PROJECT NUMBER

2023-2-TR01-KA210-VET-000180148

PROJECT TITLE

NEW APPLICATIONS IN ELECTRIC VEHICLES TECHNOLOGY ACCORDİNG TO 4.0 STANDARDS

NEEDS ANALYSIS AND SURVEY IMPLEMENTATION REPORT

Funded by the European Union

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This report was prepared within the scope of the project titled “New Applications in Electric Vehicle Technology According to 4.0 Standards” (Project No. 2023-2-TR01-KA210-VET-000180148). It is intended to serve as a guide for vocational education instructors. It is free for users, cannot be sold, and cannot be reproduced. It will be published as an e-book on the Project Website (https://evta40.com).

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The following academics served as researchers in the preparation of survey questions and the evaluation of the surveys conducted.

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FINDINGS and COMMENTS

Analyses of the data obtained from participants' views are discussed below.

Figure 1. Distribution of Participants by Country

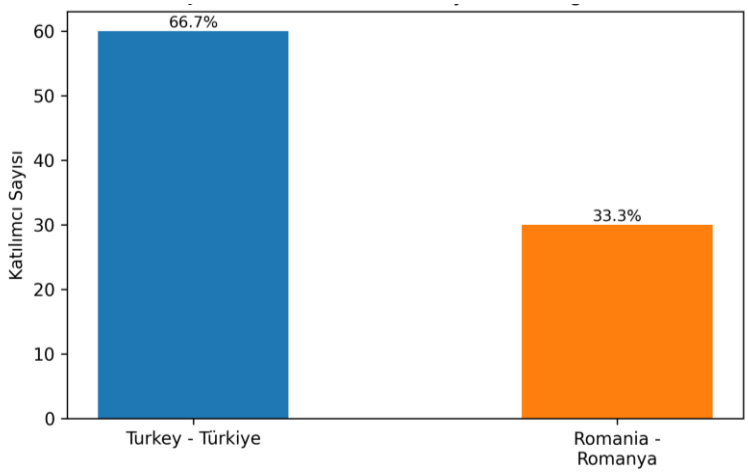

Figure 1 shows that 66.7% of participants were from Turkey, while 33.3% were from Romania.

Figure 2. Distribution of Participants by Gender

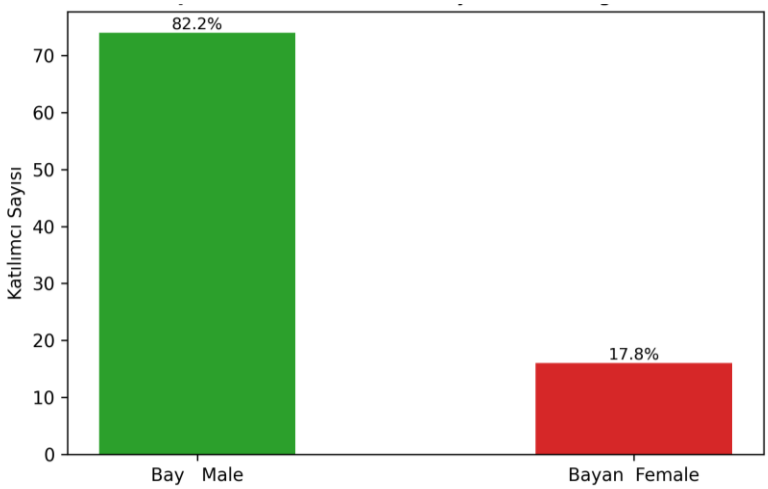

Figure 2 shows that 82.2% of participants were male and 17.8% were female. The high percentage of male participants indicates that the sample consisted mainly of individuals working in technical and professional fields. This structure provides a meaningful framework for designing project outputs in line with the professional skill development needs of the target audience.

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Figure 3. Distribution of Participants by Age Group

