature survey

Several methods to evaluate efficacy and effectiveness of public transport lines or networks are based on data envelopment analysis (DEA, a linear programming technique) or similar approaches, such as the ones proposed by Button and Costa (1998) and Yu (2008). Lao and Liu (2009) suggested a method that integrates DEA and geographic information systems (GIS). That method needs some input variables reflecting the potential demand for bus service (e.g. bus commuters, elderly population) and uses the geographical information associated to each bus line to calculate an output indicator, representative both of efficiency and effectiveness of the services, which is the total number of passengers per year. These methods are useful if ridership data are not available, however do not explore the possible causes of inefficiency or ineffectiveness of the services.

Useful references for this purpose can be found in an analysis of interurban services in Italian region of Lombardy. Divieti, Stanta, Parma & Ugazio (1997) suggested a method to classify interurban services and indicators to measure supply, ridership and effectiveness. MIP Politecnico di Milano (1999) developed a method to detect rail and bus services' overlapping, that was partly borrowed here. To that aim they considered town areas served, number of bus stops in each town area, overlay of services and distance between a railway station and the centre of the town served, before proceeding to a more detailed analysis of supply, demand and ridership.

Mackechnie (2012) notes that reorganising lines after funding reductions may be done by first eliminating overlapping services then either choosing to "spare the key routes" by applying funding reductions to services with low ridership or to "spread the pain" by applying undifferentiated service cuts.

Effects of reduction of subsidies on ridership of interurban public transport have been discussed by van Goeverden & Peeters (2005) with reference to the case of the Netherlands. They also discussed the effect on interurban transport demand of varying elements such as speed, frequency and fares.

5. Some characteristics of the case application

Almost 4.5 million people live in Piedmont, which has total surface area of about 25,400 km2, and a density of 176.9 inhabitants/km2. It is also worth noting that some 35% of the surface area is mountainous.

Interurban bus transport provision in 2010 was made up by 564 lines. There are seven types of lines, as regards the type of service offered:

- regular lines, which amount to 89% of the total bus-km offered in a year (equivalent to some 50 million bus-km), and to 90% of the routes;
- market lines. Aimed to increase transport capacity to and from markets only on market days;
- school services, 2% of the total bus-km and about 4% of the routes;
- services for factory workers, accounting for 8% of bus-km and 5% of routes;
- touristic lines, which aim to serve leisure destinations or areas;

- long distance touristic lines. Similar to the previous ones, but longer;
- atypical lines. These are lines for factory and office workers that do not receive public subsidies but are monitored by the local contracting body, which is also responsible for approving their timetable.

The total production in 2010 was 70.3 million bus-km, for a total of 10,504 services run on a reference winter working day. There are several companies operating the services and the share of each varies from 2% of the total bus-km by the company with the smallest part of the production to 19% of the total by the company providing the largest share of bus-km.

Services are organised in lines, but each line may comprise more than one route. In 2010 the 564 bus lines included 3,249 routes. A detailed study of the network of services in the whole Region revealed how many lines are made up of several routes. Each route may branch out to different places at its ends, but may also travel along different roads and stop in different places altogether along the central part of its path. Indeed, looking at maps allowed us to appreciate that -in some cases- alternative routes belonging to the same line could actually be seen as completely separate lines. The importance of this issue is remarkable, as noted above by comparing the number of lines and the much larger number of routes. In fact, there were lines with a single route but also lines with more than twenty routes. This state of practice may be surprising –and is likely confusing and inconvenient for the users- but may be explained by looking back at the development of the services over the years: when new needs arose and services were directly awarded to bus companies, sometimes the contracting body designed a separate route of an existing line instead of opening a new line.

Routes and, more generally, services may have different days of operation (e.g. Mon-Fri, Mon-Sat, Sat only, Sun/Holidays only) and typically have different timetables during the winter period (September to June) and the summer period (June to September). The key distinction between the summer and the winter periods is the absence of patronage due to school attendance over the summer months. Students are partly accommodated on the school services run only on schooldays (with a timetable typically determined by entrance and exit time of the schools served) but many students travel also on regular services.

