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Research on the Evaluation of T Company's New Project Development

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ABSTRACT
At present, projects in the automotive industry have the characteristics of multiple product models, short development cycles, and fast iteration updates. Therefore, most automotive parts companies rarely evaluate new projects before they begin. This article combines the experience of T Company's project development and applies the Delphi method and Analytic Hierarchy Process to develop a new project development potential evaluation system. The weight table of new project development evaluation indicators and the scoring of each indicator are used to objectively evaluate the development potential of new projects. This method can help automotive parts companies evaluate the prospects of new projects and ensure efficient and orderly allocation of company resources.

KEYWORDS
automotive parts; Potential evaluation of new projects; analytic hierarchy process

1 Introduction

With the rapid rise of China's automobile industry, the total production and sales of automobiles in China will exceed 30 million units by 2023, and the output value of the automobile industry will exceed 11 trillion yuan, ranking among the top in the world [1]. In the rapid growth process of the automotive industry, people have increasingly high requirements for the performance of cars, including intelligence, comfort, and passability, which in turn drives OEMs to continuously iterate and upgrade their products and develop technologies that meet market demand. Therefore, supporting industries such as automotive parts have also experienced explosive growth.

With the increasing diversification and personalization of consumer demands, the automotive market presents a trend of endless product models. From traditional fuel vehicles to new energy vehicles, from family sedans to multi-purpose SUVs, MPVs, and even to intelligent cars with cutting-edge technologies such as autonomous driving, product models are constantly enriching to meet the needs of different consumer groups. At the same time, rapid technological advancements and fierce market competition have further compressed the development cycle of automotive products. In order to seize the opportunity in the market, automobile companies have to accelerate product development speed, shorten the time from conceptual design to mass production and launch, shorten the development cycle from the past few years to 1-2 years or even shorter now, and the iteration and update speed is also accelerating. New power systems, intelligent cockpit technology, and vehicle networking functions are constantly emerging, promoting rapid updates and upgrades of automotive products.

This industry characteristic places extremely high demands on project management for automotive parts companies. The increase in product models means that component companies need to adapt to the diverse needs of different vehicle models and develop components with different specifications and performance; The shortening of the development cycle requires component companies to improve research and development efficiency, and complete the design, testing, and production of components in a shorter period of time; Fast iteration updates require component companies to keep up with technological trends, continuously invest in research and development resources, and maintain product competitiveness. However, currently most automotive parts companies rarely conduct a comprehensive and in-depth evaluation of new projects before they begin. This is mainly because traditional project evaluation methods are difficult to adapt to the rapid changes in the automotive industry projects and lack a scientific and systematic evaluation system. In this situation, component companies may blindly undertake projects, resulting in scattered resources and inability to concentrate limited manpower, material resources, and financial resources on projects with high potential, thereby affecting the company's economic benefits and market competitiveness.

T Company is a composite multinational corporation involved in multiple fields such as communication electronics, power and healthcare, automotive, aerospace, and communication networks, always committed to creating a safer, sustainable, efficient, and interconnected future. The automotive industry projects have the characteristics of multiple product types, long recycling cycles, short iteration times, and high requirements for research and development capabilities [2]. The Sensor Division of T Company mainly provides a variety of automotive sensor components for major OEMs. With the explosive increase in demand for various sensor components in the market, T Company's sensor department has encountered a situation where organizational resources are insufficient to support the simultaneous development of so many projects due to the large number of projects. In this situation, it is necessary to establish a

systematic evaluation system for the development potential of new projects by analyzing various factors in the development process, making an overall evaluation of the development potential of new projects, comparing the advantages and disadvantages of different projects in achieving organizational goals, and based on this, allocating limited resources of the organization.

2 Identification of Potential Factors for T Company's Sensor New Project

T Company has a weak matrix organizational structure, with each functional department having strong discourse weight and professionalism.

