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Smart Automation, Customer Experience and Customer Engagement in Electric Vehicles

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Abstract: A major challenge to cleaner and more sustainable transportation is the lack of adoptability of electric vehicles (EVs) by customers. Therefore, most of the vehicles we see on the road use fossil fuel instead of sustainable green energy sources. One way to improve customer acceptance is to market EVs as a socially desirable product, rather than only environmentally friendly. The silver lining to promote is the potential of information and communications technology (ICT) features in EVs, which can lead to a deeper connection between the EVs and their users. These engaging technologies can bring customers closer to the company, resulting in generating big data, which can lead to even deeper insights into customer preferences. Because the technology of vehicle connectivity and automation is just taking off, it is important to understand how these technologies in EVs can enhance customer experiences and result in sustainable customer engagement. Unfortunately, this important research area remains neglected. This research, therefore, is focused on building a conceptual framework for understanding the influence of electric vehicle (EV) automation and connectivity on customer experience, and ultimately, customer engagement.

Keywords: customer experience; customer engagement; electric vehicles; automation; connectivity

1. Introduction

Traditionally, customers prefer vehicles with more horse power, economy, material and stylish exterior design features. Therefore, automakers made cars with desirable engine power, fuel economy, interior and exterior material designs. However, with the evolution of artificial intelligence (AI), Internet of Things (IoT) and Internet of Vehicles (IoV) the paradigm has shifted to a more data driven, service oriented, automated and connected environment. Customers' demand more for connectivity and other ICT features in their cars. This phenomenon apart from resulting in privacy concerns is also providing manufacturers and service providers with information that enables them to know more about customer preferences, based on big data [1,2]. Therefore, future consumer demand in the automobile industry will be more relationship-based and the automakers' role will change more to servicing their customers, rather than just selling them vehicles [3].

Products and services based on smart automation and connected vehicles are estimated to generate around 150 billion USD profits by 2022 [4]. The future of the IoV is on the verge, with semi-autonomous cars already being launched in the market. However, existing automakers accustomed to traditional technology, seem to be unable to overcome these technological boundaries. This means that new entrants into the market, including EV manufacturers and digital service providers will gain the main share of these profits [4].

A major potential for EVs and autonomous and connected car technologies is the Chinese market, which has been the largest market for automobiles in the world since 2009 [5,6]. The Chinese middle class is rapidly growing and almost 30 percent of the Chinese population is born between 1980 and

1990. These young customers have the purchasing power and a heightened eagerness for high-tech products in their cars, as compared to the rest of the world [7]. Therefore, around 75% of Chinese customers are ready to pay more for enhanced safety features in their cars and more than 60% are ready to pay for car management such as online diagnostics, track usage etc. The private sector in China has already realized the importance of EVs, connectivity and autonomous features of vehicles and has done some experiments. Xpeng Motors [8,9], NextEV [10,11], ZhicheAuto [12], WM Motors [13] and Future Mobility [14,15] are involved in such initiatives, ranging from producing intelligently connected electric vehicles to providing services to automakers to enhance customer experience in the automotive sector.

Similarly, Chinese automobile manufacturers are focusing on smart automation of vehicles to close the gap for foreign competitors. Some western automakers, e.g., Tesla, already have vehicles on the road that are partially connected and automated. For this purpose, various Chinese OEMs, e.g., DongFong Motors, SAIC, FAW, Cherry, Geely, Changan, BAIC, BYD and GAC are collaborating with scientific institutions, e.g., universities/research labs as well as technology companies such as Baidu, Alibaba, Ericson, Uber, etc. to catch-up and even surpass the western automobile brands. For this purpose, the made in China 2025 vision also devotes a specific percentage of vehicles to be electric and intelligently connected to other vehicles and infrastructure to reduce traffic accidents, traffic congestions and reduce discharge of environmental pollutants [16].

Overall, the automobile industry has lower customer loyalty rates. They are even lower in the automobile industry in China, with around 80 percent of the customers of local brands wanting to change the brand when buying their next vehicle. The rates are slightly lower for foreign volume brands and luxury brands with around 70 percent and 60 percent respectively [17]. As the automated and connected car applications are evolving, so are the options and opportunities related to this revolutionary technology. Smart automation and connected vehicle applications will give electric automobile manufacturers tools to shape their customers' experience with their brands. Any touchpoint of a company with the customer is an opportunity to build a relationship with the customer, by designing it in a way to stimulate desirable responses in the customer's mind [18].