With the exception of atypical lines, all the services are considered essential according to the laws on transport (LR no.1/2000 and D.Lgs. 422/1997), in other words they form the services that the contracting agencies consider necessary to provide an adequate supply of public transport. Essential services are subsidized by the contracting agency and, ultimately, by the regional administration which is in charge of distributing subsidy budgets received from the State and tops them up with own funds (all public bodies involved may further integrate the funds required for the subsidies).

6. Method and application

This section describes the method employed including mentions of examples from the application.

As indicated in the introduction, the study aimed at indicating parts of the public transport system that need immediate attention and suggested actions consistent with a long term reorganisation of the system complying with subsidy limitations. Key points of the latter are:

- simplification of routes and timetables (regular interval timetables);
- hierarchical organisation of rail and bus services: rail services at the top of the hierarchy and bus services organised in key routes, feeder services, local services (with special provision for low demand areas, e.g. services on demand), plus special services for school, factories, markets (when needed);
- integration among services (rail and bus services) in terms of routes, timetables, ticketing;
- level of service –e.g. frequency- consistent with the level of the service in the hierarchy;
- network based on interchange nodes (already existing);
- frequent monitoring of service quality and ridership with feedback in the system organisation;
- better information to users.

The method discussed here and applied to point out which services and routes deserve attention at the beginning of the reorganisation comprises the following steps:

- definition of the objectives;
- choice of unit of analysis;
- development of a geo-database merging available data on services;
- identification of indicators relevant to the objectives;
- identification of the typical issues;
- development of a tool to visualise and analyse data on services and indicators;
- scrutiny of the available data to find typical issues and quantify their magnitude.

6.1. Definition of the objectives

The key objective was to ensure that funds spent for public transport are within budget and are spent in the best possible way. This means minimising the funds spent on passenger-km avoiding to apply linear cuts across the services to comply with the budget. Thus, efficiency and effectiveness of services were considered together. Efficiency was intended as operating the maximum number of effective bus-km within the given subsidy budget. As for effectiveness, the larger the number of passenger-km for every bus-km, the more effective is a service. The analysis showed that subsidies for a bus-km and average distances travelled by users were similar across contracts in the area interested by the study. Therefore, the objectives considered here could be achieved by increasing the ridership of the services. Ridership may be considered dependent on services' efficiency and effectiveness (as well as on the potential demand, which is not investigated in this work).

6.2. Choice of unit of analysis

Caution had to be taken when choosing the unit of analysis, which is the route, as opposed to the line (recall the discussion in section 5). The choice was made after inspecting the database of service supply and realising the relevance of the route/line issue. Working on the lines would have meant missing details which are useful for identifying possible items to refer for action as well as to define effective actions.

6.3. Development of a geo-database merging available data on services

To allow an easy review of this study every year, data routinely available to the contracting authorities and the region were used, avoiding costly and time-consuming field data collection. Available data included:

- geographical (GIS) representation of the network of services, with location of lines, routes and stops. There were two separate sets of information to be merged to get the full picture and aligning data proved difficult;
- a database on the supply of services, part of the data routinely collected by the contracting authorities. Those data include the timetables of each of the actual routes and services provided, with route type, days of operations, bus-km, and commercial speed;
- information on ridership, collected twice a year, once during the winter and once during the summer, at points in time chosen by the contracting authority. Data collection is the responsibility of the bus companies and, in practice, of the drivers who note the number of passengers who board and get off at each stop;
- economic data were available from the regional observatory on mobility and from the national transport statistics. They included total production in bus-km and total subsidies per contracting authority.

Unfortunately, the available data -being of different sorts- were not entirely aligned as for details and times to which they referred. Due to this reason, there was a strong need to make data homogeneous and merge them in a single and robust geo-referred database, allowing the clear reading and analysis of the data. This work, mainly carried out manually, allowed us to identify the most important requirements that should be met during the data collection process to obtain an homogenous and readily usable dataset for the whole Region. At the end of this work, these requirements were included in a handbook delivered to the Region.