Therefore, this article uses brainstorming and Delphi methods to organize experts from various departments to identify potential evaluation indicators for new projects [3]. This survey was initiated by the project manager and invited 10 experts, including senior managers from the project department, R&D department, manufacturing department, sales department, procurement department, quality department, and finance department in China, as well as 3 senior employees, to participate in the discussion.

This survey will first be conducted in the form of an offline meeting, using brainstorming to statistically record all the influencing factors in the new project development process and score them to distinguish the importance of different factors.

After the meeting, collect and organize opinions from various experts, classify and summarize them to form the initial version of the new project potential evaluation index list [4]. Afterwards, the initial version of the new project potential factor evaluation checklist was sent to 10 experts via email for discussion and modification. After multiple rounds of discussion and modification, everyone finally reached a consensus and determined the final version of the evaluation index system for T Company's new project potential, as shown in Table 1.

Table 1 Evaluation Index System for Potential of T Company's New Projects

Index System	First-level Index	Second-level Index
T Company's new project potential evaluation index A	Strategy B_1	Product development cooperation model C_{11}
		Product market positioning C_{12}
		Matching degree of company technology strategy C_{13}
	Market B_2	Customer conversion rate C_{21}
		Customer Importance C_{22}
		potential competitors C_{23}
	Development B_3	Technical development difficulty C_{31}
		Supplier stability C_{32}
		Quality risk C_{33}
		Engineering design working hours C_{34}
	Finance B_4	Expected income for 10 years C_{41}
		Project investment amount C_{42}
		Product profitability C_{43}
		Investment payback period C_{44}

3 Potential Evaluation of T Company's New Projects Based on Analytic Hierarchy Process

Based on the characteristics of new project development in the automotive industry, this article uses the Analytic Hierarchy Process to determine the weights of various potential evaluation indicators.

Firstly, organize experts to judge the scale table based on the matrix, as shown in Table 2, and compare and score the indicators pairwise.

Determine the relative importance of various potential evaluation indicators based on expert ratings, construct a judgment matrix table, and conduct consistency tests. The results are shown in Tables 3 to 7.

Table 2 Matrix Judgment Scale Table

Scale a_{ij}	Definition
1	Indicating that two factors have equal importance compared to each other
3	Indicates that i is slightly more important than j of the two factors
5	Indicates that one of the two factors i is significantly more important than j
7	Indicates that i is more strongly important than j of the two factors
9	denotes the extreme importance of i over j of the two factors
2,4,6,8	The median of the above two neighboring judgments
Count backwards	The judgment aij of factor i compared to j, then the judgment of factor j compared to i aji=1/aij

Table 3 Judgment Matrix A-B and Evaluation Results

Layer A	B1	B2	B3	B4	W	Consistency check
B1	1	1/3	1/4	2	0.1192	λmax =4.1023
B2	3	1	1/3	5	0.2803	CI=0.0341
B3	4	3	1	6	0.5331	RI=0.89
B4	1/2	1/5	1/6	1	0.0674	CR=0.0383< 0.1
						Meet the consistency check

Table 4 Judgment Matrix B1-C and Evaluation Results

Layer B1	C11	C12	C13	W	Consistency check
C11	1	1/4	3	0.2064	λmax =3.0183
C12	4	1	8	0.7146	CI=0.0092
C13	1/3	1/8	1	0.0789	RI=0.52
					CR=0.0177< 0.1
					Meet the consistency check

Table 5 Judgment Matrix B2-C and Evaluation Results

B2层	C21	C22	C23	W	Consistency check
C21	1	6	4	0.6999	λmax =3.0092
C22	1/6	1	1/2	0.1066	CI=0.0046
C23	1/4	2	1	0.1935	RI=0.52
					CR=0.0089< 0.1
					Meet the consistency check

