sciendo

Applying the TAM Model in Assessing Pro-electrification Behavior in Road Transport. A SEM Approach

Irina CALOTĂ*
National University of Science and Technology Politehnica Bucharest, Bucharest, Romania
**Corresponding author, nicucalota@yahoo.com*

Alexandra PERJU-MITRAN
Romanian-American University, Bucharest, Romania
alexandra.perju-mitran@rau.ro

Cristina Chira PANCĂ
Bucharest University of Economics Studies, Bucharest, Romania
cristina.busu@yahoo.com

Augustin SEMENESCU
National University of Science and Technology Politehnica Bucharest, Bucharest, Romania
Academy of Romanian Scientists, 3 Ilfov St., 050044, Bucharest, Romania
augustin.semenescu@upb.ro

Abstract. *Lack of user acceptance has long impeded the success of new types of different technologies from a variety of sector activity. The present research addresses why users accept or reject electrification of commercial freight transport and how user acceptance is affected in the context in which the European Union has set as its objective "the reduction of greenhouse gas emissions by at least 55% by 2030 and climate neutrality by 2050", according to the "European Ecological Pact".*
Building a sustainable future by supporting electric mobility is essential to reduce pollution, improve energy efficiency and improve quality of life, a multidimensional approach involving the government, producers and transporters of goods is necessary. From this perspective, we considered the fact that we need to determine to what extent the target audience, consisting of manufacturers and/or users of electric trucks, is ready to sell /buy and use an electric truck for the transportation of goods in large urban agglomerations. Using the Technology Acceptance Model (TAM) as a research framework. provides a much more complete picture of the acceptance of a carrier/driver to use an electric goods truck in large urban agglomerations, which can also serve as a starting point in the implementation of electric mobility, as well in the largest economic centers in Romania. The Technology Acceptance Model (TAM) for electrical mobility specifies the causal relationships between system design features, perceived usefulness, perceived ease of use, attitude toward using, and actual usage behavior.

Keywords: Technology Acceptance Model (TAM), Sustainable Transport, Green Economy, Truck E-mobility, Consumer Behaviour.

Introduction

"A green economy is an economy that leads to the improvement of the population's well-being and social equity, simultaneously with the significant reduction of environmental risks and ecological constraints," is the definition provided by UNEP (Towards a Green Economy, UNEP, 2011), which is also the most widely used definition on a global scale.

DOI: 10.2478/picbe-2025-0152

Road transport represents 77% of all goods transported by land in the European Union and generates an annual trade surplus of billions of euros for the EU. They are a vital and integral part of the economy. The freight transport sector is also responsible for a quarter of the greenhouse gas (GHG) emissions from road transport and for around 6% of the total GHG emissions in Europe.

Ensuring a sustainable future by promoting electric mobility is essential for reducing pollution, optimizing energy consumption, and improving quality of life. Achieving this goal in Romania's capital and major economic centers requires a multidimensional approach involving the government, manufacturers, and freight carriers. The increasing trend of electrification is driven by the need to lower carbon emissions, improve air quality, and comply with strict urban emission regulations. This research evaluates the willingness of manufacturers and users of electric trucks to adopt this technology in dense urban areas using the Technology Acceptance Model (TAM). The study provides a comprehensive perspective on the factors influencing the adoption of electric freight transport and serves as a foundation for implementing e-mobility solutions.

Literature review

The context and importance of sustainability in supporting electric mobility (E-mobility)

Sustainability is a global priority, assessing its impact in research presents numerous challenges. The lack of a common framework and standardized methodologies complicates the comparison and quantification of the impact of research projects on sustainability objectives. Currently, many research projects are evaluated based on traditional criteria, such as the number of publications or citations, without considering the real effects that this research has on society and the environment (Clark, W. & Harley, A.G, 2020).

A common framework for sustainability impact assessment is essential to ensure that research effectively contributes to the achievement of sustainable development goals. This framework should include specific indicators that measure aspects such as carbon reduction, resource efficiency and contributions to biodiversity. It should also enable the assessment of research impact at local, national and global levels, providing a clear picture of how research results influence the transition to a green economy.

To support e-mobility, sustainable development offers a framework of thought that, once adopted by the populace, will contribute to the creation of a sustainable future that is characterized by solidarity and balance and that can adapt to the changes brought about by contemporary national, regional, and worldwide issues, such as the decline in the population.