6.4. Identification of indicators relevant to the objectives

Workshops with local public transport experts -coming from universities, research centres, public administrations and companies- and a review of literature were carried out to identify a number of indicators describing supply and ridership. Altogether some seventy indicators were computed, some to further obtain composite indicators. We mention here those used in the procedure described below:

- type of line (among the seven detailed above) and days of operation;
- passengers-km: this is the number of passengers who boarded the service times the actual distance travelled (rather than an average distance). The calculation is carried out by multiplying the number of passenger actually on board between any two stops (as results from the surveys) and the distance between those stops, and finally summing over all the pairs of stops along the route travelled by the service considered. Note that passengers-km are computed separately for winter and summer time and for the 3 different types of day of operation: Mon-Fri, Sat, Sun/Holidays;
- average ridership, obtained as the ratio between passengers-km actually occurred for a service and the length of the route travelled by that service. Again, average ridership is calculated for the 3 separate types of day of operation, Mon-Fri, Sat, Sun/Holiday, further separated into winter or summer time;
- overlap among routes, either belonging to the same line or to different lines, and number of town council areas across which the overlap occurs;
- distance between a railway station and the centre of the town or village it serves.

Note that the value of passengers-km is particularly revealing about actual usage of services since it allows evaluating ridership and distance travelled, without double counting passengers who use connections. Double counting happens when using boarded passengers only, though this information is fine to gauge -in a first approximation- a service's profitability. Passengers-km allows us also identifying when a service has different patronage on different sections of its route, which would be missed when using boarded passengers only.

Moreover, for this study the average ridership was a more interesting a piece of information than the load factor since it does not relate to the capacity of the vehicle on the service, which is up to the operator.

The indicators employed refer to winter working days (Mon-Fri) in the first instance, unless otherwise noted in table 1, since those are the days when the highest ridership is expected in most cases, so that routes with poor results of indicators during those days certainly deserve further attention.

A limitation of working with data on actual services and actual ridership is that potential demand is not considered. This was accepted in this work since it was meant as first step of the reorganisation and, while a large quantity of information had to be inspected, no modelling exercise was possible in the time available.

6.5. Identification of the typical issues

The selection of a catalogue of typical issues -causes of inefficiency and/or ineffectiveness- which warrant earmarking a route for action was made in parallel to the choice of summary indicators illustrated above. The list of such issues and the criteria for considering a route as affected by one of the typical issues were obtained from a review of literature and with interviews with local public transport experts and stakeholders. Typical issues may recur across the dataset and may be identified with the indicators selected. The following table 1 summarises the ten typical issues considered and the criteria for identifying them.

While several typical issues are identified with the same criteria, the services considered are different, so the issues were highlighted separately. The following paragraphs discuss each of the typical issues.

6.5.1. Typical issue no. 1: Sections of interurban lines entering the urban area of Turin

This issue had already been noted by the Metropolitan Transport Agency of Turin (AMM). Turin, the capital city of Piedmont, has about one hundred urban lines operated with trams or buses and one underground line. In addition to those, five lines of metropolitan railway services serve the city. The analysis carried out showed that there are 60 interurban lines –corresponding to a total of 319 routes- entering the city of Turin. This fact results in overlaps with urban services, also considering that interurban services usually just pick up or drop interurban travellers when travelling within the city. These interurban services might be integrated with the urban ones by stopping them in some interchange nodes located in the outer parts of the city (the AMM had already identified a number of locations suitable to become interchanges among interurban lines and the network of urban services, especially linking with lines with high capacity/frequency and metropolitan railway services).

Table 1. Summary of typical issues and criteria for selecting of services affected.