Table 6 Judgment Matrix B3-C and Evaluation Results

Layer B3	C31	C32	C33	C34	W	Consistency check
C31	1	7	3	4	0.5446	λmax =4.0816
C32	1/7	1	1/5	1/2	0.0631	CI=0.0272
C33	1/3	5	1	3	0.2750	RI=0.89
C34	1/4	2	1/3	1	0.1173	CR=0.0306< 0.1
						Meet the consistency check

Table 7 Judgment Matrix B4-C and Evaluation Results

Layer B4	C41	C42	C43	C44	W	Consistency check
C41	1	4	1/3	2	0.2519	λmax =4.0606
C42	1/4	1	1/6	1/2	0.0743	CI=0.0202
C43	3	6	1	3	0.5250	RI=0.89
C44	1/2	2	1/3	1	0.1487	CR=0.0227< 0.1
						Meet the consistency check

Finally, by organizing the judgment matrix table formed by expert scoring, a weight table for the evaluation indicators of new project development potential was obtained, as shown in Table 8.

Table 8 Weight Table of Evaluation Indicators for New Project Development Potential

Index System	First-level Index	First-level Index Weight	Second-level Index	Second-level Index Weight Distribution	Second-level Index Weight	Scoring
T Company's new project potential evaluation index A	Strategy B_1	0.1192	Product development cooperation model C_{11}	0.2064	0.0246	
			Product market positioning C_{12}	0.7146	0.0852	
			Matching degree of company technology strategy C_{13}	0.0789	0.0094	
	Market B_2	0.2803	Customer conversion rate C_{21}	0.6999	0.1962	
			Customer Importance C_{22}	0.1066	0.0299	
			Potential competitors C_{23}	0.1935	0.0542	

Table 8 Weight Table of Evaluation Indicators for New Project Development Potential 9 (Continued).

Index System	First-level Index	First-level Index Weight	Second-level Index	Second-level Index Weight Distribution	Second-level Index Weight	Scoring
T Company's new project potential evaluation index A	Development B_3	0.5331	Technical development difficultyC_{31}	0.5446	0.2903	
			Supplier stability C_{32}	0.0631	0.0336	
			Quality risk C_{33}	0.2750	0.1466	
			Engineering design working hours C_{34}	0.1173	0.0625	
	Finance B_4	0.0674	Expected income for 10 years C_{41}	0.2519	0.0170	
			Project investment amount C_{42}	0.0743	0.0050	
			Product profitability C_{43}	0.5250	0.0354	
			Investment payback period C_{44}	0.1487	0.0100	

4 Results and Discussion

Through our above analysis, we have determined the weights of different evaluation indicators and obtained a new project development potential evaluation indicator weight table. Afterwards, based on the specific meaning of the secondary evaluation indicators and referring to the actual situation of the company's projects, we will develop scoring criteria for each secondary evaluation indicator through expert meetings. The score will be an integer between 1-5, with higher scores indicating that the project is easier to develop or can bring higher profits to the company.

Our company's scoring criteria for some evaluation indicators are as follows: for the evaluation indicator of "product development cooperation mode C11", we can define it as: independent self-developed development, 5 points; Joint design and development, 3 points; Customer entrusts OEM, 1 point. For the evaluation metric of "customer conversion rate C21", we can define X (customer conversion rate): X<30%, 1 point; 30%⩽X⩽60% , 3 points; X>60% , 5 points. For the evaluation index of "C31 difficulty in technical development", we can define: difficulty (there are technical difficulties that need to be overcome), 1 point; General (with relevant technical reserves that require application verification), 3 points; Simple (with similar or identical technological products), 5 points. Our company has developed a unified, professional, and feasible scoring standard for each evaluation indicator, and based on this, we score existing projects. We multiply the scores of all secondary evaluation indicators by their indicator weights and add them up to obtain the total score. We evaluate the development potential of different projects based on their overall scores, and adjust or even abandon projects with low scores. This effectively ensures the efficient and rational use of organizational resources and provides guarantees for the long-term development of the company.

About the Author

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