The term "sustainable freight transport" describes the employment of economic, environmentally friendly, and energy-efficient methods for moving cargo. It seeks to lower pollution, non-renewable resource consumption, and greenhouse gas emissions.

Given that the goal of "user acceptance of new technologies" is behavior modification, skepticism and criticism are common responses among many.

The necessity of an evaluation framework The Model of Technology Acceptance (TAM)

Many researchers from a variety of domains find user adoption of new technologies and systems to be a very relevant topic. To correctly show the usage of technologies and systems, a suitable theoretical and experimental framework is created with the aid of theories and models of adoption of new technologies. Usability is a prerequisite, but not a sufficient one, for users to adopt technology.

In his 1986 doctoral thesis, Fred D. Davis (Davis, 1989) created the Technology Acceptance Model, which is an adaptation of TRA. The model was created to accept a causal relationship between beliefs, perceptions, attitudes, intentions, and behavior to explain the adoption of new technology. Perceived usefulness (defined as "the degree to which a person believes that the use of a certain system leads to an increase in the performance of his activities in an organizational context") and perceived ease of use (defined as "the degree to which a person expects the use of a certain system to be effortless") are the two main constructs in TAM as defined by Fred D. Davis.

Perceived usefulness and intention are directly related, indicating that people base their behavioral intentions of use on their cognitive understanding of how using the system will enhance performance.

Perceived ease of use affects perceived usefulness because, when all other factors are held constant, the more user-friendly a system is, the more valuable it is. Therefore, the potential performances that might be achieved by a system that an individual finds useful are obscured by the effort required to use it if it is difficult to use.

The relationship between, on the one hand, individual differences, context-specific constraints, and controllable managerial interventions that impact system use and, on the other hand, beliefs, attitudes, and intentions in TAM are defined by the external variables (e.g., system characteristics, user characteristics, development process nature, etc.) (Davis, F.D., Bagozzi, R.P., Warshaw, P.R., 1989). At the same time, perceived utility and perceived ease of use act as mediators between the impacts of external variables on intention to use.

When two components work together, perceived usefulness and attitude determine behavioral intention to use, which in turn determines the utilization of a system. Personal ideas (perceived utility and perceived ease of use) impact on the attitude toward use (Figure 1).

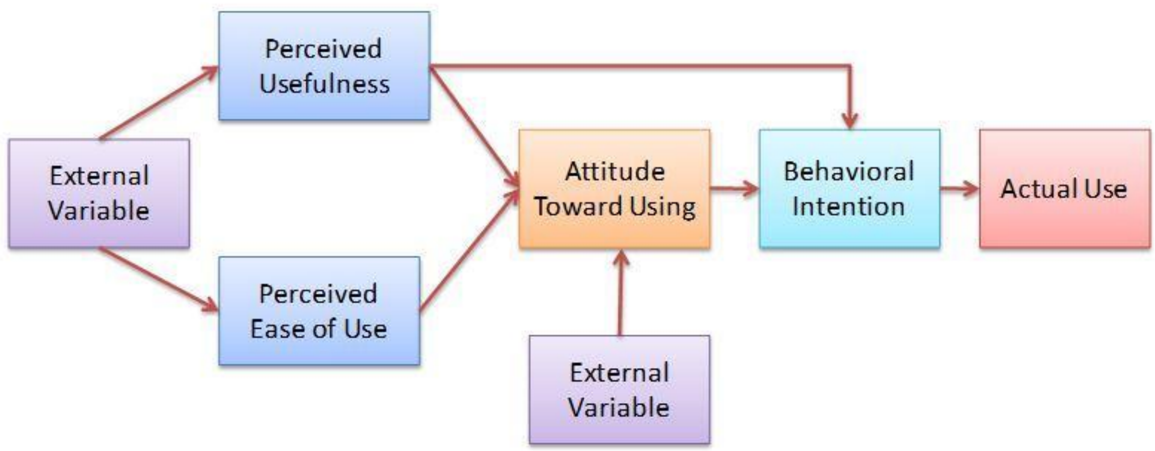

Figure 1. "Technology Acceptance Model"

Source: Davis et al. (1989).