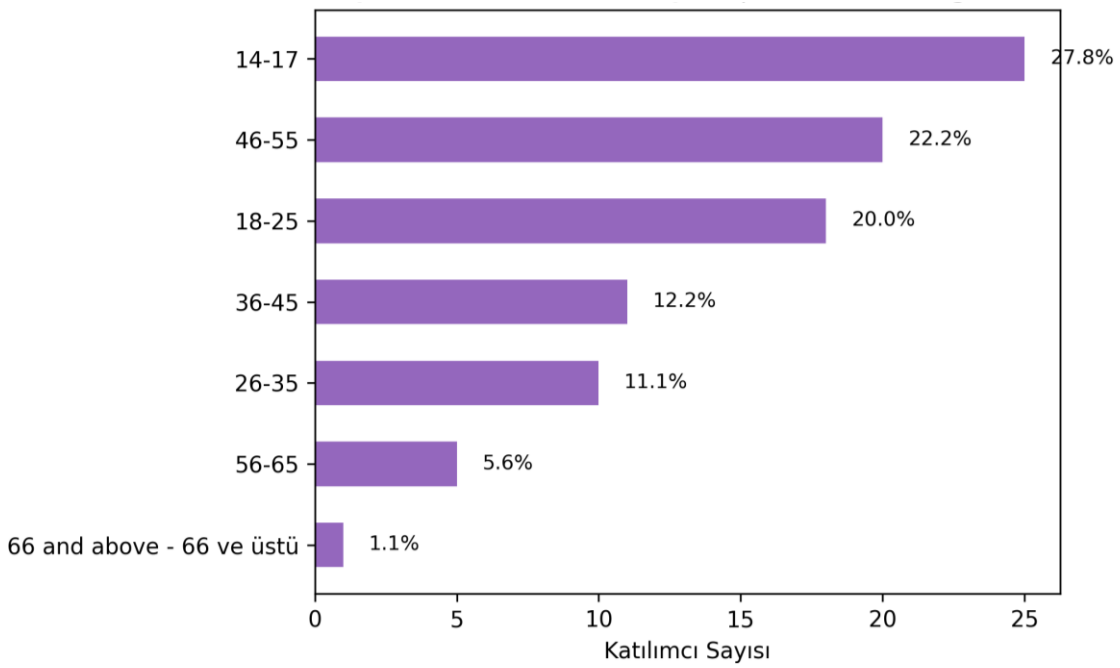

Figure 3 shows that 27.8% of participants were in the 14-17 age group, 22.2% were in the 46-55 age group, 20.0% were in the 18-25 age group, 12.2% were in the 36-45 age group, 11.1% in the 26-35 age range, 5.6% in the 56-65 age range, and 1.1% aged 66 and above. These findings indicate that the participants are predominantly in the active working age range, which can be linked to vocational education and employment.

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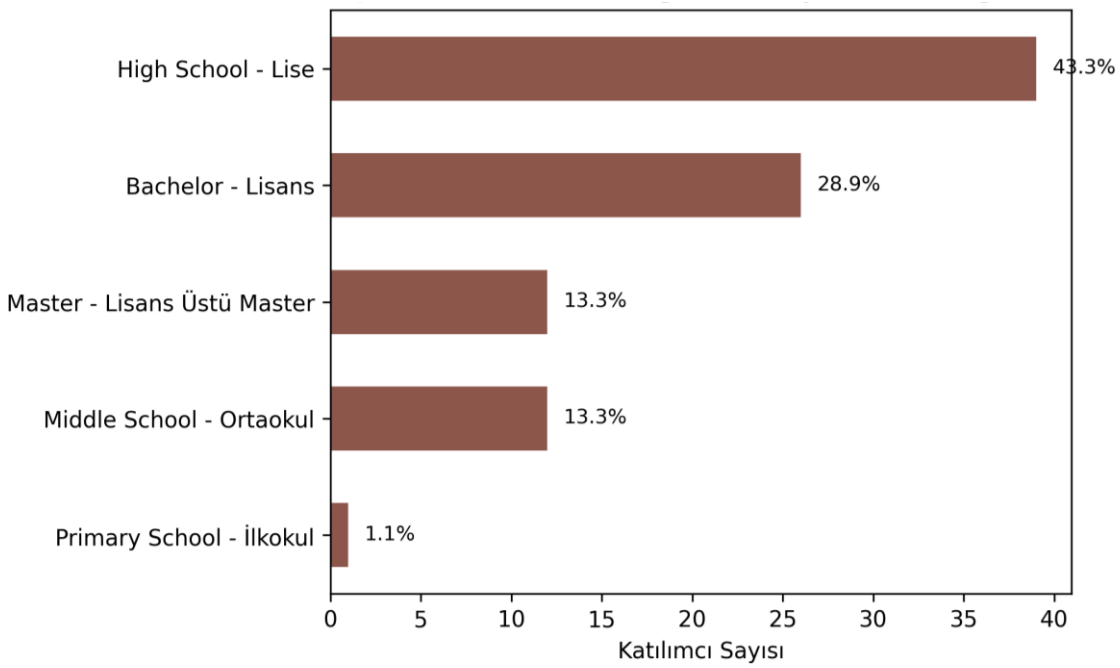
Figure 4. Distribution of Participants by Education Level



When examining the distribution of participants according to their educational level in Figure 4, 43.3% have a high school education, 28.9% have a bachelor's degree, 13.3% have a postgraduate degree, 13.3% have a middle school education, and 1.1% have an elementary school education. The number of participants with high school and bachelor's degrees indicates that the educational content to be developed within the scope of the project can be designed in a practice-oriented and evidence-based structure that can be adapted to different proficiency levels.

