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Intention to commute by public transportation and/or by foot: findings from a PLS Structural Equation Model

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Abstract

Sustainable mobility stands at the forefront of contemporary discussions, driven by the clear imperative to transition towards more environmentally friendly transportation and patterns. This shift is widely recognized as a crucial opportunity to address the challenges and inherent dangers posed by climate change. It is then crucial to introduce attitudes to encourage voluntary behavioral changes toward different sustainable solutions. In this perspective, to foster a future where sustainable personal mobility options are widely embraced and integrated, it is crucial to comprehend the inclination of younger generations to use them. For this reason, a survey on the use of sustainable mobility tools by young generations was recently conducted by the authors on the population of individuals aged 18 to 35 who live in the metropolitan area of Rome. The survey was multipurpose. Here, we focus on the propensity of young people to commute to work or study places on foot, exclusively or in combination with public transport tools. The attitude to move as a pedestrian, one of the most vulnerable road users, is modeled by adopting the Technology Acceptance Model (TAM). The model is enriched by considering the possible effect of the perceived quality of the area where one lives, treated as a proxy of the economic and social well-being of the respondents. Model relationships are estimated according to the Structural Equation Model perspective. Finally, whether the choice to reach the working/studying place with public transport and/or by foot varies according to some contextual variables such as living-to-work/study distance, and urban (Rome) versus suburban residence is evaluated.

Keywords

Latent Variables, Structural Equation Models, Technology Acceptance Model (TAM)

1 Background, research questions and methodology

The Technology Acceptance Model (TAM) [2] was first defined to explain and predict the adoption of new technologies by potential users. It includes four key concepts in relation to each other, namely Perceived Ease of Use and Perceived Usefulness, which are supposed to influence the Intention to Use and Actual Use of novel technologies or products. Over the years the model has been enriched with social and cognitive variables, as well as variables related to user prior experience of new technologies [5, 6], and its use has spread to a wide range of domains.

In this work, the TAM-associated Structural Equation Model exploited by Natale et al. (2025) [4] is considered with the aim of analyzing the attitude of people to reach their work/study place by foot, also in combination with public transportation. That is, the goal is to investigate what moves people not to use any private (motorized and non-motorized) vehicle for working day commuting. The final goal is to give a contribution to the debate on how to push people to adopt environmentally friendly transportation habits. With respect to the TAM original model, the principal variables are declined as follows. Perceived Ease of Use and Intention to Use become “How easy is it for you”, and “How much are you ready to” commute to your work/study place by foot/public transports. Actual Use was instead measured as “How much likely is it” you will reach your work/study place by foot/public transports in the next two weeks. Perceived Usefulness combines instead a set of measures related to time, economics, self-estimate, and health advantages in moving by foot/public transports. Furthermore, this contribution aims at understanding to what extent mobility choices are related to the quality of the area where one lives, being aware that such a measure is associated with the wealth and the social status of the people living there. With that in mind, and within the described framework, the following research questions are considered. RQ1: Is the Ease of Use related to the Intention to use public transports/to move by foot? RQ2: Is the Perceived Usefulness related to the Intention to use public transports/to move by foot? RQ3: Does the Residential Area Perceived Quality moderate the effect of the Ease of Use on the Intention to use public transports/to move by foot? RQ4: Does the Residential Area Perceived Quality moderate the effect of the Perceived Usefulness of commuting by public transports/by foot?

With that aims, the TAM developed by Balzano et al. (2025) [1] was adopted. The model is represented in Figure 1. There, the analysis referred to the use of bikes, e-bikes, and electric kick scooters. Here, the same model is considered to describe the intention of using public transportation and/or walking when commuting to the work/study place.

To obtain the model coefficients, the data collected in the survey described in Natale et al. (2025) were used. The coefficients were estimated with the help of a Structural Equation Model (SEM, [3]), following the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach [7].

2 Main results and conclusions

Results are based on the entire collected sample (n=1003), for which no missing values are present. The estimated model coefficients,

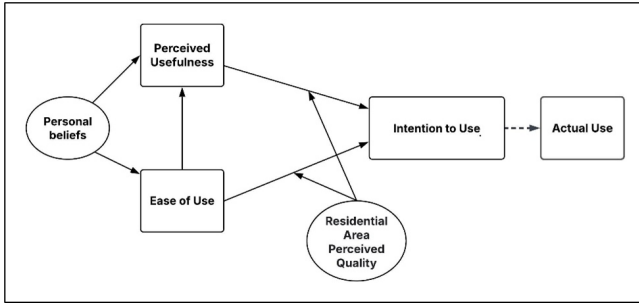


Figure 1: Sustainable mobility TAM adapted with a moderating effect of the Residential Area Perceived Quality.

Table 1: Estimated SEM structural model coefficients and 95% CI limits (coefficients significant at 5% level in bold).