In contrast to its low acceptance rate inside businesses, TAM emerges against a backdrop of technological advancement. Given the failure of earlier research, a trust model was more urgently needed to explain why an information system was accepted or rejected. Due to empirical research that has involved hundreds of investigations over the course of two decades, TAM has earned widespread research appeal and academic legitimacy. The "user acceptance of new technologies" behavior was significantly influenced by the model's emergence and evolution during this time. The necessity of adding additional variables and expanding the model with new constructs to better understand how individuals adopt new technology has been recognized in several research.

Electric mobility and the Technology Acceptance Model (TAM)

TAM can be used to explain how consumers and organizations embrace electric trucks in the context of electric mobility. When transport companies choose electric trucks over fossil fuels, they are adopting electric fuel. Unsurprisingly, a lot of behavioral models begin with the well-known TAM research paradigm, which assumes that users' intention to embrace a new technology depends on how they feel about it and how beneficial they think it is (Triandis, H., 1977).

In electric mobility, the TAM elements consist of (Figure 2):

- The degree to which the subject (maker, transporter, or driver) thinks that utilizing the technology (in this example, electric vehicles) will enhance his life or activity is known as perceived usefulness, or PU. Examples include fuel expense savings, less impact on the environment, tax breaks, and subsidies.
- The degree to which the user believes the technology is simple to comprehend and operate is known as Perceived Ease of Use (PEOU). Examples include, charging stations are easily accessible, the charging procedure is straightforward, and there is enough autonomy.

In turn, these two factors impact the intention to use (Behavioral Intention, or BI), the attitude toward use (Attitude Toward Using, or ATU), and ultimately the actual adoption of the technology (Actual System Use, or ASU).

Other significant determinants of electric mobility include:

- social norms and external influences (social pressure, friends/family recommendations, sustainability trends).
- economic factors (price of electric vehicles, maintenance costs, government subsidies).
- technological factors (battery autonomy, charging infrastructure, technological innovations).
- environmental and sustainability factors (carbon reduction, government emissions regulations).

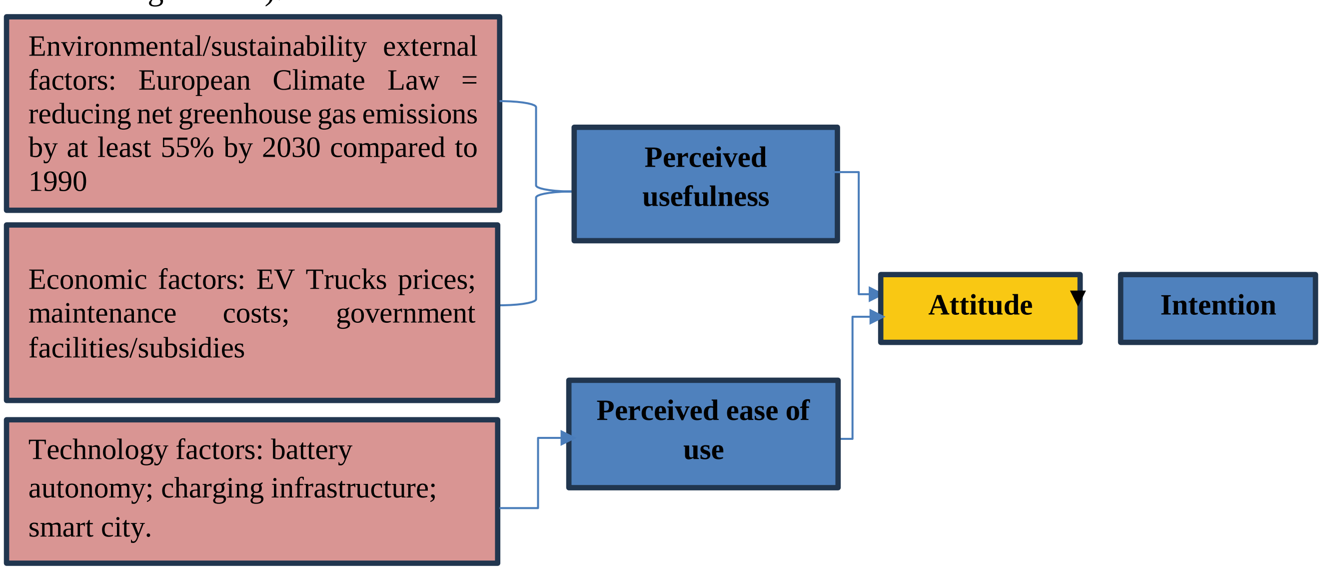

Figure 2. "Technology Acceptance Model for Electrical Mobility"

Source: Authors' own research.