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Figure 5. Distribution of Participants by Field of Work

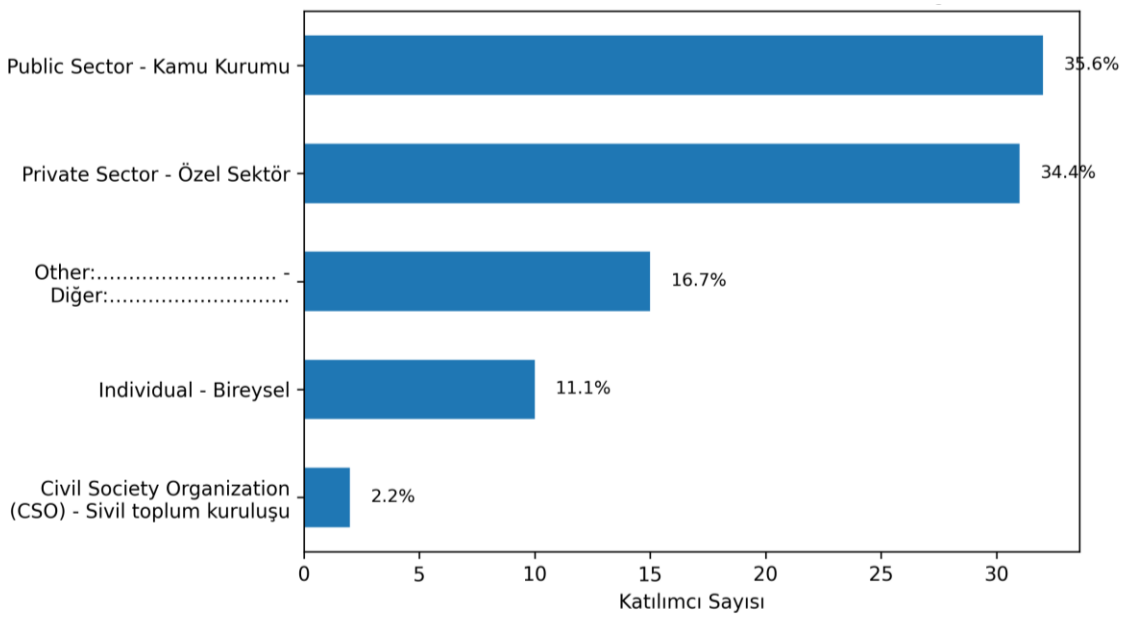

Figure 5 shows the distribution of participants according to their work areas. The total sample size is N=90. Accordingly, 35.6% (n=32) of participants work in public institutions, 34.4% (n=31) in the private sector, 16.7% (n=15) in different work areas under "Other," 11.1% (n=10) stated that they worked individually, and 2.2% (n=2) stated that they worked in non-governmental organizations. This distribution shows that the sample has a predominantly public and private sector-based structure. The findings reveal that training needs related to electric vehicle technologies are directly linked to field applications and institutional practices; they support the necessity of designing the training content to be developed within the scope of the project in an application-based manner that is sensitive to sectoral requirements.

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Figure 6. Distribution of Participants by Field of Activity

