Development Assessment of self-driving cars in developed and developing countries (UK, Hungary, Malaysia & Pakistan)

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Abstract: As Technology is increasing, human life and perception are also changing. Automotive industry is one of the major sector of technology revolution. This sector keeps attracting public and investors towards it by bringing advance technology in the form of self-driving cars. Developed countries are progressing in this area because researchers, investors, Governments and interlinked organizations are visioning something fruitful for the public, social, environmental and technology in the near future. These developments are also impacting on the developing countries to think about this technology system in the transportation system. Although, developing countries are far behind from this advancement. It also influences about the people conceptions and life style.

It is all depend on the country's economic, social, political and environment structure because they have limited resources, inconsistent legal and social norms. In the developed countries, they are facing advance technology, cyber security and public issue. In this research paper total no. of people are 310 who respond to the questionnaire. To know about the development in the self-driving cars, four countries (UK, Hungary, Malaysia, Pakistan) have been selected to do the study. To find the relationship among the dependent and independent variables, I have used descriptive statistics analysis and correlation matrix to prove hypothesis and what will be the current situation going on regarding the self-driving cars through this observation analysis. During the measurements of the relationship in the variables, I have found no relationship dependency in the variables.

1 Introduction

The perception of self-driving cars has been in progress for many years, but latest development in technology, specifically in artificial intelligence, sensor systems, Industry 4.0 and connectivity, have brought the concept in physical existence. According to the statistical data 94% accidents happened due to the human error during the driving. In 2022 Kisling, Nestico & Redick LLC, Automakers reported nearly 400 crashes of vehicles with partially automated driver-assist systems to the National Highway Traffic Safety Administration (NHTSA).

Sometime people are drunk in some countries, most of the countries followed zero tolerance against alcohol such as Hungary, Malaysia and Pakistan. Few of countries allowed to drink a glass of beer during the driving. Sometime people are tired and upset while driving. Countries, US, Germany, Japan, and China are mainly investing in the self-driving cars. This study also helps to assess level of preparedness where we are standing in this journey of self-driving cars mainly in UK, Hungary, Malaysia and Pakistan developed and developing countries respectively.

The size of the global market for autonomous vehicles was estimated at USD 121.78 billion in 2022 and is expected to reach USD 2,353.93 billion by 2032, growing at a projected CAGR of 35% from 2023 to 2032. The demand of Level 1 and 2 are increasing in the market which are the major caused to increase in the investment in level 4 and 5 of the self –driving cars. OEM plans to launch level3 semi-autonomous cars models and conduct testing of level 4 cars. This will take leap of growth in the car industry in the coming years. (Carlier, 2023). Currently, 20.3 million units are working in automotive industry. By 2030, 62.4 million units will be expected to function in the car industry at compound annual growth rate(CAGR) 13.3% in near future as per recent forecast period. Moreover, there are chances of shared mobility and growing partnership in the self- driving cars.

2 Assumptions

1. Relationships between age, gender, education, and nation with technology will be revealed by certain factors.

2. The relationship will give information on the difficulties and effects on the nations and their citizens.

3. The demographic section's features differ from nation to nation.

4. The steering, pedal, environmental decision-making, and wheel functions of the car will also be linked.

Problem 1. What are the factors contributed to prefer self-driving cars?

Descriptive Statistics	*afraid*	*buy*	*emission*	*society*	*redu_acci*	*love_try*	*sup_ini*
Expected Value	2.9226	3.1581	3.0194	3.0032	2.9355	3.3516	3.1387
Standard Error	0.0811	0.0788	0.0748	0.0780	0.0797	0.0780	0.0753
Median	3	3	3	3	3	3	3
Modus	1	4	3	3	1	5	3
Standard Deviation	1.4280	1.3879	1.3169	1.3736	1.4035	1.3732	1.3257
Relative Standard Deviation / Coefficient Variation	0.4886	0.4395	0.4362	0.4574	0.4781	0.4097	0.4224
Variance	2.0393	1.9264	1.7343	1.8867	1.9699	1.8857	1.7574
Skewness	-1.3528	-1.1936	-1.0535	-1.2101	-1.2872	-1.1382	-1.1010
Kurtosis	0.0565	-0.1906	-0.1128	0.0319	0.0093	-0.3058	-0.1479
Range	4	4	4	4	4	4	4
Relative Range	1.3687	1.2666	1.3248	1.3319	1.3626	1.1935	1.2744
Minimum	1	1	1	1	1	1	1
Maximum	5	5	5	5	5	5	5
Sum of Example	906	979	936	931	910	1039	973
Nr. Of Example	310	310	310	310	310	310	310
Confidence Level (95%)	0.1596	0.1551	0.1472	0.1535	0.1569	0.1535	0.1482