People base their behavioral intentions of usage on their cognitive understanding of how utilizing EVs will increase performance, as seen by the clear correlation between perceived usefulness and intention.

Perceived ease of use affects perceived usefulness because, if all other factors are equal, the more user-friendly an EV system is, the more valuable it is. Therefore, if a system that a person finds valuable is hard to use, the effort needed to utilize it will reduce the final performances that may be achieved with it.

The goal of the study

According to the "European Ecological Pact," Romania must now find ways to integrate and apply the "Truck E-mobility" phenomenon to become one of the future smart cities and meet the EU's goals of reducing greenhouse gas emissions by at least 55% by 2030 and becoming climate neutral by 2050.

By highlighting the structure of the Technology Acceptance Model (TAM) in the context of electric mobility and the technical components specifically created for the Romanian context, this study aims to present the process of "acceptance by users of new technologies" such as electric mobility in the urban transportation of goods.

Table 1 provides a summary of the stated goals and key hypotheses.

Table 1. Central objectives and hypotheses

Central Objectives	Objective Description	Hypothesis	Hypothesis Description
O1	Researching how consumers' perceptions of using an electrical truck affect their propensity to do so.	H1	Drivers' attitudes regarding the electrical truck and their inclination to utilize it are directly and favorably correlated.
O2	Researching how customers' opinions about the Electrical Truck's utility affect their propensity to use it	H2	Drivers' intentions to use the Electrical Truck and their opinions of its utility are directly and favorably correlated.
O3	To investigate how customers' attitudes toward using the Electrical Truck are influenced by their opinions about its utility.	H3	Drivers' attitudes regarding using electrical trucks and their opinions of their utility are directly and favorably correlated.
O4	Investigating how consumer attitudes toward the utilization of the Electrical Truck are influenced by their opinions of its usability.	H4	Drivers' attitudes toward electrical mobility and how easy they believe the Electrical Truck to be to use are directly and favorably correlated.
O5	Researching how consumers' opinions about the usefulness of electrical mobility are influenced by their opinions about how easy it is to utilize an electric truck.	H5	Drivers' opinions of how beneficial electrical mobility is and how simple the Electrical Truck is to operate are directly and favorably correlated.

Source: Authors' own research.

Methodology

We employed the "Technology Acceptance Model (TAM)" as a research framework to ascertain the degree to which the target audience, which consists of producers and/or consumers, are prepared to buy and utilize an electric vehicle for the transportation of commodities in an urban setting.

Four latent variables must be defined and their measurements determined as part of the study's conceptual model:

- A is the attitude toward using them,
- U is the perceived utility,
- B is the carriers' plan to purchase electric trucks (electric fleets)
- E stands for usability (ease of use).

Defining the latent variable "carriers' intention to continue using/buying electric trucks" (B) at both the general and specific levels is the first step in figuring out its measures.

Fishbein and Ajzen's principle of compatibility suggests that measures of intention and behavior include the same action, target, context, and time, which have been defined either at a specific or general level. A singular behavior is an action directed towards a target, executed in a specific context, at a specific moment in time (Fishbein, M.; Ajzen, I. 1977).

With a definition tailored to the study's particulars, the attitude toward the usage of electric trucks and electric fleets (A) is a measure of the evaluative effect that a person has and relates with the thought of utilizing an electric truck vs a fossil fuel truck (Davis, F.D., 1993). With a set of four items that do not distinguish between the instrumental and experiential components of the attitude, the attitude variable is built as a reflecting unidimensional based on these factors.

(Fishbein, M.; Ajzen, I., 1977) Fishbein and Ajzen distinguish between attitude toward conduct and attitude toward an object. According to the authors, an individual's attitude toward the appraisal of themselves for a certain conduct that involves an object is their affective assessment of that object.

With a set of four items that do not distinguish between the instrumental and experiential components of the attitude, the attitude variable is built as a reflecting unidimensional based on these factors.