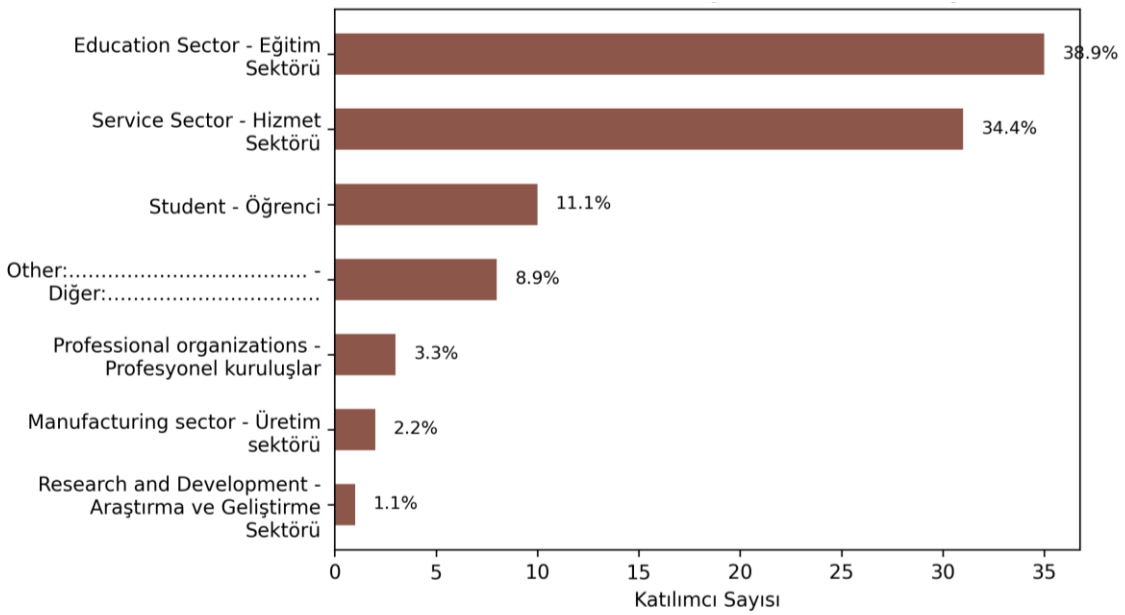

Figure 6 shows the distribution of participants according to their field of activity. A total of N=90 people participated in the study. According to the findings, 38.9% (n=35) of participants were in the education sector, 34.4% (n=31) were in the service sector, 11.1% (n=10) were students, 8.9% (n=8) in various fields of activity under "Other," 3.3% (n=3) in professional organizations, 2.2% (n=2) in the manufacturing sector, and 1.1% (n=1) in R&D. This distribution reveals that the sample is predominantly concentrated in the education and service sectors. The findings show that training needs for electric vehicle technologies are directly related to both vocational training environments and industry practices; they emphasize the importance of designing the training content to be developed within the scope of the project in an inclusive and application-oriented structure that takes into account sectoral diversity.

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1. Do you know about the damages that fossil fuels cause to the world?

Answer	Number of People (n)	Percentage (%)	Total (n)
Yes	73	81.1	90
Partly	11	12.2	90
No	6	6.7	90

Table 1 clearly shows the distribution of participants' responses. The answers to this question were Yes (81.1%, n=73); Partly (12.2%, n=11); No (6.7%, n=6). The vast majority of participants stated that they were aware of the negative effects of fossil fuels on the environment and the world. However, the presence of participants who stated that they had limited knowledge indicates that there is still a need for awareness-raising efforts on this issue. A very small group stated that they were not aware of the issue.

2- Are you aware of alternative energy sources instead of fossil fuels?

Answer	Number of People (n)	Percentage (%)	Total (n)
Yes	71	78.9	90
Partly	10	11.1	90
No	9	10.0	90

Table 2 clearly shows the distribution of participants' responses. The answers to this question were Yes (78.9%, n=71); Partly (11.1%, n=10); No (10.0%, n=9). The responses reveal that a significant portion of participants are aware of alternative energy sources to fossil fuels. However, the fact that some participants indicated they only had partial knowledge or no knowledge at all points to the need for increased education on alternative energy sources.

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3- Are you aware of the European Green Deal announced by the European Union in 2019?

Answer	Number of People (n)	Percentage (%)	Total (n)
Yes	43	47.8	90
Partly	37	41.1	90
No	10	11.1	90

Table 3 clearly shows the distribution of participants' responses. The answers to this question were No (47.8%, n=43); Yes (41.1%, n=37); Partly (11.1%, n=10). It is evident that participants' awareness levels regarding the European Green Deal are limited. The prevalence of "No" responses suggests that this policy has not sufficiently reached its target audiences. However, the existence of a group that is knowledgeable or partially informed about the subject indicates that awareness can be increased.

4- Do you think you are aware of global warming and climate change?

Answer	Number of People (n)	Percentage (%)	Total (n)
Yes	64	71.1	90
Partly	15	16.7	90
No	11	12.2	90

Table 4 clearly shows the distribution of participants' responses. The answers to this question were Yes (71.1%, n=64); Partly (16.7%, n=15); No (12.2%, n=11). The majority of participants considered themselves to have sufficient knowledge about global warming and climate change. However, the presence of participants who considered themselves to have partial knowledge or insufficient knowledge indicates that the subject needs to be addressed in depth.