Firstly, People love to try new technology in self-driving cars as score is 3.3. Secondly, buying and support initialization of self- driving cars get 3.1 score, so it means that people will buy and are in the favor of self-driving cars. Thirdly, people will prefer self-driving cars due to environment protection and society change as per score show 3.0. Fourthly, afraid in the environment and less in accident get score 2.9. so, it means that people will not afraid of self-driving cars. In this data standard error is close to the zero which means that data of the population is true. It shows that mean of the population is true.

Problem 2. What are the impact of self-driving cars in the countries UK, Hungary, Malaysia and Pakistan?

Descriptive Statistics	*hackers*	*sys_brk_dn*	*cr_dcid_df*	*6_B*	*prof.*	*C_not_gain*	*2_xpensv*	*joy*	*Pers_data*
Expected Value	3.1581	3.1516	2.8968	2.8290	3.0968	3.0355	3.0742	2.9581	3.1032
Standard Error	0.0817	0.0803	0.0788	0.0754	0.0788	0.0769	0.0790	0.0789	0.0772
Median	3	3	3	3	3	3	3	3	3
Modus	5	5	3	3	3	3	2	3	3
Standard Deviation	1.4383	1.4141	1.3873	1.3268	1.3878	1.3541	1.3903	1.3893	1.3590
Relative Standard Deviation / Coefficient Variation	0.4554	0.4487	0.4789	0.4690	0.4481	0.4461	0.4523	0.4697	0.4379
Variance	2.0688	1.9996	1.9246	1.7603	1.9259	1.8337	1.9330	1.9303	1.8469
Skewness	-1.2984	-1.2657	-1.2225	-1.0924	-1.2216	-1.1404	-1.2636	-1.2253	-1.1949
Kurtosis	-0.1285	-0.1395	0.0836	0.1583	-0.0866	-0.0568	-0.0171	0.0462	-0.0092
Range	4	4	4	4	4	4	4	4	4
Relative Range	1.2666	1.2692	1.3808	1.4139	1.2917	1.3177	1.3012	1.3522	1.2890
Minimum	1	1	1	1	1	1	1	1	1
Maximum	5	5	5	5	5	5	5	5	5
Sum of Example	979	977	898	877	960	941	953	917	962
Nr. Of Example	310	310	310	310	310	310	310	310	310

Confidence Level (95%)	0.1607	0.1580	0.1550	0.1483	0.1551	0.1513	0.1554	0.1553	0.1519

This analysis of self-driving cars in UK, Hungary, Malaysia and Pakistan shows about the impact on the countries in the economic, social, technological and safety but more related with the technology factors.

Firstly, Technological impact: Hackers, system break down during the driving and personal data safety issue score 3.1, it means that this statement is more significant in the eye of the people.

Secondly, Economical impact: people think that car will be expensive and driving profession will get effected from these self-driving cars as per score indicated 3.0. skewness is positive due to positive value, curve is longer and fatter to the right side.

Thirdly, score get 2.8 to the social and security factor as people will be happy to use self-driving car. Kurtosis negative values in the security scenario means that more value located near the mean and less value located on the tail. In the social factor kortosis has positive values.

Problem 3. How are the demographic differences feature affects the self-driving cars?

