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The citizen satisfaction survey on the local public transport in Bologna

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Aim of this paper is to evaluate the customer satisfaction in a public service context. It is well know that customer satisfaction plays a strategical role for companies providing the public services. In section one some introductory aspects, concerning the concept of citizen satisfaction are discussed. In the second section we define the quality of public services, describing the quality dimensions, considering the "service chart" as a tool useful for the construction of our questionnaire. Infact, our survey, carried out on citizen satisfaction, has been developed through the analysis of questionnaires administered in Bologna city with respect to the service of local public transport. In section three we briefly delineate the sampling procedure adopted for our survey and we describe the questionnaire. In the following section, we illustrate the main statistical results in term of descriptive analysis and multiple correspondence analysis. Finally some conclusive remarks about the needs of citizen-users are discussed.

keywords: local public transport, customer satisfaction, statistical analysis.

1 Citizen satisfaction and quality service

In recent years, the utility companies of public services have been affected by numerous changes; both internal, either for new legislation, either by changes in the way of service delivery, and both external changes because citizens-customers claim to have public services of high quality (Margheri, 2002).

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Who designs the delivery of a service must keep in mind that the perception of quality is multidimensional and depends on efficiency, effectiveness and durability. We ourselves define the quality of a service after it is used according to the characteristics that it should possess. This shows the need for a company to know the felt needs or quality standards that the community of citizens consider most important. This is made even more complex by the growing public expectations regarding standards of quality in providing a service, and forces companies to refine their own mechanisms in order to retain their customers.

There is not a significant difference between the concept of citizen satisfaction respect to the same definition of customer satisfaction used in the private sector, except for the objectives. Infact in the public area, the target is to fulfil the collective demands, listen and understand in-depth the needs that the citizen requests, while developing and improving dialogue and relationship skills (Gramigna, 2005).

Ensure quality of service is the priority for private organizations and should also be the same for public companies and institutions. Therefore, customer satisfaction plays a strategic role for companies providing a public service, as the cornerstone to reach citizen loyalty, increase in sales revenues, cost reduction; but it is also interesting to take into account consequences from the dissatisfaction: the direct economic costs due to inefficiency and loss of dissatisfied customers, or the effect generated by a negative word of mouth that causes mainly damage to reputation and corporate image, as well as to the whole city in which a service wouldn't satisfy the citizens (Cusatelli et al., 2016).

The processing of these data made an interesting user segmentation according to the perception of respective service quality. This was made possible through the multivariate data analysis, examining in depth the characteristics of the citizen-users sampled.

Since transport issues lie at the heart of urban development policies, a sustainable transport policy should consider them in its local action planning. At the same time it is necessary to introduce specific organization methods and innovative technologies in terms of energy saving and environmental protection. It is therefore crucial to raise awareness on the impact of the people's choices of transport on the quality of the urban environment.

In this paper, the case of the Tper company is examined: it manages public transport in the City of Bologna; a statistical analysis was performed by administering a questionnaire to a sample selected from the population of Bologna, in order to evaluate and study the quality of provided service.

2 Measuring customer satisfaction in the services

Define quality of public services is not entirely simple, and the difficulty depends primarily on the characteristics that differentiate a service from a product (Fontana et al., 2005): the service is an immaterial benefit, so it is rarely possible to establish specifications of production in the design phase; the presence of the human factor makes the service influenced by the conditions and the context in which the services are provided, as intrinsic mental reasoning, difficult to observe (Bezzi, 2006).

Moreover, quality can be seen as an abstract and relative value and defined in many ways, because it is composed of an objective part (i.e. tangible aspects that have to meet specific customer requirements) and a subjective part (i.e. the intangible aspects that need to meet the expectations and desires of the customer). It is therefore necessary to define the factors of the service we are going to study (e.g. service punctuality, seats availableness).

Currently, the concept of quality is technically explained as a set consisting of four subsystems that can be defined as follows (Cantieri, 2007):

- expected quality: it refers to expectations and thus to the citizen. The goal is to identify what citizen wants, that is, what are its implicit, explicit and latent needs;
- designed quality: it refers to the provision and then to the Administration. The goal is to identify what the Administration wants to give and how to give it;
- given quality: this also refers to the provision and then to the Administration. The purpose is to identify what the Administration truly delivers compared to the standard services defined upstream in the design phase;
- perceived quality: it refers to expectations and thus to the citizen. The purpose is to evaluate the citizen-user satisfaction with the received service.