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5- Do you have efforts to contribute to the prevention of global warming and climate change?

Answer	Number of People (n)	Percentage (%)	Total (n)
None - Yok	32	35.6	90
I use energy-efficient products	19	21.1	90
I participate in educational activities for environmental protection	14	15.6	90
I use renewable energy sources	12	13.3	90
I use public transport -	10	11.1	90
Other:..……	3	3.3	90

Table 5 clearly shows the distribution of participants' responses. The responses to this question were None - None (%35.6, n=32); I use energy-efficient products - I prefer energy-efficient products (%21.1, n=19); I participate in educational activities for environmental protection - I participate in educational activities for environmental protection (%15.6, n=14); I use renewable energy sources (%13.3, n=12); I use public transport (%11.1, n=10); Other:..…… (%3.3, n=3). The responses indicate that a significant portion of participants are not making individual efforts to combat climate change. However, the presence of participants who are making efforts in areas such as energy conservation, renewable energy use, environmental education, and green transportation shows that environmental awareness is not entirely absent.

6- How much do you know about the training materials used in electric vehicles?

Answer	Number of People (n)	Percentage (%)	Total (n)
I have some knowledge	48	53.3	90
I have enough information	23	25.6	90
I do not have information	19	21.1	90

Table 6 clearly shows the distribution of participants' responses. The responses to this question were: I have some knowledge (53.3%, n=48); I have enough information (25.6%, n=23); I do not have information (21.1%, n=19). Most participants stated that they had limited knowledge about the educational materials used in electric vehicles. The fact that there are those who state that

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they have sufficient knowledge alongside those who have no knowledge on this subject indicates that educational content needs to be disseminated more widely.

7- Have you been able to find sufficient training documents on electric vehicle?

Answer	Number of People (n)	Percentage (%)	Total (n)
Yes	34	37.8	90
Partly	28	31.1	90
No	28	31.1	90

Table 7 clearly shows the distribution of participants' responses. The answers to this question are Partly (37.8%, n=34); Yes (31.1%, n=28); No (31.1%, n=28). Participants' opinions regarding access to educational documents on electric vehicles show an uncertain distribution. The responses suggest that the existing documents are considered partially adequate, but there are perceived shortcomings in terms of access and content.

8- Have you been able to find sufficient video, animation etc. interactive materials to use in trainings on electric vehicle?

Answer	Number of People (n)	Percentage (%)	Total (n)
Yes	45	50.0	90
Partly	24	26.7	90
No	21	23.3	90

Table 8 clearly shows the distribution of participants' responses. The answers to this question were Partly (50.0%, n=45); Yes (26.7%, n=24); No (23.3%, n=21). Participants mostly expressed an uncertain attitude regarding the adequacy of interactive materials such as videos and animations related to electric vehicles. This indicates that visual and digital content needs to be improved in terms of both quantity and quality.

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9-Do you think that distance education applications related to electric vehicle are satisfactory in vocational education?

Answer	Number of People (n)	Percentage (%)	Total (n)
Yes	54	60.0	90
Partly	21	23.3	90
No	15	16.7	90

Table 9 clearly shows the distribution of participants' responses. The answers to this question were No (60.0%, n=54); Yes (23.3%, n=21); Partly (16.7%, n=15). There is a strong perception that distance learning applications for electric vehicles in vocational education are insufficient. While some participants find these applications sufficient, a significant portion believe that the current systems do not meet their needs.

10- Do you think that distance education applications related electric vehicle can help meet education needs?

Answer	Number of People (n)	Percentage (%)	Total (n)
Yes	32	35.6	90
Partly	31	34.4	90
No	27	30.0	90

Table 10 clearly shows the distribution of participants' responses. The answers to this question were No (35.6%, n=32); Partly (34.4%, n=31); Yes (30.0%, n=27). Participants' views indicate that distance learning applications for electric vehicles have the potential to meet educational needs, but this has not yet been fully realized. The responses suggest that these applications could be more effective if further developed.

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11- Do you think that the shift towards Electric Vehicle Technology could create new business opportunities?

Answer	Number of People (n)	Percentage (%)	Total (n)
Yes	63	70.0	90
Partly	15	16.7	90
No	12	13.3	90

Table 11 clearly shows the distribution of participants' responses. The answers to this question were Yes (70.0%, n=63); No (16.7%, n=15); Partly (13.3%, n=12). The view that the shift towards electric vehicle technology could create new job opportunities is widespread among participants. This indicates that electric vehicle technology has not only environmental but also economic and employment-focused potential.