	Typical issue	Criteria to consider a service affected by the issue
1	Sections of interurban lines entering the urban area of Turin	Routes entering the city of Turin to reach the terminus
2	Overlapping among bus routes belonging to the same line	Routes belonging to the same line, overlapping across the area of > 4 town councils and with average ridership (Mon-Fri, winter) < 5
3	Overlapping among bus routes belonging to different lines	Routes overlapping across the area of > 4 town councils, and with average ridership (Mon-Fri) < 5
4	Overlapping among bus and rail routes	Rail and bus routes overlapping across the area of > 4 town councils (with distance town centre – railway station < 1 km), and with average ridership (Mon-Fri, winter) < 5
5	Underutilized services for factory workers	Average ridership (Mon-Fri, winter) < 5
6	Underutilized market lines	Average ridership (Market days, winter) < 5
7	Other services with limited ridership	Average ridership (Mon-Fri, winter) < 5
8	Services with low ridership on Saturdays, Sundays and holidays	Average ridership (Sat, Sun, holidays, winter or summer) < 5
9	Services with low ridership during the summer	Average ridership (Mon-Fri, summer) < 5
10	Inefficient routes	Routes including loops

6.5.2. Typical issue no. 2: Overlapping among bus routes belonging to the same line

As underlined above, there are many lines divided into several routes. This has already been partly explained but is also due to changes to public transport provision that were aiming to satisfy local requirements without accounting for the integration of services into the wider system. The analysis of ridership data showed that many paths, overlapping for much of their length, have each a very limited ridership. Therefore, regular routes are considered affected by this typical issue if they overlap across the areas of at least five town councils and have an average ridership on winter working days of less than five people.

6.5.3. Typical issue no. 3: Overlapping among bus routes belonging to different lines

This issue has the reasons recalled for the previous one, but it is also due to route design sometimes carried out separately by different operating companies or contracting bodies, without integrating the respective networks. Overlapping among bus routes belonging to different lines occurs in terms of paths but also of timetable (with services on a same stretch of route operated close to one another or almost at the same time). Regular routes were noted as affected by this issue when belonging to different lines but overlapping across the areas of at least five town councils and showing an average ridership on winter working days of less than five people.

6.5.4. Typical issue no. 4: Overlapping among bus and rail routes

There were several instances of such overlappings, most likely due to planning and contracting bodies as well as operators for railways and buses being different. A bus route was considered overlapping with a railway line (and services) when overlay occurred across the areas of at least five town councils and had an average ridership on winter working days of less than five people. For the overlap to occur, the railway stations had to be located at less than 1 km from the town centre, so as to exclude from consideration bus lines serving towns whose railway stations are inconvenient to reach on foot.

6.5.5. Typical issue no. 5: Underutilized services for factory workers

Routes and services for factory workers are operated when plants are located away from the regular routes or shifts begin or end at times when regular services are not available. Recently there have been cases of reduced production times and of dismissed plants due to changes in production. Public transport provision was not always promptly updated to reflect changes. Moreover, there were cases where the lack of coordination among working times at different factories close to one another required a dedicated service for each. Routes marked with this issue are those with an average ridership of less than 5 on winter working days.

6.5.6. Typical issue no. 6: Underutilized market lines

Market services are operated when regular services are deemed insufficient to cater for the people travelling to and from market towns on the day of the market. However, there have been cases when ridership on such services has become low. Sometimes the reason is the lack of coordination with actual market opening times.

Routes marked with this issue are those with an average ridership of less than 5 on winter market days.

6.5.7. Typical issue no. 7: Other services with limited ridership

There are routes of services different from those listed above which have low average ridership on winter working days, when ridership is expected to be at its highest. This may be due to services not meeting the demand (e.g. timetable needing revision, area unsuitable for conventional fixed line services). Routes were highlighted for further attention when they had an average ridership of less than 5 people on winter working days.

6.5.8. Typical issue no. 8: Services with low ridership on Saturdays, Sundays and holidays

While most services are designed for commuters and students, services on Saturdays and Sundays are also intended to meet the demand of leisure travellers but some have low ridership and should perhaps be reorganised to meet actual demand. Regular routes have been marked as affected by this issue if their average ridership during holidays and Saturdays (during winter or summer) is less than 5.