Model relationships	Estimate	2.5% CI	97.5% CI
Pers. beliefs ->Ease-of-use	0.325	0.262	0.385
Pers. beliefs ->Perc. Usefulness	0.229	0.164	0.305
Ease of use ->Perc. Usefulness	0.171	0.109	0.235
Ease of use ->Intention to use	0.385	0.320	0.441
Perc. usefulness ->Intention to use	0.168	0.108	0.223
Area quality ->Intention to use	0.108	0.046	0.166
Perc. usef.*Area qual. ->Intent. to use	-0.020	-0.073	0.082
Ease of use*Area qual. ->Intent. to use	0.005	-0.044	0.083
Intention to use ->Actual use	0.682	0.650	0.718

along with their significance, are shown in Figure 2 (* = p-value < 0.1, ** = p-value < 0.05, *** = p-value < 0.01). They are also reported in Table 1 (with 95% confidence interval limits).

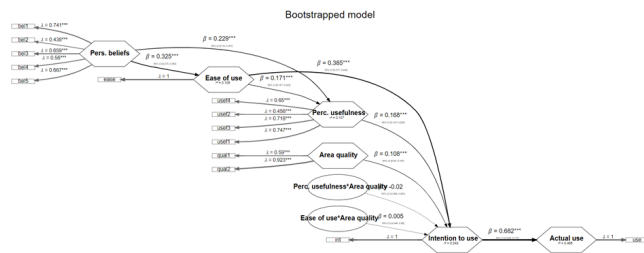


Figure 2: Model bootstrap estimates.

It is first found that all the main TAM relationships are positive and significant. That is, the first two research questions RQ1 and RQ2 are confirmed. In addition, Area Quality has a positive significant direct influence on the Intention to use. The higher the perceived quality of the area where one lives, the higher the propensity to use a public transportation tool or to walk to the work or study place. This could be related to the fact that areas with higher perceived quality enjoy better public transportation connections. On the other hand, research questions RQ3 and RQ4 are not confirmed. In contrast with the results obtained for bikes users in Balzano et al. (2025) [1], the Area Quality does not significantly moderate the Perceived Usefulness nor the Ease of Use. Differences among groups of respondents who declared they commute to their work/study place at least once a week

(n=853) were also investigated. Respondents were grouped by considering if they live in the same town where they work/study or not, and if they live in Rome or a surrounding town. Differences in the estimated individual scores (fitted values) of Intention to Use public transports were compared. Welch's one-way ANOVA was applied to the scores, followed by Games-Howell post-hoc tests or pairwise t-tests to identify specific group differences. This is because the standard one-way ANOVA assumption of homoscedasticity was violated for both the grouping variables. Results show that living in the same town where one works/studies makes a significant positive difference in the Intention to Use the public transport tools (Figure 3). Moreover, people living in Rome show a higher intention than those living in the surrounding cities (Figure 4).

Welch Anova, $F(1,209.68) = 15.67, p = 1e-04, n = 853$

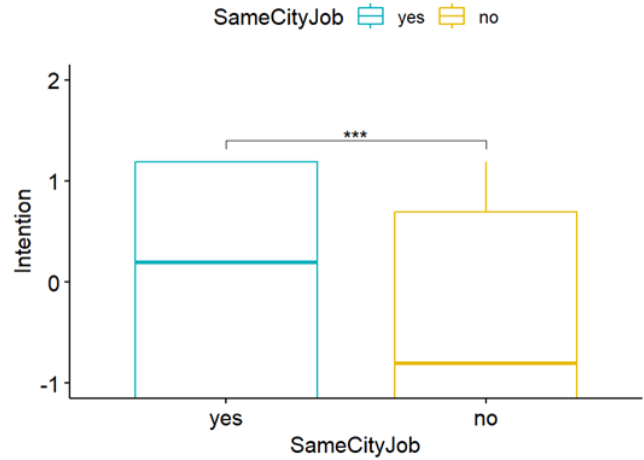


Figure 3: Intention to Use public transports for those who live in the same town where they work/study (SameCityJob = yes) and those who live in a different town from where they work/study (SameCityJob = no).

To summarise, according to this study, both Ease of Use and Perceived Usefulness are related to the Intention to move by public transports/foot. Perceived Area Quality has also an effect on the Intention. However, a moderating effect is not detected. Finally, it was found that the Intention varies based on the living place (Rome versus suburbs) and the commuting distance (living and working/studying in the same city versus different cities).

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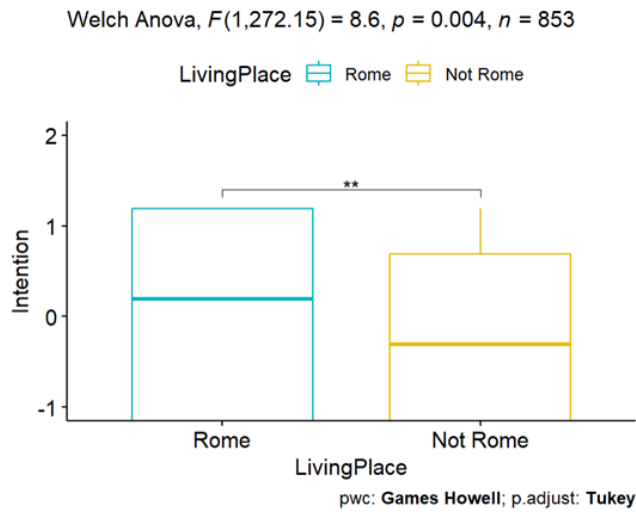


Figure 4: Intention to use public transports for those who live in Rome (LivingPlace = Rome) and those who live in a nearby town (LivingPlace = Not Rome).

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