As a concept of TAM, perceived utility (U) is the conviction of the individual (carrier/driver) that there are specific advantages to utilizing electric truck technology (Davis, F.D., Bagozzi, R.P., Warshaw, P.R., 1989). Relative advantage, a particular idea from the invention Diffusion Theory that indicates the extent to which an invention is viewed as a genuine amplification or improvement, is directly linked to perceived usefulness (Rogers, E.M., 1995). A set of four items was used to generate the "perceived utility" variable, which was a unidimensional reflexive construct.

One of TAM's concepts, ease of use (E), is the degree to which people believe they can use a piece of information with little effort. We shall define perceived ease of use as the consumer's perception of the minimal amount of effort needed to operate an electric truck, tailored to the research of electric truck usage behavior. Taking into account measures that had already been modified for the study of ease of use, perceived ease of use measures was modified from Davis (1989). "Ease of use" was established as a unidimensional reflecting concept as a construct.

The need to document a "Questionnaire"

The suggested research model is a questionnaire with pre-formulated questions that aims to gather data on the following topics:

- the sociodemographic profile of the transporters (undoubtedly, Romania's most significant economic cities play a significant role in this process);
- attitudes and beliefs related to the use / replacement of the car fleet with an electric fleet;
- the driving habits of drivers who work for carriers, as well as the opinions, beliefs, and attitudes regarding the use of electric trucks versus trucks that run on fossil fuels.

Various question kinds will be utilized within the manager, depending on the type of question: scaled answer questions based on the seven-category Likert measurement scale; closed, dichotomous, and multiple-choice questions.

The purpose of the first question, also known as the filter question, in the suggested questionnaire-type research model is to choose respondents who are eligible to be included in the sample under investigation, such as those who possess a driver's license. The remaining questions followed a logical framework and were classified by topic and section. With the characteristics of the population under investigation, 256 respondents will complete the questionnaire.

The sample's establishment

The sampling technique is a classic one, meaning that the full sample must be determined before data collection, depending on the time criterion. Additionally, because the sampling technique is non-returnable, an item may only be included in the research sample once.

A non-probability sampling approach is one in which the likelihood of choosing a unit from the population under study is unknown prior to data collection, depending on the extent of the researcher's involvement in sample selection. The inability to employ a sampling frame led to the selection of this sampling technique. A sample (n) of of 256 people was sized to validate all the variables that want to be studied, as well as the subsequent analyses through the structural equation modeling (*SEM*) method using the partial least squares (*PLS*) method (Wold, Herman. 1966).

The characteristic "driving license" was selected as the primary variable because the sample would be used to examine manufacturers' and transporters' intentions to employ electric trucks for the transportation of commodities in big metropolitan agglomerations.

Validation and review of data

Missing values can be non-random when respondents decide not to answer a particular question for a variety of reasons, or random when they neglect to answer a question. The statistical program *WARP* version *PLS 8's* examination of missing values further supports this claim. The program indicates whether or not there are missing values in each variable by pretesting the data. *PLS* is the most effective technique for data analysis since the gathered data does not adhere to the normalcy principle (Wold, Herman, 1985).

Results and discussions

To increase the accuracy of the phenomenon being examined, some error must be eliminated from every data gathering. Since measurement inaccuracy jeopardizes the validity of the empirical findings, the measuring device must be checked prior to presenting the study conclusions.

Measurement validity: As a result, *Cronbach Alpha coefficients* will be employed to assess measurement accuracy if the number of indicators is limited. To evaluate the accuracy of each variable used in the current investigation, we used the *WARP=PLS* program, version 8.0 (Table 2), where the items represents:

- PEOU: Perceived Ease of Use;
- PU: Perceived Usefulness;
- Attit: Attitude;
- Int: Intention.

Examples include fuel expense savings, less impact on the environment, tax breaks, and subsidies.

The degree to which the user believes the technology is simple to comprehend and operate is known as Perceived Ease of Use (PEOU).

Table 2. Cronbach's alpha coefficients

PEOU	PU	Attit	Int
0.888	0.88	0.933	0.894

Source: Authors' own research.

This scale exhibits good internal consistency for all variables, as indicated by the size of the *Cronbach Alpha coefficients*. The overall association between each item and the total of the other items' scores lends credence to this assertion. Furthermore, when we eliminate one of the components in the construct, we obtain a *Cronbach Alpha coefficient* that is lower than the one generated by all of the components combined. As a result, no part of the structure must be compromised.