12- Do you think there are any obstacles to choosing Electric Vehicles?

Answer	Number of People (n)	Percentage (%)	Total (n)
Yes	38	42.2	90
Partly	37	41.1	90
No	15	16.7	90

Table 12 clearly shows the distribution of participants' responses. The answers to this question were No (42.2%, n=38); Yes (41.1%, n=37); Partly (16.7%, n=15). Participants' views are divided into two categories: those who believe there are certain barriers to the adoption of electric vehicles and those who do not. This suggests that perceptions vary according to individual experiences and circumstances.

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13-If your answer to the above question is yes, tick the relevant options..

Answer	Number of People (n)	Percentage (%)	Total (n)
Range and charging problems of electric vehicles	33	36.7	90
Other	30	33.3	90
Economic reasons	13	14.4	90
Political reasons -	7	7.8	90
Lack of awareness of the issue	7	7.8	90

Table 13 clearly shows the distribution of participant responses. Responses to this question were Range and charging problems of electric vehicles (%36.7, n=33); Other (%33.3, n=30); Economic reasons (14.4%, n=13); Political reasons (7.8%, n=7); Lack of awareness of the issue (7.8%, n=7). Technical problems and uncertainties are the main barriers to the adoption of electric vehicles. In addition, economic, political, and awareness-based reasons are also mentioned by participants. This result reveals that the barriers are multidimensional.

14- Do you think buying an Electric Vehicle is economical and affordable?

Answer	Number of People (n)	Percentage (%)	Total (n)
Yes	35	38.9	90
Partly	33	36.7	90
No	22	24.4	90

Table 14 clearly shows the distribution of participants' responses. The answers to this question were Yes (38.9%, n=35); No (36.7%, n=33); Partly (24.4%, n=22). There is no clear consensus among participants regarding the economic viability of purchasing electric vehicles. The responses indicate that the perception of cost varies depending on personal economic circumstances and current market conditions.

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15- Do you think electric vehicles have lower maintenance costs?

Answer	Number of People (n)	Percentage (%)	Total (n)
Yes	32	35.6	90
Partly	31	34.4	90
No	27	30.0	90

Table 15 clearly shows the distribution of participants' responses. The answers to this question were Yes (35.6%, n=32); No (34.4%, n=31); Partly (30.0%, n=27). Participants' opinions on whether the maintenance costs of electric vehicles are low show a balanced distribution. This suggests that information regarding maintenance costs is not sufficiently clear and widespread.

16-Do you think electric vehicles are more environmentally friendly than other carbon emitting vehicles?

Answer	Number of People (n)	Percentage (%)	Total (n)
Yes	56	62.2	90
Partly	17	18.9	90
No	17	18.9	90

Table 16 clearly shows the distribution of participants' responses. The answers to this question were Yes (62.2%, n=56); Partly (18.9%, n=17); No (18.9%, n=17). A significant portion of participants share the view that electric vehicles are environmentally friendly. However, the partially affirmative or negative responses indicate that there are some concerns regarding environmental impacts.

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17- What motivates you to become interested in Electric Vehicle Technology?

Answer	Number of People (n)	Percentage (%)	Total (n)
Contributing to a sustainable world	47	52.2	90
Keeping up with the changing World	29	32.2	90
Creating the employment area of the future	14	15.6	90

Table 17 clearly shows the distribution of participant responses. The responses to this question are: Contributing to a sustainable world (52.2%, n=47); Keeping up with the changing world (32.2%, n=29); Creating the employment area of the future (15.6%, n=14). The interest in electric vehicle technology is fundamentally based on environmental sustainability, adapting to a changing world, and future employment areas. This shows that motivation is based on both environmental and professional grounds.

18- What are the uses of electric vehicles that interest you the most?

Answer	Number of People (n)	Percentage (%)	Total (n)
Protecting nature (reducing CO2 and greenhouse gas emissions)	49	54.4	90
Meeting the need for comfortable transportation	26	28.9	90
I do not have information	10	11.1	90
Meeting the need for freight transportation	5	5.6	90

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Table 18 clearly shows the distribution of participants' responses. The responses to this question were: Protecting nature (reducing CO2 and greenhouse gas emissions) (%54.4, n=49); Meeting the need for comfortable transportation (28.9%, n=26); I do not have information (11.1%, n=10); Meeting the need for freight transportation (5.6%, n=5). The most appealing aspect of electric vehicles is their potential to protect the environment. In addition, providing comfortable transportation is also a prominent factor. The presence of participants lacking information highlights the importance of awareness campaigns.