A 2016 PwC connected car report highlights effective digital customer experience management as the defining factor to get benefits from its automation efforts. Similarly, in the year 2022, autonomous and data packages are projected to have the highest incremental value in car sales. A car is likely to host the 5th screen in people's lives, after mobile phone, TV, computer and cinema. This will most likely lead to marketing opportunities as well as challenges [4].

When it comes to the adoption of EVs, the experiential side is an important factor in all the major theories of innovation adoption. In the case of planned behavior theory, experience with the innovative product (EV) and product category (cars) in general is considered by the consumer before product adoption [19]. Similarly, the perceived or anticipated pleasure associated with EV driving experience plays a crucial role in the diffusion of innovation theory [20]. However, most of the research in EV adoption is focused on functional factors such as driving range, financial feasibility, availability of chargers etc. while the emotional and experiential factors associated with driving EVs remain unexplored [19,21].

Therefore, there is a need to know the various marketing concepts related to products of smart automation and EV connectivity in order to advance the body of knowledge in this emerging field. The main objective of this research is to develop a conceptual model to understand how automation and connected vehicle applications influence customer experience and customer engagement in the EV industry.

2. Method

This research is based on the synthesis of previous peer reviewed literature in the areas of marketing, information science, automobile industry and sustainability. A keyword search was used to search renowned databases such as Emerald, Science Direct, Springer, Web of Science, Google Scholar,

IEEE, EBSCO, Sage Publications, Taylor and Francis, and Wiley. Several keywords were used, and the results were briefly examined to ascertain the relevance of the results displayed. Most relevant articles were generated by the following keywords: "vehicle connectivity, experience, engagement", "vehicle connectivity, engagement, experience" and "connected EV, experience, engagement". Filters were used to gather more relevant material in the English language, by limiting the results to research articles, conference proceedings and book chapters from 2007 to 2018. After reading the titles of the results, a total of 127 articles were downloaded, based on the relevance of the title to our study. After reading the abstracts and conclusions of the downloaded papers, a total of 60 articles were selected for the study and a final 42 articles were referenced in our study. Since the research belongs to an emerging inter-disciplinary area, the latest industry reports [4,7,16], current and future project information from promising EV company websites [8,10,12,22,23] and news reports [9,11,13–15,24] from renowned sources such as BBC, CNN, Bloomberg, Reuters etc., were also included.

3. Theoretical Framework

Figure 1 shows a conceptual model based on sources mentioned in the preceding section. The study uses an experiential lens to analyze the literature and gives a conceptual model for improving customer engagement in EVs.

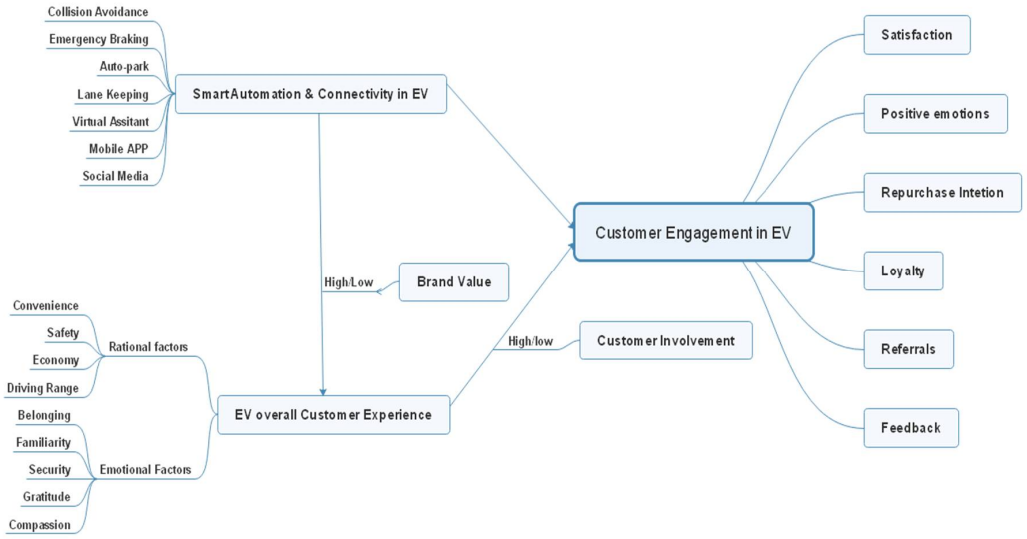

Figure 1. Conceptual model.