In summary, the quality of a service can be defined as the set of the aspects and characteristics of a service on which depends its ability to satisfy a given need. There is, therefore, a strong link between customer satisfaction and service quality (Margheri, 2002), which can be explained as the customer:

- feels a sense of discomfort when the performance is lower than his expectations and demonstrates a deep dissatisfaction when the magnitude of the deviation is high;
- is satisfied when the achieved performance coincide with his expectations;
- is very satisfied when performance is superior to his expectations (i.e. when he receives something more than what he thought to find).

2.1 The service chart

Customer satisfaction takes on the strategical role in identifying any differences which exist between the levels of expectation and perception. This gap expresses, in turn, the level of non-quality, and the direction of corrective actions according to the classification of deviations between:

- needs and provided services (i.e. expected and given quality): it occurs when the needs are not fully understood by the Administration or in the case when different priorities are assigned;

- expectations and designed service standards (i.e. expected and designed quality): it occurs when there is a time lag between the citizen expectations and the standard services provided by the Administration;
- standard facilities and services effectively performed (i.e. between designed and given quality): this happens when the provided service does not reach the intended standards;
- delivered effective performance and the perception of the citizen-user (i.e. given and perceived quality): this occurs when the provided service is different from the expectations.

Once the deviations are identified, the competency of the Administration to guarantee citizen satisfaction is connected with a continuous improvement, that is thinking in terms of systemic solutions, in order to find the causes which prevent an effective performance and to promptly intervene in overcoming them: it must be taken under consideration that citizen satisfaction is relative (depending on the context where it belongs) and dynamic (varying in time).

Therefore, the development of public institutions follows a pattern that alternates improvement and maintenance actions. In this context, customer satisfaction represents an excellent indicator because on one hand it can measure the degree of satisfaction of the users needs and expectations, and on the other, provides the extent of efficiency level related to a particular corrective action (Zanella, 2002).

Towards citizen satisfaction, the so called "service chart" is a document introduced in Italy on 27th January 1994 with the purpose of linking the government and even private entities that provide public services to assume the burden of monitoring and improving their standards of quality performance. The Directive focuses on three main levels:

- fundamental principles to be followed issuing a public utility service, which are equality, impartiality, continuity, right of choice, participation, efficiency and effectiveness;
- instruments to be used for the development and implementation of quality charter services: adoption of quality standards, simplification, information, checks on quality;
- protection instruments: reimbursement, user complaints procedures, penalties for failure to comply with regulations.

So the chart is a statement with which targets and quality standards must be verified and tested with special instruments that allow the assessment: the hope is to open a new phase between public services providers and citizens.

2.2 Programming the customer satisfaction survey

Once the matter under study was defined, we chose indicators able to represent the performance levels of service provided. The indicators are divided into objective ones,

that can represent independent and directly observable aspects by personal ratings (i.e. coverage area), and subjective indicators that show the experiences of consumers (i.e. level of perceived safety while traveling). The next step was the creation of indexes that summarize the information contained in the indicators.

The "perception" is detected through a hierarchy of evaluation variables of the service; that is, by a grid of pre-defined variables is obtained, through the research, the ranking of these variables, starting from the one on which the service is better evaluated to that on which it is negatively evaluated (Gramigna, 2005). It is not sufficient to measure the perception, but we must also point out the expectations: it is not enough, in fact, that a field of investigation (variable) is highly perceived, but the perception have to be high on the variables considered important by users. There are, in essence, two distinct but complementary measurements: customer perceptions and expectations expressed by customers. The survey of customer satisfaction thus assumes a key role as part of the tools for continuous improvement and the overall quality of service. For the service of urban mobility were considered appropriate quantitative indicators relevant to evaluate the quality of services. From the comparison between expected performance and received service, it appears that there are two levels of expectations: desired and adequate level. The desired level corresponds to the quality of service that the citizen is hoping to receive; the adequate level corresponds to a sufficient level; in between lies a zone of tolerance where the citizen is satisfied but considers that the service could be improved.