6.5.9. Typical issue no. 9: Services with low ridership during the summer

During the summer period services are organised to satisfy both work and leisure demand. Nevertheless there are several services with low average ridership, especially at lull times. Therefore, regular routes with an average ridership of less than 5 on summer working days were earmarked for further investigation.

6.5.10. Typical issue no. 10: Inefficient routes

These routes pass more than once from the same stop, i.e. all cases with loops and, more generally, with paths that seem inefficient. The few cases detected –mostly on the mountains- were inspected in detail, checking for the possibility to simplify the route. In fact, the inspection revealed that the apparent path inefficiencies where reasonable since they were due to lack of space to manoeuvre the bus (e.g. to change direction), one way streets or other limitations to traffic.

6.6. Development of a tool to visualise and analyse data on services and indicators

The indicators described in paragraph 6.4 were analysed to find the occurrences of typical issues by means of a tool developed on purpose, called VisualTPL (TPL being the acronym typically used to refer to public transport in Italian). The choice of developing an ad hoc tool was due to two main reasons: usability and cost. Several commercial tools are available to manage public transport data. However, to use these tools, input data have to meet specific requirements of homogeneity in graph representation, a condition that is sometimes impossible to obtain with real data. Moreover these tools require specific user' skills and have often significant license costs. VisualTPL, instead, has been built on a user-friendly web platform by the use of Google Fusion Table free applications. Through these technologies all the data available included in the geo-database developed (see paragraph 6.3) and the indicators calculated (see paragraph 6.4) were merged and visualised in a customised Google Maps Interface. This interface is presented in Fig. 1.

The top frame of the interface allows the formulation of queries to filter data, e.g. by contracting body, bus line or route (number or denomination), type of line, Bus-km/year, daily bus services in winter working days, average ridership or average ridership in winter working days.

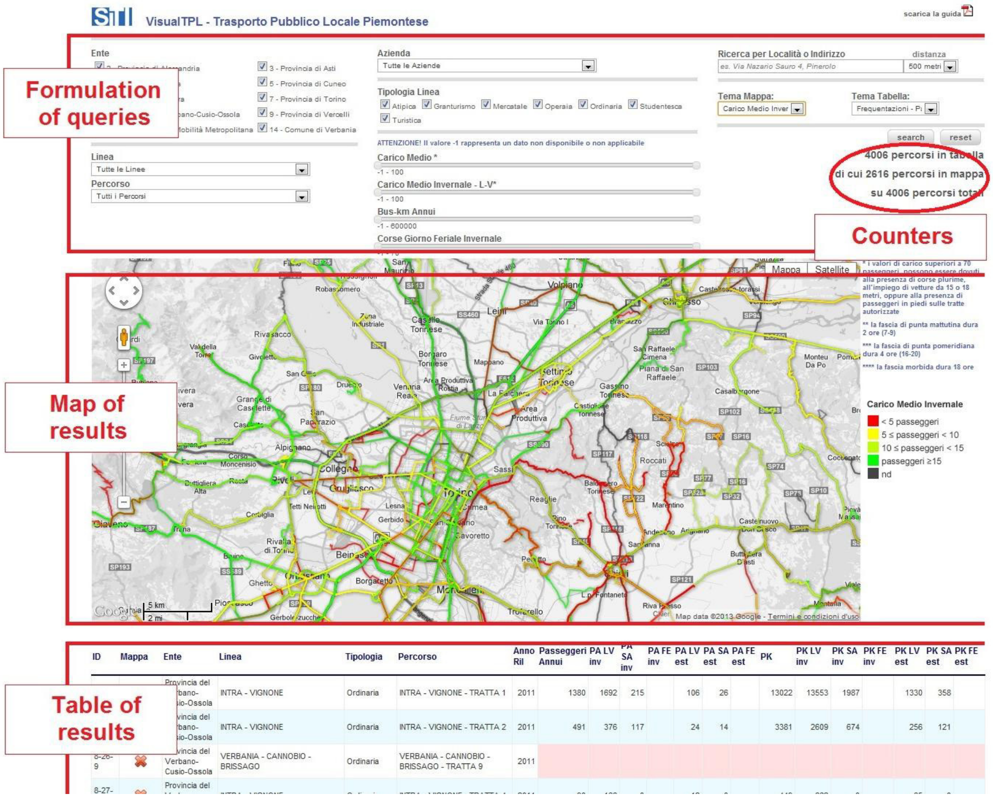

Fig. 1. Interface of the Visual TPL tool.