Smart automation and connectivity features are more prevalent in EVs than conventional automobiles, as almost all major EV brands include these as standard features in their cars [10,12,22]. As the figure shows, smart automation and connectivity features such as collision avoidance, emergency breaking, auto-parking, virtual assistant, mobile APPs, and social media connectivity have a positive relationship with customer experience. The two major elements of the customer experience are 'rational' and 'emotional'. Rational factors of the customer experience include convenience, safety, economy and driving range. Emotional factors include belonging, familiarity, security, gratitude and compassion. Smart automation and connectivity features in EV also have a direct relationship with customer engagement. The dimensions of customer engagement are customer satisfaction, positive emotions for the brand, repurchase intention, loyalty, product referrals and feedback/suggestions for product improvement. The following subsections further delineate the conceptual model and relationships proposed, based on existing literature.

3.1. Customer Engagement in EVs

The term "customer engagement" evolved from the transactional nature of the relationship between a company and its customers over the past three decades. When the customer moves from being a monetary contributor to a relationship of trust and commitment, and ultimately, to a stage when there is a connection between the customer and the company based on satisfaction and emotions, then we could term that an engaged customer. In other words, customer engagement includes an emotional dimension serving as a strong bond for the company's performance, which is demonstrated directly through repeat purchases and indirectly through loyalty, brand advocacy, social media discussions about the brand, customer feedback and suggestions [25]. If customer engagement happens naturally because of the experience of the customers with the brand without obvious marketing efforts, then it has more potential for customer trust, and the brand experience remains with the customer for a longer time, as compared to firm sponsored marketing communications. If it occurs organically, then it is twice as effective as radio communication, four times more effective than personal selling and seven times more effective than print advertising [26]. IT based upgradation of vehicles in terms of connectivity to the user through internet-based applications (APPs) and autonomous features are not "intentional marketing efforts". Therefore, we argue that in this case, customer engagement with their cars will happen more organically.

Interestingly, highly engaged customers are 23% more profitable for a company than the average customer in terms of revenue, share of wallet and long-term relationship. However, only 58% of the managers in companies have a formal plan for customer engagement [27]. Specifically, in the automobile industry, customer engagement is lower than in the IT industry, seen for example in the notion that mobile phones essentially function as another bodily appendage for most users. Therefore, we argue that the incorporation of IT based features in EVs have the potential to transform this situation. This argument is further supported in the case of fully autonomous EVs when customers will have more time and attention to use IT based features in their cars.

There are four kinds of tools for customer engagement initiatives, i.e., amplification tools for spreading engagement behavior through sharing options, re-blogging, retweeting, etc.; connective tools that connect the customer to firm and other customers such as virtual communities; feedback tools that enable customers to respond to the initiatives taken by the firm; and creative tools which enable innovation and creativity by harnessing customer knowledge, e.g., online labs, design options, upload links, etc. [26].

One of the most important factors for the digital reinvention of businesses is to provide engagement platforms to their customers [28]. Businesses are getting transformed by the latest technology and the interactivity it offers [29]. For traditional businesses, such as the automotive industry, this interactivity might be a way to increase this most valued and required form of customer engagement.

3.2. Smart Automation and Connected Vehicle Technologies in EVs

Smart automation in automobiles is "the programming of vehicle components to work on its own without human interference" [30]. Smart automation refers to technologies that make the car less dependable on humans for its capabilities, while connectivity is the communication between the vehicle and its surroundings including infrastructure, electronic devices, other vehicles and the users [31].

The Society of Automobile Engineers (SAE) categorize vehicle automation into five categories depending on the intensity of the automation. Level 1 automation refers to driver assistance features such as cruise control and lane keeping. Level 2 automation is called partial automation and includes freeway traffic jam pilot features with human supervision. Level 3 conditional automation is where a vehicle can drive autonomously but requires human intervention in case of complex situations. Level 4 is high automation where a vehicle can handle most of the driving tasks but needs the presence of a driver. Level 5 is full automation where no driver is needed, and the vehicle can act on its own for all the driving tasks [32,33]. In our research we will consider up to Level 2 automation, as it is already

available in certain car brands, e.g., Tesla. The features include the autosteering mode, auto lane change, auto-park, collision avoidance assistance, summoning of a vehicle and automatic emergency braking [22].

For connectivity of the EVs with the user, we consider mobile application, virtual assistant, and website forums. There are automakers such as Tesla and NextEV [10] who provide APPs for controlling certain features of the car such as remote diagnostics, summon the car, remote cabin management such as climate control, locking/unlocking of the doors, charging control, real time location, windows and side mirror controls.

