

# Scenario Developments for the Development of Autonomous Vehicle Industry

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## Introduction

The increasing use of autonomous vehicles in industrialized nations can be attributed to two primary factors: the urgent emphasis on road safety and the diminishing availability of human labor. Countries that are leading in technological advancements or making significant progress in this area prioritize the development and implementation of self-driving technologies. Both governmental entities and corporate organizations are making substantial investments in technologies that are closely connected. Nevertheless, the definitive path that these investments will follow, whether influenced by governmental policies or company strategies, particularly in the context of driverless vehicles, remains uncertain. It is noteworthy that there is a lack of scholarly discussion surrounding these crucial subjects.

In order to address this gap in research, our study utilizes the Political, Economic, Social, Technological, Environmental, and Legal (PESTEL) framework to anticipate prospective scenarios for the autonomous car sector. This study used a multi-criteria decision-making (MCDM) methodology to merge the decision-making trial and evaluation laboratory (DEMATEL) technique with the analytic network process (DANP) and VIKOR methodologies. The objective is to determine the most feasible future scenarios. This study will employ an empirical approach to examine the potential for establishing the autonomous vehicle sector in Taiwan. The aim is to assess the viability of the suggested analytic framework via the use of various scenarios.

Based on empirical evidence, it can be inferred that the development of Taiwan's autonomous vehicle sector would primarily be shaped by various economic, social, environmental, and legal factors. There are four potential scenarios that might be envisioned. The first scenario (S1) involves a strong economic growth accompanied by societal stability, as well as significant environmental and legal aspects. Another scenario (S9) entails an economic decline while society remains stable, with prevailing environmental and legal forces. These are only a few examples of the potential scenarios that can be considered.

The analytical findings provide a framework to guide subsequent policy development and decision-making for governmental entities and corporate organizations. Furthermore, it offers scholars worldwide a more thorough comprehension of distinctive paradigms in autonomous vehicle strategy.

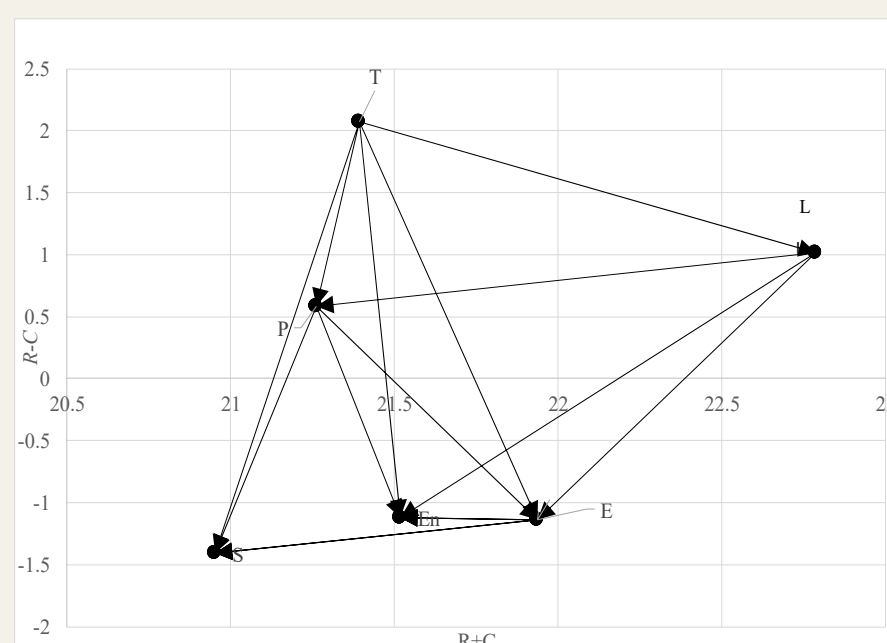
## Methods

In order to address the existing research gap, this study utilizes the macro-environmental analysis technique known as PESTEL. Additionally, a multi-criteria decision analysis model is developed to establish potential future development scenarios for the autonomous car sector. After conducting a comprehensive review of expert perspectives, this research used the DEMATEL technique and the DANP to identify the three most significant driving forces for development scenarios. By employing the DEMATEL approach in conjunction with the VIKOR multi-criteria compromise evaluation method, this study created four probable scenarios for the development of telemedicine in the upcoming five years. These scenarios were generated from a total of eight possible combinations established by considering the influence of three key driving variables.



## PESTEL - The Causal Relationship

The evolution of autonomous vehicles in the future was predicted using the PESTEL analytical framework in this study, a method frequently deployed for macro-environmental analysis. This framework scrutinizes Political, Economic, Social, Technological, Legal, and Environmental dimensions. From these aspects, preliminary criteria for the evaluation model were drawn. A graphic representation of the initial hybrid Multiple Criteria Decision Making (MCDM) model can be seen in the following illustration. The scenario logics can be derived accordingly.



## Scenario Logics

Driving Forces	Combinations							
Economic	High Growth							
Society	Stable				Unstable			
Environment	Support	No	Support	No	Support	No	Support	No
Legal	Support	No	Support	No	Support	No	Support	No
Scenarios	SC1	SC2	SC3	SC4	SC5	SC6	SC7	SC8

Driving Forces	Combinations							
Economic	Low Growth							
Society	Stable				Unstable			
Environment	Support	No	Support	No	Support	No	Support	No
Legal	Support	No	Support	No	Support	No	Support	No
Scenarios	SC9	SC10	SC11	SC12	SC13	SC14	SC15	SC16

## Results of VIKOR

	SI	QI	RI	Rank
SC1	0.001	0.001	0.000	1
SC2	0.820	0.019	0.848	9
SC3	0.214	0.008	0.272	3
SC4	0.897	0.022	0.937	12
SC5	0.128	0.007	0.205	2
SC6	0.880	0.021	0.912	10
SC7	0.272	0.009	0.338	5
SC8	0.929	0.022	0.953	14
SC9	0.218	0.010	0.330	4
SC10	0.918	0.021	0.932	11
SC11	0.363	0.013	0.476	6
SC12	0.956	0.021	0.951	13
SC13	0.348	0.016	0.526	7
SC14	0.955	0.021	0.958	15
SC15	0.496	0.016	0.615	8
SC16	0.995	0.022	1.000	16
SI*/Qi*	0.001	0.001		
SI-/Qi-	0.995	0.022		

## Conclusions

Scenario analysis holds considerable significance in shaping a company's and industry's progression by enabling them to anticipate and prepare for future opportunities and threats and thereby sustain their competitive edge. Several methods and techniques are available for macro-environmental analysis, and in this study, we employed the political, economic, social, technical, environmental, and legal (PESTEL) framework.

The driving forces marked by high impact and uncertainty are technological, social, and economic elements. We synthesized these three variables to develop eight fundamental scenario logics. Subsequently, we identified the most probable scenario based on the chosen scenario factors. The top three scenarios, according to the assigned scores, served as the backdrop for the subsequent study, as detailed below:

Scenario 1: high economic growth, social stability, supports by environment and law.

Scenario 3: high economic growth, social stability, supports law, but not supported by environment,

Scenario 5: high economic growth, unstable society, supports by environment and law.

Scenario 9: economic recession, social stability, supports by environment and law.

Following the scenarios being developed, comprehensive innovation strategies that would effectively foster the growth and development of national autonomous car sector can be defined. Policy roadmaps can be defined accordingly.