3 The sampling plan and the questionnaire structure

Actually, Italian law requires putting in place a series of activities and obligations, to be achieved with the active participation of citizens in the capacity of consumers and users of services, such as to enable more control on the quality of local public services. The investigation has so moved by the knowledge that the expectations and needs of the users are a prerequisite for identifying the direction in which to address any corrective actions.

Therefore, the objectives of the survey are: verify the relationship with the buses and the preferences of other means of transport; check out some of the aspects of the service provided; assess the impact of some aspects of the service on the user rating; check the feedback of the service.

The reference population is that of residents in the city of Bologna on 31st December 2013, by sex and five age groups, and the sample size was calculated according to the known formula:

$$n = \frac{(d/2)^2 + p\,(1-p)\,z^2_{\alpha/2}}{(d/2)^2 + \frac{p(1-p)z^2_{\alpha/2}}{N}} \tag{1}$$

where (Delvecchio, 2015):

- N is the size of the reference population: in this survey coincides with the adult residents in the city of Bologna, i.e. 384,202 units;

- d is the maximum permissible error in the survey: an error rate of 6% was used, i.e. 0.06;
- p is the expected prevalence of assessed arrangements, which in our case is the proportion of satisfied users of the services: we used a conservative approach, assuming a prevalence of 50%, i.e. 0.5;
- α is related to the security measure of estimate: since in this case it was used a 95% confidence level, $z_{\alpha/2} = 1.96$.

The extraction of 267 sample units followed the technique of stratified proportional sampling (Tab. 1) and the survey started in October 2014, involving Tper (Bologna local public transport service) users.

There are two main reasons behind this sampling plan choice. At first the used sampling method is probabilistic, thus allowing to extend the results from our sample to the total population (Giacalone et al., 2014). The second consideration is that we get the official adult resident data from the Registry of Bologna city.

Table 1: Adult residents in Bologna and number of sample units by age and gender

Age	Age strata size (N_i)	$f_i = N_i/N$	Sample units in age strata ($n_i = n \cdot f_i$)	Male strata size ($_M N_i$)	$_M f_i = {}_M N_i/N_i$	Female strata size ($_F N_i$)	$_F f_i = {}_F N_i/N_i$	Male sample units ($_M f_i \cdot n_i$)	Female sample units ($_F f_i \cdot n_i$)
$18-23$	69,608	0.181	48	35,919	0.516	33,689	0.484	25	23
$24-39$	80,090	0.208	56	40,394	0.504	39,697	0.496	28	28
$40-54$	88,808	0.232	62	42,987	0.484	45,821	0.516	30	32
$55-69$	68,503	0.178	47	31,254	0.456	37,249	0.544	21	26
≥ 70	77,193	0.201	54	29,710	0.385	47,483	0.615	21	33
Total	384,202	1.000	267	180,263	0.469	203,939	0.531	125	142

In the definition of survey instruments it was paid particular attention to the use of clear and immediate language, and to the various response options so that they were understandable and stored by the interviewee. To facilitate the response process and to make the responses more instrumental to the process of evaluation of services we have also chosen to draw up questionnaires that contained closed questions. Clearly define the questionnaire is the element of crucial importance as part of the survey methodology.

The questionnaire was divided mainly into three different macro areas, consisting of 29 closed questions, each of them with 5 qualitative responses in ordinal scale. The first macro-area contains some questions about the use of bus and some questions in which the respondent will be asked to make a comparison between buses, cars and motorcycles.

In the second macro-area, on which we focus the present analysis, are asked some questions in term of judgments about certain characteristics of the public service received (as reported in Tab. 2). The third, and final, macro-area deals briefly with the impact that the Tper service had on the respondents (so called feedback).

Table 2: Percentage distributions of interviewees according to various aspects of transport service

Transport aspects	Customer judgment			Transport aspects	Customer judgment		
	Dissatisfied	Satisfied	Very satisfied		Dissatisfied	Satisfied	Very satisfied
Bus punctuality	13.8	47.8	38.4	Safety on board	29.2	53.6	17.2
Bus frequency	10.4	53.6	36.0	Alerts timeliness	9.7	37.1	53.2
Seats availableness	21.0	43.8	35.2	Buses cleanness	39.3	52.5	8.2
Buses efficiency	13.4	59.6	27.0	Driver rating	4.5	28.1	67.4
Land coverage	4.5	33.7	61.8	Fees rating	43.1	45.7	11.2

3.1 Descriptive Analysis

The results for the individual questions, grouped according to the various aspects in the questionnaire reported in the appendix, are shown below. After a brief presentation of the characteristics of the user in the survey, we proceeded to the analysis of the other aspects of the customer satisfaction and enjoyment of the service.