Descriptive Statistics	*gender*	*age*	*country*	*live*	*HE*	*c_study*	*obst*	*C_Work*
Expected Value	1.1419	6.0161	3.6774	3.3839	4.4839	4.4387	4.3355	1.4129
Standard Error	0.0438	0.1028	0.0856	0.0783	0.1167	0.1182	0.1243	0.0384
Median	1	7	3	4	5	5	4	2
Modus	1	7	3	5	7	7	7	2
Standard Deviation	0.7712	1.8105	1.5070	1.3787	2.0554	2.0811	2.1879	0.6759
Relative Standard Deviation / Coefficient Variation	0.6753	0.3009	0.4098	0.4074	0.4584	0.4689	0.5046	0.4784
Variance	0.5947	3.2781	2.2710	1.9007	4.2247	4.3312	4.7868	0.4568
Skewness	-1.2788	0.3917	-0.9147	-1.0346	-1.2484	-1.1975	-1.4243	-0.5938

Kurtosis	-0.2495	-1.4401	0.8238	-0.4088	-0.1771	-0.2152	-0.1618	-0.7245
Range	2	6	6	4	6	6	6	2
Relative Range	1.7514	0.9973	1.6316	1.1821	1.3381	1.3517	1.3839	1.4155
Minimum	0	1	1	1	1	1	1	0
Maximum	2	7	7	5	7	7	7	2
Sum of Example	354	1865	1140	1049	1390	1376	1344	438
Nr. Of Example	310	310	310	310	310	310	310	310
Confidence Level (95%)	0.0862	0.2023	0.1684	0.1541	0.2297	0.2326	0.2445	0.0755

Based on the data, age get more score 6 as compared to the other independent variable and then higher education, currently study level get score 4.4. After it, country and residing destination get 3.6 and 3.3 score.

Standard error is low which shows that there is no relationship between dependent variable of self-driving cars such as safety, technical, social and economic factor and independent variable like age, gender, country, education, working and obstacles.

So, it means that demographic feature does not effect on the other factors of self-driving cars.

3 Results and Discussion

			Nr.	Share
Relation type	Pearsons type correlation coefficient value	Relation type	Cases	
Independent	-0,25 < □ < 0,25	Independent	621	98.57%
Stochastic	-0,75 < □ < -0,25 or 0,25 < □ < 0,75	Stochastic	9	1.43%
Deterministic	□ < -0,75 or 0,75 < □	Deterministic	0	0.00%
		Sum	630	100.00%

Overall, Variation is low. Variable are independent. To achieve the results, Pearson correlation is measured to analyze the demographic factors and other factors related with technology, safety and human preference.

In the case of demographic scenario, level of significance is low and relationship does not exist among the Independent variable gender, age, education, location, country and working and dependent variable such as safety aspects, technical features, economic and social factors of the car.

In the case preference and conception of the self-driving car's impact in the future, this study shows that more education is required, special attribute related to the self-driving car must be specific, condition of area to get specific result and special technical features related with specific consumer and location requirements. I think that Generalized study is challenging in this specific area of the self-driving cars. Unfortunately, there is no strong relationship among the variables, so we have to focus on some other alternative ways to get the required results. Although, self-driving cars bring convenient in the society and help the traffic jam in the rush and peak hours as there is heavy traffic load in the Berlin, London, Budapest, Lahore and Kualalumpur.

If self-driving cars are the future, Communication lamp or tower must be integrated in the infra-structure. Uber mode must be introduced, formal public transportation system eliminates, if consumer use ride-sharing or Uber cab for the mobility.

Conclusion

There is no significance interlinked among dependent and independent variables. So, more research required to analyze the factors. self-driving cars must be manufactured on specific area, person and technology need. There is some more specification needs to be address. It also shows that there is no specific direction regarding the further improvement of the self-driving cars.

Recommendations

The findings of this study are data efficiency of observation is required for safety and public reliance. Advance method of deep learning are required in lidar, radar and camera in the external and internal side of the cars. Visualizations and sound identification issue needs to be addressed properly for the safety and security of the passenger. Awareness and practical knowledge must be given to the people. Trust and reliability needs to be created among the people. Cost of the cars, Pool car system, the ride sharing must be economical.

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