19- To what extent does using electric vehicles reduce fuel consumption?

Answer	Number of People (n)	Percentage (%)	Total (n)
%50	30	33.3	90
I don’t know	24	26.7	90
%75	15	16.7	90
%25	13	14.4	90
%100	8	8.9	90

Table 19 clearly shows the distribution of participants' responses. The responses to this question are as follows: 50% (33.3%, n=30); I don't know (26.7%, n=24); 75% (16.7%, n=15); 25% (14.4%, n=13); 100% (8.9%, n=8). Participants' perceptions of the extent to which electric vehicles reduce fuel consumption vary. The responses indicate that there is no clear and common level of knowledge on this subject.

20- How much do you know about electric vehicles?

Answer	Number of People (n)	Percentage (%)	Total (n)
I have some knowledge -	64	71.1	90
I have enough information	15	16.7	90
I do not have information	11	12.2	90

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Table 20 clearly shows the distribution of participants' responses. The responses to this question are: I have some knowledge (71.1%, n=64); I have enough information (16.7%, n=15); I do not have information (12.2%, n=11). Most participants stated that they had basic knowledge about electric vehicles. However, the limited number of those who considered themselves to have in-depth knowledge indicates that there is a continuing need for education

21. In which of the following areas do you need support regarding electric vehicles?

Answer	Number of People (n)	Percentage (%)	Total (n)
Training materials	40	44.4	90
Financial support	20	22.2	90
Other:……	15	16.7	90
Legal regulations	7	7.8	90
Training materials - Legal regulations - Financial support -	5	5.6	90
Training materials - Legal regulations	2	2.2	90
Financial support Other:……	1	1.1	90

Table 21 clearly shows the distribution of participants' responses. The responses to this question were Training materials (44.4%, n=40); Financial support (22.2%, n=20); Other:…… (16.7%, n=15); Legal regulations (7.8%, n=7); Training materials, Legal regulations, Financial support (5.6%, n=5); Training materials, Legal regulations (2.2%, n=2); Financial support, Other:…… (1.1%, n=1). It is seen that the area most in need regarding electric vehicles is training materials. In addition, expectations regarding financial and regulatory support are also noteworthy.

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22- Do you have any information about periodic maintenance of electric vehicles?

Answer	Number of People (n)	Percentage (%)	Total (n)
I have some knowledge	42	46.7	90
I do not have information	32	35.6	90
I have enough information	16	17.8	90

Table 22 clearly shows the distribution of participants' responses. The responses to this question are: I have some knowledge (46.7%, n=42); I do not have information (35.6%, n=32); I have enough information (17.8%, n=16). The majority of participants indicated that they either had limited knowledge or no knowledge about the periodic maintenance of electric vehicles. This situation indicates that training on maintenance processes needs to be strengthened.

23-I can find training materials on mechanical maintenance processes of electric vehicles

Answer	Number of People (n)	Percentage (%)	Total (n)
Uncertain	37	41.1	90
Agree	24	26.7	90
Disagree	13	14.4	90
Strongly Disaggree	9	10.0	90
Strongly Agree	7	7.8	90

Table 23 clearly shows the distribution of participants' responses. The responses to this question are as follows: Uncertain - I am uncertain (41.1%, n=37); Agree - I agree (26.7%, n=24); Disagree - I disagree (14.4%, n=13); Strongly Disagree - I strongly disagree (10.0%, n=9); Strongly Agree - Strongly agree (7.8%, n=7). A significant portion of participants are undecided regarding access to training materials on the mechanical maintenance processes of electric vehicles. This suggests that the current materials may not be sufficiently visible or accessible.

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24- I can find educational materials on electrical maintenance processes of electric vehicles.

Answer	Number of People (n)	Percentage (%)	Total (n)
Uncertain	35	38.9	90
Agree	25	27.8	90
Disagree	15	16.7	90
Strongly Agree	8	8.9	90
Strongly Disaggree	7	7.8	90

Table 24 clearly shows the distribution of participants' responses. Responses to this question were Uncertain - I'm not sure (38.9%, n=35); Agree - I agree (27.8%, n=25); Disagree - I disagree (16.7%, n=15); Strongly Agree (8.9%, n=8); Strongly Disagree (7.8%, n=7). There is also a similar uncertainty regarding the availability of training materials for electrical maintenance processes. The responses indicate a need for standard and comprehensive materials in this area.