From this analysis of the questions related to the general characteristics of the user, the prevalent sex, slightly, turns out to be the female (because of stratification sample adopted). Age groups are divided as follows: 18% of citizens under 23 years old, 21% for the age group ranging from 24 to 35 years, 23%, then the greater, the range of between 40-54 years, 18% for the group 55-69, and finally 20% for the group 70 and over. The users are characterized by a relatively high level of education: in fact, 57% of the sample has a high school diploma, while 39% even a university degree, only 4% have a middle school certificate, while not logged in sample users who have only an elementary school or no title. In reference to the employment status, the majority category is the one of employees at a rate of 40%, followed by retired with 21%, by professionals, with 16%, by the students, with about 14%, and self-employed, unemployed and the "other" category covering a total of 11% of the total.

In addition, the sample shows that 38% are occasional traveler, or uses on average in a month the bus for a maximum of 5 times, 28% use the bus from 6 to 15 times, while those who choose the bus 16 to 30 times is 20% finally, who use the bus more than 30 times per month accounts for 13% of the total. For what concerns the main reason users prefer the bus towards other means, 30% of the sample does not have access to other means of transport; 26% prefer the bus for its cost, 16% of the sample use the bus as much of the center of Bologna is closed to car traffic. The 33% interviewed said they use for their journeys the ordinary ticket; 33% buy the City-pass ticket that entitles to make up to 10 races after the purchase, instead 23% and 8% respectively buy monthly and annual ticket. The 69% of respondents buy these tickets in tobacco stores.

In the administration of the questionnaire we asked some questions about the comparison in relation to some aspects of a journey: comfort/functionality and economy. With

reference to the car, 43% of the sample is substantially disagree on to greater comfort and functionality of a voyage by bus, however, 31% of respondents recognized the bus greater comfort and functionality in travel. As regards the cheapness, 64% of the sample is located substantially in agreement with the statement, 26% cannot give a response, while 12% is in disagreement. Overall, 57% of the sample would not prefer the bus to make a journey. Instead, with reference to a motorcycle, 45% of respondents disagrees with the question asked about convenience/functions, 43% recognizes these qualities to the bus compared to the motor and 12% doesn't know. With reference to the economic aspects: 45% of the sample does not recognize such a characteristic of the bus against the motorcycle, 25% does not take a clear position, instead of 30% is located substantially in agreement with the question asked. In conclusion, 52% of the sample prefers the bus to the motor. The website of the service isn't "ever visited" by 37% of users, but narrowing down of our analysis on the actual evaluations, it appears that 55% of 169 respondents assigns sufficient evaluation.

The results for the section parsing opinions on the perceived quality of the service supply, aspects impacting significantly on the satisfaction of the citizen users of public transport, are shown in Table 2. For example, the sample gives a rather negative assessment of the cost of the service: the negative judgments in this case are related to 43% of the sample, the sufficient ones account for the majority of the responses: 46% This result can be justified considering that much of the sample uses the ordinary ticket as a travel solution, which recorded slight increases of the past year and a half.

Asking to formulate an overall judgment on the service provided in the municipality of Bologna, 48% of respondents assign a passing grade, a 36% positive vote, and only 16% consider it negative. In addition, 51% in principle recommend the service provided, and 22% puts it as the first means of transport if it were needed. The 26% of the sample does not recommend the bus as a means of transport. 46% of the sample would decrease the cost of the service, while the second most voted option was the cleanness of the buses with 19%, and the third and fourth options were "number of buses in circulation" for 14% of the sample, and "more safety on board" for the 11% of the respondents. Finally, for 49% of the sample the service has remained the same over time, while respectively 30% and 8% believe that the service has had an adequate or good improvements.

The survey yield positive results, showing a good level of satisfaction among users-citizens. The most appreciated aspects are those which refer to the "objective" side regarding a service such as transport: e.g., very popular aspects regard the driver, that is a major achievement, and land coverage. For the negative aspects, interviewees show a degree of impatience with the cleaning of the buses, the perceived safety on board, and the price of the ticket is especially perceived as too exorbitant.

