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The Stylistic Innovation of Automobile Design Driven by Technology

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Abstract. In recent years, electrification and intelligent technologies have changed the Design of cars in a very visible and significant way. New energy vehicles (NEVs) do not need a large front engine to serve as the central position of the whole car layout, as they are not traditional gasoline cars. Therefore, the designers have much more flexibility in both the design of the outside and inside. Although there is more freedom in car design now, it has also become more complex. In the past, most of the Design choices were for the mechanical structure and engine placement. Now, designers need to consider aerodynamics, brand image, user experience, intelligent operation, etc., as well as other factors that make people impressed when they first see the car. In short, the future Design of automobiles will need to integrate the trend of "future appeal" with practical application; it is not enough for cars to look good and innovative, but they must also be convenient for people's daily lives.

Keywords: electrification, smart tech, car design, innovation, user preferences

1. Introduction

Literature and case studies will be employed in this paper to explore how technology promotes Design innovation in different ways, such as technical conditions, Design language and user needs. According to the above data, a closed grille and a hidden door handle can help improve the shape of the car [1]. They also help build a new world and a high degree of recognisability for the brand [2]. To increase the intelligence of the car and break away from the old way of operation, a large screen, AR-HUD, and voice- and gesture-control functions have been added to the smart cockpit [3, 4]. At the same time, different brands have also been taking various Design approaches. New electric vehicle brands are generally more forward-looking and innovative; at the same time, the traditional brands are relatively conservative in their changes and thus maintain the original image [2]. Not all new design ideas can be used as they are. Due to regulations and safety reasons, some radical forms have started to be restricted [1]. Overall, in the future, car design needs to be both attractive and practical; otherwise, even if it is stylish and modern, it will not be suitable for people's daily life as a car.

Design of cars has changed significantly with the advent of electric and intelligent vehicles. It is not a small change, and it is not just a new trend that will fade away soon. It is a profound change that has affected almost all parts of the car. Historically, the design of cars has often been more about power and a traditional shape. Usually, the front part of a car has a relatively large grille for engine

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cooling, and its whole shape is mainly determined by the position of the power unit. But now, with the development of electric vehicles and digital systems, the old rules are no longer the only rules. Designers no longer only consider the horse power and engine size. Instead, they are designing for the user experience, smart functions, brand expression and so on.

It means that now, a car is more than a way of transport. Now it is also a product of technology, lifestyle and visual culture. A new car should be attractive, high-performing and smart at the same time. In addition to the speed and driving range of a car, people will also consider its newness of design, convenience of use for the electronic screen, comfort and luxury of the cabin, etc. As a result, the design is now more closely related to technology than ever before.

At the same time, it has brought about some problems as well. On the one hand, electric and intelligent vehicles have enabled designers to explore new forms and create new Spaces that were not possible before. At the same time, it is also necessary to consider safety, regulations, cost and user habits in the design. A very futuristic Design may attract attention, but if it is inconvenient or unsafe, it will not be popular in the market for a long time. Therefore, the new era of car design is not just about new appearances for products. In other words, it is to discover an application for technology in people's daily lives.

How new technologies impact the Design of cars and why different brands have taken different design roads in this new era is the subject of this paper. Also, it will be presented how Design Innovation is affected by technical conditions, brand strategy and user acceptance. Therefore, the reasons behind the rapid changes in automobile design and the ways to keep up with these changes become clear.

2. Literature review

Historically, many studies have concentrated on a single factor, such as aerodynamics, ergonomics and so on, but such a limited view may not be comprehensive [3, 5]. Design of automobiles is a very general subject, so studying only one part will not do. A car may have a small drag coefficient, but if people do not like the appearance or other reasons, it will not sell well. A cabin may have a beautiful screen layout, but if the interface is not intuitive, it will be difficult for people to use it happily. Therefore, the Design research should not be separated too much into technology, appearance and user needs.

Previous studies have also tended to address the design of the outside world, the Design inside, and the needs of different people separately, so it is not clear how they are interconnected. The above parts are connected in fact. Change the Appearance and improve the Performance of the brand. The Layout of a House Affects Living. Users will have different demands, so not all functions will be popular. These factors are in a certain degree of alignment, and when one is changed, the others will likely follow.

Therefore, this paper will combine academic articles and industry reports to analyse the current trends in car styling in terms of the three factors of technical foundation, design language and user acceptance. A combination of the two can be used to get a more general overview. Technology shows us what is achievable. Design Language shows us how the company intends to present its prospects to the public. User acceptance tells us whether the idea will be popular in life. That is to say, design is not only creativity. It is also about being understood, liked, and accepted by other people.