25- I can find training materials on detecting faults in electric vehicles

Answer	Number of People (n)	Percentage (%)	Total (n)
Uncertain	33	36.7	90
Agree	22	24.4	90
Disagree	18	20.0	90
Strongly Disaggree	9	10.0	90
Strongly Agree	8	8.9	90

Table 25 clearly shows the distribution of participants' responses. The responses to this question are as follows: Uncertain - I am uncertain (36.7%, n=33); Agree - I agree (24.4%, n=22); Disagree - I disagree (20.0%, n=18); Strongly Disagree - I strongly disagree (10.0%, n=9); Strongly Agree - Strongly agree (8.9%, n=8). There is no clear consensus among participants regarding access to training materials for identifying electric vehicle faults. This situation indicates the need to diversify technical training content.

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26- I can find training materials on Occupational Safety when working with electric vehicles..

Answer	Number of People (n)	Percentage (%)	Total (n)
Uncertain	34	37.8	90
Agree	28	31.1	90
Disagree	11	12.2	90
Strongly Disaggree	10	11.1	90
Strongly Agree	7	7.8	90

Table 26 clearly shows the distribution of participants' responses. The responses to this question are as follows: Uncertain - I am uncertain (37.8%, n=34); Agree - I agree (31.1%, n=28); Strongly Agree - I strongly agree (12.2%, n=11); Disagree - I disagree (11.1%, n=10); Strongly Disagree (7.8%, n=7). The perception of access to training materials on occupational safety is generally uncertain. This finding demonstrates the critical importance of occupational safety training, particularly when working with electric vehicles.

27- I can find educational materials on the competencies that technical personnel working with electric vehicles should have.

Answer	Number of People (n)	Percentage (%)	Total (n)
Uncertain	30	33.3	90
Agree	26	28.9	90
Disagree	15	16.7	90
Strongly Disaggree	13	14.4	90
Strongly Agree	6	6.7	90

Table 27 clearly shows the distribution of participants' responses. Responses to this question were Uncertain - I'm not sure (33.3%, n=30); Agree - I agree (28.9%, n=26); Disagree - I disagree (16.7%, n=15); Strongly Agree (14.4%, n=13); Strongly Disagree (6.7%, n=6). Participants' opinions differ regarding access to training materials on the competencies required for

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technical personnel working with electric vehicles. This indicates that competency-based training content needs to be presented in a more systematic manner.

EVALUATION

The primary objective of the needs analysis survey conducted within the scope of this project is to objectively and measurably identify the current knowledge, skills, and competency levels of the target audience in the field of electric vehicle technology and to determine the current expectations of the job market based directly on field data. The survey findings clearly revealed that there is a general awareness of electric vehicle technologies; however, this awareness has not reached a systematic, comprehensive, and application-oriented level of professional competence.

The results obtained show that participants experience significant knowledge gaps and uncertainty regarding the basic components of electric vehicle technology, power electronics and motor systems, maintenance and repair processes, and occupational health and safety issues. In particular, the answers given to questions related to technical processes and professional practices indicate that the current level of knowledge remains fragmented and that a standardized competency structure has not been established. This situation reveals that the target audience in the field of electric vehicle technologies does not yet fully possess the equipment compatible with professional requirements.

The survey results clearly show which professional and technical skills are needed in the field of electric vehicles as part of the digital transformation process. The fact that participants experience uncertainty, particularly in areas such as maintenance and repair, fault detection, understanding system integrity, and safe working processes, reveals that current training content is insufficient to meet these needs. Furthermore, the limited awareness of the European Green Deal and sustainability policies indicates that electric vehicle technology should be addressed not only as a technical issue but also in terms of its environmental and economic dimensions.

The training content to be structured in line with these findings will be designed to directly address the areas of need identified in the survey. Strengthening the basic conceptual framework related to electric vehicle technology, increasing the depth of knowledge on technical systems, eliminating uncertainties regarding occupational health and safety, and developing professional

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competencies related to maintenance and repair processes have been identified as key requirements highlighted in the survey results. This indicates that the educational content to be developed is not random; rather, it is the product of a field data-driven, reasoned, and goal-oriented design process.

In conclusion, the findings of the needs analysis survey reveal a clear mismatch between the current state of electric vehicle technology and the expectations of the sector. This mismatch can be addressed by bringing the target audience's knowledge, skills, and competency levels in line with current technological developments. Therefore, this project emerges as a data-driven and strategic necessity that directly addresses the identified gaps; it stems from a concrete and imperative need to develop qualified human resources in the field of electric vehicles.

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