3.2 Multiple Correspondence Analysis

The multidimensional analysis allows to consider many aspects of customer satisfaction, with the aim of simplifying, summarizing and representing the phenomenon. In particular, the multiple correspondence analysis (MCA) is used to study the structure of relationships in a set of qualitative variables with the purpose of interpreting the associ-

ations between them, using the projection of the responses on a reduced space dimension (Fabbris, 1997). That leads to the definition of new variables given by the linear combinations of the responses in the binary encoding of the **Z** disjunctive complete matrix, so as to maximize the projection of each of the column vectors on those new dimensions. The solution is given in terms of the eigenvalues λ and eigenvectors of the Burt matrix **B**, in which the eigenvectors identify the directions of maximum elongation of the cloud of points and the eigenvalues measure the variability of the same cloud along those directions. The new factors, used to represent the responses and the cases, are projected as points in the space factor perpendicular to each other, as combinations of the responses included in the analysis, each showing the maximum dispersion **B**, in descending order. The sum of eigenvalues (so-called total inertia) is equal to the trace of **B**: it follows that the ratios $\lambda^i / \sum \lambda^i$ between each eigenvalue and the trace are the proportion of dispersion reproduced from the corresponding factor. If the values are close, there is a high association between the modes of the variables (correlation), whereas if they are distant, there is a high dispersion between such modes (discrimination).

From the discrimination measures indicated in Tab. 3, relative to the original variables of the main aspects considered, it can be deduced that the first dimension represents the "user satisfaction", while the second dimension is the "quality of service".

Table 3: Discrimination measures of MCA

Original aspects under investigation	**Dimensions**		**Average**
	1	2	
Bus punctuality	0.540	0.395	0.467
Bus frequency	0.539	0.516	0.527
Seats availableness	0.493	0.377	0.435
Buses efficiency	0.659	0.494	0.577
Land coverage	0.642	0.354	0.498
Safety on board	0.542	0.190	0.366
Alerts timeliness	0.290	0.170	0.230
Buses cleanness	0.514	0.067	0.290
Driver rating	0.557	0.459	0.508
Fees rating	0.437	0.071	0.254
Total (eigenvalue)	5.213	3.094	4.153
Cronbach Alfa	0.898	0.752	0.844

There is a match between positive judgment on the quality of service and level of citizen-user satisfaction, as regards the elements of frequency, efficiency, coverage, punctuality: the "objective factors of service" concerning the journey are appreciated between users. Cleanliness, fees, security are good values on the "dimension 1", much greater than that associated with the "dimension 2": this highlights a mismatch between quality

and level of satisfaction.

4 Conclusive considerations

The quality of services is an important aspect characterizing the performance of public institutions, such as the capacity to operate with efficiency and effectiveness. The relationship between citizen and Administration is based on the necessity to fulfil and resolve collective needs and problems, and these aspects are felt as a right on the part of the citizen and a duty on the part of the Administration. So, in theory, the latter should simply perform the functions and activities in serving the citizen, but in reality, the relationship between citizen and Administration is more complex and problematic: the needs of citizen-users should be considered through the techniques of customer satisfaction, allowing the administration to identify possible differences between the current needs and expectations of the community, in order to improve the quality of services. The survey carried out in Bologna had satisfactory results, as the questionnaire founded great involvement by the users in the sample: the results obtained show a good level of satisfaction by users-citizens. The most popular are those that belong to the first "objective" dimension of MCA, regarding punctuality, frequency of service provided, efficiency of buses. Another very popular item is that regarding the driver: it is a major achievement, as a public company that provides services such as transport will "relate" users with just the driver. The results also confirm the validity of the policies undertaken by local company, which in recent years has invested and still invests on staff, media, and works to make service efficient, more effective and so able to satisfy the user: the requirements of quality in service are achieved. To operate with a view to improving the local transport service of Bologna, we would act on variables such as buses cleanness and safety, increasing the "comfort" of the trip: if the quality is perceived high by the users, the cost of the service can be justified by the presence of positive results in all the other variables, so also the fee for the service would be considered rightful to the citizens.

Appendix: Citizen satisfaction questionnaire on public transport

1. **Gender**:
   1.□ M
   2.□ F

2. **Age**: ...