Filters can be combined, enabling the visualisation of complex queries. Filtered data are then represented in a Google Maps window –in the central frame of the interface- and in a Google Charts table located in the bottom frame. The selection of a single item on the map generates a pop-up window which contains its main characteristics.

The user can visualise the results using a set of predefined maps and tables (e.g. Bus-km/year, daily Bus services in winter working days, average ridership, average ridership in winter working days or maximum ridership).

All data are listed in the table, while only data with a geographical attribute can be visualised in the map. The user is aware of possible non-displayed data thanks to a counter located on the left of the interface (see Fig. 1).

6.7. Scrutiny of the available data to find typical issues and quantify their magnitude

Occurrences of the typical issues outlined above were flagged up following a detailed analysis carried out by means of the Visual TPL tool. Note that only services whose ridership had actually been monitored were analysed (some services had not been monitored and were excluded from the analysis).

The relevance of issue 1 (sections of interurban lines entering the urban area of Turin) was quantified by counting the bus-km/year which would be saved by siting the termini of the routes at the interchanges out of the city centre rather than at the current locations. The magnitude of issues 2 to 7 was obtained by considering the actual production in bus-km over the whole reference year, even though the criteria to characterise the issues were referred only to the winter period. In fact, it was assumed that when services were subject to the issues on winter working days (when ridership is expected to be at its highest) they would show the same issue during the rest of the year. The magnitude of issues 8 is given by the production in bus-km during Saturdays, Sundays and holidays, consistently with the marker, and that for issue 9 is the actual production in bus-km over the summer period.

Final results showed that both the total magnitude of the issues and the relevance of each issue vary a lot among the contracting bodies. This heterogeneity underlines the need to reorganise services in a tailored way rather than applying linear cuts. The most relevant issue, in terms of bus-km, was no.1, concerning interurban lines entering the urban area of Turin. A better integration between regional and urban services would overcome it but could also bring about a decrease in demand due to the newly introduced interchanges among interurban and urban services. Overlapping among bus routes belonging to the same line (issue no. 2) and to different lines (issue no. 3) were also relevant. This finding confirms the current complexity of the system, due to the high number of contracting bodies and operators, and warrants action to correct overlaps in terms of timetables and routes. The issue regarding "other services with limited ridership" (no. 7) was noteworthy for all contracting bodies. This may indicate that in some cases supply does not meet the demand (due to e.g. timetable, route). Further analyses are required to detail whether some services may need a revision. However, average ridership cannot be the only indicator to decide which services should be reorganised or cut, even when public administration face reduced funds. Regional services - whose objective is to guarantee accessibility to primary services to people living in rural areas – may have low ridership in some cases, as long as this is recognised and accounted for in transport policies.

7. Conclusions

The method and the tool described allowed us to work through a large quantity of data on services and ridership extracting the key indications required to identify areas of likely inefficiency or ineffectiveness that deserve immediate attention when rethinking a interurban transport system, also to comply with limited subsidy budgets.

The method, based on a set of typical issues and relevant markers may be adapted to other situations, and may also be used to simulate different scenarios (e.g. by varying markers' thresholds), also depending on budgets.

For its simplicity this procedure may be used by planning bodies to scan their system and find the main issues needing attention, thus focusing their actions.

Moreover this approach allows different planning bodies to analyse and reorganise their services following a common method and a strategy agreed with the regional administration according to a long term vision, avoiding inconsistent courses of actions. To this aim, and in order to assist planning bodies with devising solutions representing the state-of-the-art in the transit sector, the results of the work outlined here were supplied along with guidelines to reorganize the services.

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