Convergent validity was evaluated using the statistical tool *WarpPLS*, *version 8.0*, which generates factor loadings and cross-loadings based on structure, pattern, and a combination of the two types of matrices. Three different techniques were created in different tables as the output of this process.

Rotation in factorial analysis has been viewed as a group of methods where the researcher tries to connect the calculated factors to hypothetical entities, regardless of whether the researcher expects a correlation. (Table 3)

Table 3. Pattern loadings and cross-loadings

	PEOU	PU	Attit	Int
peou1	0.922	0.015	0.046	-0.109
peou2	0.971	0.004	-0.178	0.106
peou3	0.815	-0.019	0.138	0.001
pu1	0.087	0.94	0.01	-0.183
pu2	-0.065	1.033	-0.159	0
pu3	-0.014	0.825	-0.233	0.308
pu4	-0.01	0.632	0.373	-0.111
at1	-0.036	0.09	0.812	0.078
at2	-0.006	-0.02	0.907	0.018
at3	0.056	-0.134	1.029	-0.024
at4	-0.016	0.067	0.902	-0.073
int1	0.024	0.075	-0.025	0.858
nt2	0.036	-0.116	-0.063	1.034
int3	-0.061	0.045	0.09	0.829

Source: Authors' own research.

Every group of elements in Table 3 loads incredibly efficiently inside the designated construct, as can be seen. For example, the INT construct, which measures consumers' intention to use, has factor loadings ranging from 0.632 to 1.034, whereas cross-loadings are quite modest.

SEM, or structural equation modeling: To investigate the moderating effect, causal relationships, and validity of the measures, we chose to use the statistical program *WarpPLS, version 8.0*. Identifying the direct, indirect, and total impacts; modeling reflective and formative factors; estimating the connection coefficients in accordance with non-linear relationships; computing the effect size based on *Cohen's coefficients*; and calculating related P values are the features that distinguish *WarpPLS* from other *SEM* analysis applications.

The average strength of the relationships in the model is shown by the Average Path Coefficient (APC), which is 0.427, $p < 0.001$ according to our major model fit criteria. The associations in the model are statistically significant because the p-value is less than 0.001. This is a strong value, suggesting the model has good explanatory power.

The predictors account for 47% of the variance in the endogenous variables, according to the Average R-Squared (ARS) = 0.470, $p < 0.001$. Given its high value, the model appears to have considerable explanatory power.

The total goodness of fit is measured by the Tenenhaus Goodness-of-Fit (GoF) = 0.614.Given that a GoF greater than 0.36 is regarded as "large," the current model fits the data quite well. AVIF = 1.929 (acceptable if ≤ 5, ideally ≤ 3.3) and AFVIF = 2.265 (acceptable if ≤ 5, ideally ≤ 3.3) are the Variance Inflation Factors (VIFs) displayed. These numbers show low collinearity, which is a favorable indicator because it means that our predictors are not overly coupled. When the *Simpson's Paradox Ratio (SPR)* is 1.000, it means that there are no deceptive statistical associations and that Simpson's paradox is absent.

As a result, our model fits the data well, has statistically significant correlations, and has few collinearity problems. Figure 3 provides a graphic depiction of the model estimates.

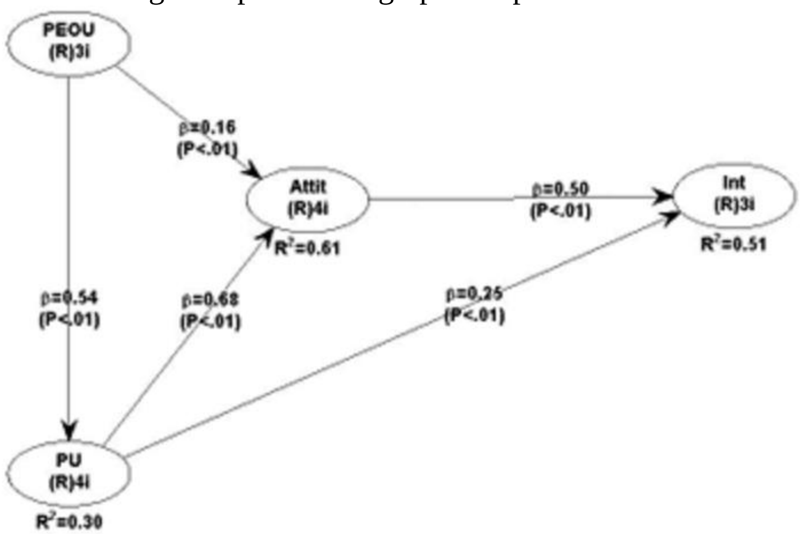

Figure 3. Model results (TAM for Electrical Mobility)

Source: Authors' own research.