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2.1. Technical basis and exterior styling

Some studies have found that the front end of a car is one of the reasons people remember that car brand. It is easy to understand because the front of the car is generally the first thing people observe. It is almost the face of the car. In the past, there was a large grille at the front of a gas car for the engine. Many of the cars were thus somewhat similar in style. However, because electric cars do not have engines in the front, designers now have much more design freedom. Therefore, they can be made simpler, cleaner and more abstract.

Closed grilles and flush door handles are typical examples of the above. In fact, they will have good aerodynamic performance and therefore be less prone to drag [1]. They can also make the car look better and more stylish in terms of visuals. Therefore, many electric cars have started to be used now. They are not only practical but also symbolic. Thus, it can be concluded that the car is a new-generation model.

At the same time, the new front-end Design will also help build a stronger brand image for the company [2]. A car with a very distinctive front end is easy to remember, even from a distance. It is very common in the crowded market of many electric vehicles that start to look alike in general shape. If a brand can have a simple but memorable front, it will be more noticeable. Thus, the exterior Design does not need to be merely ornamental. There is also competition, recognition and the desire to be loved.

BMW's Neue Klasse Concept Car is a typical case. It is a very simple and light Design language. The lines of the body are smooth, the windows are large, and the whole thing has a sense of electric power and environmental protection. The Dashboard is also entirely digital [2]. This kind of Design is not random. It is to show a change in the meaning of cars. Now the car is not only a tool for people's lives but also a representative of intelligent mobility and a green life. Thus, the outside Design has begun to tell the story of a brand.

Therefore, the Bold Exterior Design is not merely for show. They are related to changes in technology and people's demands. A new form can carry new ideas. A clean body can have good efficiency. A New Front can show Intelligence and Progress. Styling is a form of language, and technology provides the grammar for it.

2.2. Smart cockpit and interior

Smart technology is also becoming more and more common in cars nowadays. Now, many new cars are getting larger screens and touch controls, which also have instruments on their sides and AR displays. The attributes are thus more like a world of data than the interior of a traditional car [3]. In the days of older cars, the interior contained only seats, buttons, gauges, etc. Nowadays, the inside of the office is also for collecting information, controlling the situation, and sometimes for some fun.

It will be changed, so it is not the same anymore for us. Drivers are no longer just people operating a car. They have a system. The smart cockpit will show navigation and other information at the same time as entertainment, energy consumption, driving assistance, communication, etc. It will be a more intuitive way for the car to meet life. It is a rather important issue for many people, particularly the young. It is one of the reasons that people are interested in new cars now.

Recently, research in machine learning has shown that artificial intelligence can be employed to help in the design of shape suggestions based on data [4]. This is a very interesting place because now the Design does not rely solely on people's intuition and hand-drawing. Now, a computer can help us produce and test ideas faster. Designers can obtain some information on the proportion and

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change in surface shape of aerodynamism from the data [6]. This does not mean human creativity is without value. It means that creativity will have more tools.

A research group at MIT has released the DeepLearning Dataset DrivAerNet++ to improve the shape of car design with deep learning, and it contains 8,000 car designs and their aerodynamic data [7]. This kind of resource is good because it can link looks and performance. In the past, designers would first draw the shape and then test it later. Now that there is data-driven design, they can explore many forms more efficiently from the start. It will save us time and help to improve the quality of the final work.

The above technologies can change the form of the car flexibly and dynamically. This is an idea. A car is not just for show in a car dealership. A new car needs to be aware of changes in road conditions, various driving behaviours, energy-saving requirements, the desire for a smart life, etc. The Interior is also one of them. Smart Design for the inside of the car can give people a sense of intelligence, comfort and a futuristic feel.

2.3. Brand strategies and user differences

Different brands have different strategies for the design of new energy vehicles. New electric-only brands often have very bold and futuristic shapes to attract attention quickly. There are a large number of options in the market, and they need to get noticed. As they have not had a long history of gasoline car identity to protect, they can take more risks in form, layout and interface. Their designs may be very simple, very sharp, or even a little unusual, but that can also be attractive.

Traditional brands do not often introduce new products. They need to keep their original identity and gradually move into the electric era [2, 5]. If they are too different, the old users will feel lost and out of touch with the brand they know well. If they are too small, they will look old-fashioned. Therefore, they are often on the narrow path of heritage and innovation. Therefore, some well-known companies have kept their old visual symbols but have updated the exterior, lighting, cockpit and other parts.