Mobile phone APPs, virtual assistants and social media accounts of car brands and third-party AI companies provide easily accessible and convenient platforms to customers to connect to their EVs. Companies that are not engaging customers online are missing an opportunity. A recent study by McKinsey [7] reported that 64% of Chinese customers would switch their brand and pay a subscription fee for getting connectivity features from car manufacturers. This shows the need and eagerness of customers for ICT based features in their cars. A virtual assistant responds to voice commands and impersonates a car such as Teslabot's "Elon". Teslabot is an AI company that provides virtual assistant optimized for Tesla cars. The users of these virtual assistants can communicate via voice and chat through text messages remotely to get information about the car as shown in Figure 2. This feature makes a car seem just like an entity or a person (with a name) and allows for interactivity, and even exchanging jokes. These kinds of experiences bring emotional features into play, where the user feels personally connected to their EV, as if the car is a person rather than an inanimate object.

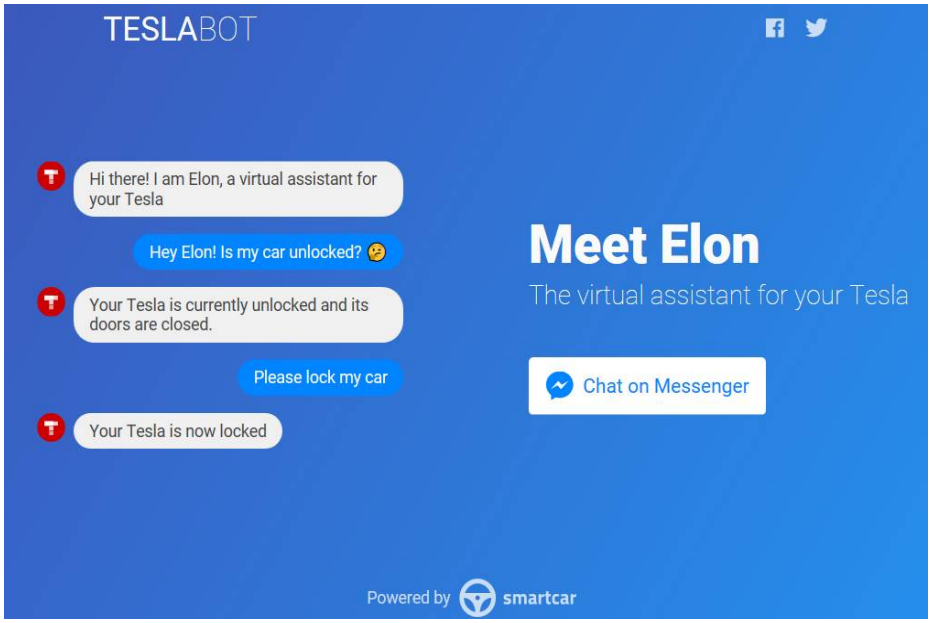

Figure 2. Teslabot by SmartCar. Source: [23].

As far as smart automation is concerned, it helps reduce human error which is the major cause of road accidents. Features such as collision avoidance and emergency braking also provide safety to customers. Similarly, auto-park, lane changing, autosteering, car summoning all lead to convenience. For these reasons, 71% of Chinese customers consider opting for autonomous features of cars for improved safety and 66% for the sake of convenience and saving time [7]. Therefore, we argue that automation and connected EV technologies have a significant potential in terms of affecting rational and emotional factors for enhancing customer experiences in the automotive sector.

Proposition 1. *Smart automation and connected EV features lead to enhanced customer experience.*

Proposition 2. *Smart automation and connected EV features have a positive relationship with customer engagement.*

3.3. Customer Experience in EVs

Traditional marketing concepts focus on selling products/services based on their functions and features and consider customers as rational decision makers. Experiential marketing, on the other hand, provides experiences and considers human decisions a result of rational as well as emotional factors [34]. Customer experience management (CEM) is regarded by practitioners as the foremost marketing concept that results in sustainable customer loyalty. Managers of renowned companies involved in CEM are focused on developing capabilities which can create customer experiences, continuously renew those experiences to engage customers and sustain a long-term relationship with the customers [35]. Customer experience is one of the critical success factors of digital strategy of businesses [36]. Similarly, successful companies focus on providing the means and environment for customers to create their own experiences while interacting with their brands, or to co-create experiences with their customers rather than simply "selling them pre-designed" experiences. Innovations that are focused on experiences have a high chance of acceptance by customers. For product category, automobiles are high on emotional, lifestyle, cognitive pragmatic and relational components. By combining these aspects in the automobile industry, we could argue that an innovation based on hi-tech, with emotional and functional utilities, can lead to an enhanced customer experience, which has the potential to translate into increased customer engagement [37]. The latest studies conducted in the field of customer experience management propose further investigation of the role of the Internet and technological tools in customer experience management [7,18,24,38–40].