From Figure 3, we can observe that since all p-values are < 0.001, the relationships are statistically significant. Also, PU has the strongest influence on Attitude ($\beta = 0.683$), meaning the more useful a system is perceived, the more positive the attitude toward using it. PU also has a direct influence on Intention ($\beta = 0.252$), meaning people who perceive a system as useful are more likely to intend to use it. Main hypothesis validation is also shown in Table 4.

Table 4. Main hypotheses validation

No.	Hypothesis	β	p	Validation
1	Attitude significantly influences Behavioral Intention	0.499	0.001	YES
2	Perceived usefulness influences Behavioral Intention	0.252	0.001	YES
3	Perceived Usefulness strongly influences Attitude	0.158	0.001	YES
4	Perceived Ease of Use influences Attitude	0.252	0.001	YES
5	Perceived Ease of Use significantly influences Perceived Usefulness	0.544	0.001	YES

Source: Authors' own research.

The suggested hypotheses are validated in both Table 4 and Figure 3. People will find an electrical vehicle more helpful if it is easy to use, according to the PEOU → PU (β = 0.544) association. Consistent with TAM extensions, usefulness also has a direct impact on intention. *The Attitude variable* is used to influence the intention through perceived usefulness indirectly. Opinions on ease of use also indirectly influence the desire to buy through three separate channels, as indicated in Table 5, with an indirect influence of 0.401.

Table 5. Sums of indirect effects

	PEOU	PU
Attit	0.371	
Int	0.401	0.34

Source: Authors' own research.

We determine the overall impact of all latent factors on the endogenous variables by adding together the direct and indirect effects (Table 6).

Table 6. Total effects

	PEOU	PU	Attit
PU	0.544		
Attit	0.529	0.683	
Int	0.401	0.592	0.499

Source: Authors' own research.

However, by focusing just on the standardized β coefficients, we cannot ascertain the degree to which an exogenous variable affects an endogenous variable. For such a forecast, the magnitude of the influence must be known. According to *Cohen's f squared coefficients*, which are calculated using the statistical tool *WarpPLS*, the effect size may be ascertained using the suggested values of 0.02, 0.15, and 0.35 for small, medium, and large effects, respectively.

Table 7. Effect sizes for total effects

	PEOU	PU	Attit
PU	0.296		
Attit	0.28	0.525	
Int	0.166	0.376	0.345

Source: Authors' own research.

It is possible to draw the conclusion (Table 7) that consumers' views and intentions to buy electric vehicles are significantly influenced by perceived utility, as both are higher than the 0.35 threshold. Convenience of use and attitudes toward electric trucks have a medium impact on consumers' desire to buy them, with values over 0.15. Customers' plans to buy or use electric trucks are not impacted in any minor or inconsequential ways.

Conclusion

According to the "European Ecological Pact," Romania must now find ways to integrate and apply the "Truck E-mobility" phenomenon in order to become one of the future smart cities and meet the EU's goals of reducing greenhouse gas emissions by at least 55% by 2030 and becoming climate neutral by 2050. Compared to passenger cars, decarbonizing freight transportation has many more challenges. These include the need for more sophisticated battery technology, significant upfront costs, and most importantly the availability of charging stations for trucks that run on batteries. This study emphasizes how truck e-mobility might help reduce greenhouse gas emissions and meet European climate targets in the context of growing global efforts to achieve sustainable urban freight transport. The results highlight how crucial perceived utility and usability are in driving the uptake of electric trucks. Policymakers and industry stakeholders may hasten the shift to a greener transportation sector by improving charging infrastructure, lowering acquisition costs, and raising public awareness. Larger sample sizes and cross-national comparisons should be investigated in future studies to confirm the model's suitability in various regulatory and economic contexts.

The purpose of this study was to investigate how the Technology Acceptance Model (TAM) extension model affected the uptake of truck e-mobility practices by consumers in Romania's major economic hubs. The study used descriptive research design and employed cross-sectional survey methodologies to gather data. The necessary respondents were given 256 copies of validated questionnaires, and both descriptive and inferential statistical tools were used to evaluate the data. The findings showed a strong correlation between customer adoption and the TAM extension model's dimensions.