The Users are also different. Research shows that the younger, technologically advanced group of consumers pays more attention to the new and smart functions [5]. They will be more willing to use the new interface, which has a different shape and is a digital-first cabin. For them, the car is not just a means of transportation. It is also a smart companion, a lifestyle item, and sometimes even a way for people to show off their taste. Therefore, cars that are more appealing to the innovative group of young people tend to have an experimental appearance and excellent interior technology.

On the other hand, cautious buyers tend to be more concerned about familiarity, convenience and reliability [5]. They might like a design that is simple, comfortable and convenient to use; they will not choose a very modern-looking one. It does not mean they are not interested in change. It only means that innovation should not be inconvenient. A feature may look good on paper, but it will not be popular if it is inconvenient for people to use in daily life.

Therefore, Design is not all-or-nothing. It depends on who is going to use the car. A brand wishing to attract young people will focus more on the Internet and have a fashionable look. If a brand wishes to retain a large number of customers, it will choose a more cautious way. The End Test is also one of them. However good an idea is, it still needs to be in line with the life habits and desires of real people.

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2.4. Challenges and future trends

Bold Design Ideas Always Have Practical Problems. One problem is the cost. A good exterior design or a high-tech interior system may look impressive, but it will also be more expensive to produce and maintain. Safety is also a problem. Some features that are very modern may have problems in an emergency or during daily life. That is to say, designers should not seek newness for the sake of novelty.

Research has shown that hidden door handles reduce drag by only a small amount, but in the event of an accident, they may not open properly and thus be dangerous [1]. Therefore, there is a problem with Style, Efficiency and Safety. A design can be beautiful and aerodynamic, but if it poses a danger in an emergency, then it will not be acceptable. Therefore, many countries have started to tighten the regulations. China will ban entirely hidden handles in 2028 and then [1]. This is to be expected; therefore, rules will guide the development of fashion.

Replacing the side mirrors with cameras has the same problem. The camera system should be drag-free and have a modern appearance; at the same time, it needs to meet all related regulations and be dependable for users. If the picture is too slow, blurry, or damaged due to bad weather, people may not be comfortable. Therefore, the new technology needs to be tested in a good environment and in reality.

In general, the design of cars is now a problem of systems engineering. The Designer should achieve a good combination of performance, safety, user convenience and brand image. It is not only about drawing a nice shape. It needs cooperation from Industrial Designers, engineers, software teams, safety specialists, marketing departments, etc. The design of cars in the future will continue to change with the appearance of new materials and technologies, but at the core, they still need to meet people's needs for life conveniently.

The other way is that the Design will be more personalised. With the development of digital technology, more people will want different designs for their car interiors. Cars will be less about fixed products and more about flexible platforms. At the same time, environmental problems and the need for energy-saving will also be addressed in materials design. Thus, future styles will be even closer to the concept of sustainability. With the development of modern automobiles, lightweight and eco-friendly design has gradually been applied; at present, to boost the speed and efficiency of the car, one needs to focus on optimisation of material use and air resistance [8]. At the same time, with the development of electrification and intelligent systems, the structure of automobiles has been changing continuously; as a result, new models are more flexible, pay more attention to user convenience, and have full-fledged digital connections [9]. In addition, recent research has shown that AI-driven and aerodynamics-guided generative design methods are now being used for the development of new cars to improve the speed and efficiency of optimisation of vehicle shapes and performance [10].

3. Conclusion

Electrification and smart technology are leading the design of new cars in the new era of openness and diversity. These are not merely superficial. They show that the automobile industry is changing profoundly. Now, the product is no longer based on the engine. Now it is powered by electricity and software, and can be used according to one's own needs.

All the time, different brand strategies have shown that innovation is not about leaving old rules behind. Instead, it should be about evolving with the times in a way that is still suitable for the brand and the market. New brands can go faster and be more adventurous; traditional brands usually have

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to take a step back. Both roads are correct, but they need to be in line with the new trend of intelligent, electric and user-oriented cars.

At the end of the day, real car Design is not just about appearing modern. With changes in technology and the requirements of users, this will still be in accordance with regulations and practical conditions. If the Design is too traditional, it will seem old-fashioned. If it is too radical, then it will be unrealistic. A Good Design is usually one that is well-balanced.

With the continuous development of new technologies and materials, car styles will also be changing gradually in an orderly manner. Designers will continue to work in the new environment and try to make cars both innovative and practical. It may seem simple at first, but in fact, it is one of the most difficult and fascinating parts of modern car design.

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