3. **Education**:
   1.□ No title
   2.□ Elementary School
   3.□ Middle School
   4.□ High School
   5.□ Degree

4. **How often do you take the bus?** ... times, monthly

5. **Why do you take the bus?**
   1.□ It's the cheapest means of transport I can use
   2.□ Much of the centre of Bologna is closed to car traffic
   3.□ It is difficult to find where to park
   4.□ I do not have access to other means of transport
   5.□ The bus stop is very close to my start point and/or destination
   6.□ It is my favourite means of transport, absolutely

6. **What kind of ticket do you usually buy?**
   1.□ Ordinary ticket (1 trip only)
   2.□ One-day ticket (24 hours)
   3.□ City pass
   4.□ Monthly ticket
   5.□ Annual ticket (1 year)

7. **Where do you usually buy your ticket?**
   1.□ Tobacco store
   2.□ News stand
   3.□ Ticket machine on board
   4.□ Online
   5.□ Other (please explain): ...

8. **To what extent do you agree with the following statement: "Public transportation is more comfortable and functional than a car"?**
   1.□ Strongly disagree
   2.□ Disagree
   3.□ Neither agree nor disagree
   4.□ Agree
   5.□ Strongly agree

9. **To what extent do you agree with the following statement: "Public transportation is cheaper than a car"?**
   1.□ Strongly disagree
   2.□ Disagree
   3.□ Neither agree nor disagree
   4.□ Agree
   5.□ Strongly agree

10. **If you could have a choice, would you prefer the bus to the car as your main means of transport?**
    1.□ Yes
    2.□ No

11. **To what extent do you agree with the following statement: "Public transportation is more comfortable than a motorcycle"?**
    1.□ Strongly disagree
    2.□ Disagree
    3.□ Neither agree nor disagree
    4.□ Agree
    5.□ Strongly agree

12. **To what extent do you agree with the following statement: "Public transportation is cheaper than a motorcycle"?**
    1.□ Strongly disagree
    2.□ Disagree
    3.□ Neither agree nor disagree
    4.□ Agree
    5.□ Strongly agree

13. **If you could have a choice, would you prefer the bus to the motorcycle as your main means of transport?**
    1.□ Yes
    2.□ No

Please rate:(**1**=*very bad*; **2**=*poor*; **3**=*adequate*; **4**=*good*; **5**=*excellent*)

14. **Service punctuality** 1.□ 2.□ 3.□ 4.□ 5.□

15. **Service frequency** 1.□ 2.□ 3.□ 4.□ 5.□

16. **Number of seats on board** 1.□ 2.□ 3.□ 4.□ 5.□

17. **Service efficiency (i.e., in terms of a breakdown, comfort and temperature on board)** 1.□ 2.□ 3.□ 4.□ 5.□

18. **Land coverage** 1.□ 2.□ 3.□ 4.□ 5.□

19. **Safety on board** 1.□ 2.□ 3.□ 4.□ 5.□

20. **Cleanness** 1.□ 2.□ 3.□ 4.□ 5.□

21. **Alerts timeliness (i.e., in case of strikes, delays, sudden changes in routes, and so on)** 1.□ 2.□ 3.□ 4.□ 5.□

22. **Cost per quality** 1.□ 2.□ 3.□ 4.□ 5.□

23. **Welcome service at bus stops** 1.□ 2.□ 3.□ 4.□ 5.□

24. **Friendliness/kindliness of bus drivers** 1.□ 2.□ 3.□ 4.□ 5.□

25. **Quality and clarity of the Tper website** 1.□ 2.□ 3.□ 4.□ 5.□ 6.□ I have never browsed on the website

26. **Overall how do you rate the service provided?** 1.□ 2.□ 3.□ 4.□ 5.□

27. **If you could have a choice, which one of the following aspects would you improve?**
    1.□ None
    2.□ Number of buses in circulation
    3.□ Decreased cost of service
    4.□ New lines
    5.□ Cleanness of the buses
    6.□ More safety on board

28. **Would you recommend the Tper service to a friend?**
    1.□ Absolutely no
    2.□ More no than yes
    3.□ More yes than no
    4.□ Absolutely yes

29. **Compared to the first time you used the Tper services, do you think they have been improved?**
    1.□ Not at all
    2.□ Just a few
    3.□ They are the same
    4.□ Enough
    5.□ Very much

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