The suggested *SEM* model fits well (GoF = 0.614, R2 = 47%), path linkages are strong and significant ($p < 0.001$ for all paths), and PEOU → PU → Attitude → Intention matches the traditional TAM model, validating the expected causal relationships, according to the final interpretation and important findings. User adoption is most accurately predicted by PU (Total effect on intention = 0.592). The presumed causal links are statistically valid, and there are no collinearity problems.

Therefore, businesses need to concentrate on improving Perceived Usefulness and Attitude toward Use in order to boost user acceptance of electrical trucks. Additionally, by enhancing PU and attitude, making a system easier to use (PEOU) indirectly promotes adoption. A dependable foundation for comprehending technology adoption, the established and validated model is robust and statistically sound.

Our study's sample size and generalizability are two possible shortcomings thus far. The used sample consists of 256 instances. Larger sample numbers are usually required for SEM models to have greater statistical power, particularly when there are multiple latent variables. Higher sample size (> 300–400) would improve model stability, external validity, and bias reduction in our ongoing research. However, we intend to increase the sample size or perform power analysis to ascertain whether 256 subjects were enough for our model validation.

The results may be context-specific and not generalizable to other populations because our model is only evaluated on one dataset without external validation. After obtaining a larger sample, one may additionally think about using multi-group analysis *(MGA)* to compare results across industries, regions, or demographics.

References

A guidebook to Green Economy (2012), Issue 1: Green Economy, Green Growth, and Low *Carbon Development – history, definitions and a guide to recent publications, UNDESA, 5-7.*

Ajzen, I. and Fishbein, M. (1977). Attitude-behavior relations: a theoretical analysis and review of empirical research. *Psychological Bulletin, 84, 888-918.*

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes*. vol. 50, issue 2, pp.179-211.

Clark, W. C., & Harley, A. G. (2020). Sustainability Science: Toward a Synthesis. *Annual Review of Environment and Resources* 45(1), 331-386.

Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly* (13:3), 319-340, 1989.

Davis, F.D., Bagozzi, R.P., Warshaw, P.R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35(8), 982-1003.

Davis, F. D., Bagozzi, R. P., and Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology* 22(14): 1111-1132.

Davis, F.D. (1993). User acceptance of information technology: system characteristics, user perceptions and behavioral impacts. *Int. Journal of Man-Machine Studies.*38 (3). 475–487.

Duffett, R.; Petroșanu, D.M.; Negricea, I.-C.; Edu, T. (2019). Effect of YouTube Marketing Communication on Converting Brand Liking into Preference among Millennials Regarding Brands in General and Sustainable Offers in Particular. Evidence from South Africa and Romania. *Sustainability*, 11, 604.

European Commission. (2019). The European Green Deal. Brussels: European Commission. Retrieved from ec.europa.eu

Fishbein, M., Ajzen, I. (1975). Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research. Reading. MA, Addison-Wesley.

UNEP, (2011). Towards a Green Economy. *Pathways to Sustainable Development and Poverty, Eradication*, 9-11.

Perju-Mitran A., Zirra D., Căruţaşu G., Stănică J-L. (2020). Applying the Technology Acceptance Model to Assess the Intention to Use an Aftermarket eCall Based on 112 Device for Passenger Vehicles to Ensure Sustainable Rescue Operations on European Roads. Article. *Sustainability*, 11, 604.

Petroșanu, D.M.; Căruțașu, G.; Căruțașu, N.L.; Pîrjan, A (2019). A review of the recent developments in integrating machine learning models with sensor devices in the smart buildings sector with a view to attaining enhanced sensing, energy efficiency, and optimal building management. *Energies*, 12, 93-100.

Rogers, E.M. (1995). Diffusion of Innovations: Modifications of a model for telecommunications. Springer: Berlin/Heidelberg, Germany. *In Die Diffusion Von Innovationen in Der Telekommunikation*; pp. 25–38.

Taherdoost, H. (2018). A review of technology acceptance and adoption models and theories. *Procedia Manufacturing*, 22, 960–967.

Triandis, H.C. (1977). *Interpersonal Behaviour*; Brooks/Cole Pub. Co.: Monterey, CA, USA**.**