Social media platforms, such as Facebook, also provide an avenue for brands to connect with their fans, sustain their customers' attention and engage them by continuously posting information about products, services and events and promotion [39]. This activity also leads to customers "likes" and "shares" of the company's page, thereby promoting the brand to other potential customers.

As stated above, the customer experience is a holistic process which involves both the rational and the emotional aspects of an encounter with a product/brand. Experiences result in responses which may be positive or negative. Positive responses will lead to satisfaction and positive emotions towards the brand, which ultimately lead to enhanced loyalty, image building, referrals and recommendations [18].

Proposition 3. *Positive customer experience of customers with EVs can result in enhanced customer engagement in EVs.*

3.4. Customer Involvement

Customer involvement is studied from three angles: personal, physical and situational. While physical (i.e., product differentiation) and situational factors (such as advertisements) are external stimuli, personal relevance is intrinsic to the consumer [41]. Therefore, we define customer involvement from the perspective of personal relevance. Customer involvement is different from customer experience which is based on "needs, values and interests that motivates a certain reaction towards an object/brand". Personal relevance and perceived importance of a brand can lead to high levels of involvement [42]. It is pertinent here to mention that, customer involvement is different from customer engagement, because customer involvement is the inherent interest of an individual and relevance of a brand, which can exist even before the purchase. This interest and relevance can lead to information searches about the features of a brand [41] and setting expectations concerning the brand. Customer engagement, on the other hand, occurs after the purchase and actual experience of the product, which in this case is the EV. Some researchers argue that high customer involvement

is not always associated with brands, which activate strong experiences. So, customers may show high involvement with a brand without having exciting experiences from the brand [43]. However, customers' emotional involvement is a main dimension of the experiential value of hedonic brands [44]. Customers' involvement with touchpoints created by businesses is the first step on behalf of the consumers which moderate the effect of the experience on customer responses [45].

Customer involvement exists before the purchase decision is made. Therefore, it can result in setting expectations for a product [25]. In other words, high/low customer involvement and high/low expectations can result in less/more perceived satisfaction and positive/negative emotions during the actual experience with the EVs. As satisfaction and emotions are the dimension of customer engagement, it is argued that customer involvement can moderate the relationship between customer experiences and customer engagement.

Proposition 4. *Customer involvement moderates the relationship between customer experience and customer engagement.*

3.5. Customer Brand Value

Customer brand equity and customer brand value are often used interchangeably for the same marketing concept. Brand equity refers to the premium amount that a consumer pays to buy a brand compared to another brand [46]. However, brand equity is a subset of brand value which is the replacement value of a brand [47]. We borrow the definition of customer brand value from Kumar et al., 2015, which is: "The differential effect of a customer's brand knowledge, brand attitude, brand purchase intention, and brand behavior on his or her response to the marketing of a brand" [48].

We propose that customer brand perceptions can moderate the relationship between self-service technologies and customer experience. For instance, customer who perceive that a brand is more innovative (such as Apple) might behave more creatively than with the product of another company such as IBM. However, Verhoef et al. suggested future research to verify this relationship [49].

Proposition 5. *Brand value moderates relationship between smart automation and connectivity in EVs and customer experience in EVs.*

4. Discussion

The proposed model shows that smart automation of vehicles can lead to enhanced customer experience in EVs. Positive experiences lead to the feeling of satisfaction and positive emotions about the brand, depending on the degree of customer involvement and perceived customer brand value. Satisfied customers with positive emotions for the brand show enhanced engagement, which is when the customers repurchase the product, have more loyalty for the brand, refer the brand to other potential customers, and give feedback and suggestions for product improvement. At the same time, smart automation and connectivity features in EVs also affect customer engagement in EVs directly. However, it can also be argued that smart automation can lead to less engagement from the customer in terms of driving the vehicle: that is, it potentially can take the fun out of driving a car. Yet, more automation and connectivity in cars can give the driver more time to interact with the new features of the car such as safety warnings, use of maps, suggestions for dining and entertainment etc. which can lead to enhanced customer engagement with the EV.

Similarly, customer involvement is an important factor which moderates the relationship between customer experience and customer engagement. High brand involvement can lead to information searches before the purchase and setting expectations towards the brand. If the actual experience meets/exceeds the preset expectations, then high customer satisfaction, positive emotions, referrals and loyalty may result. Similarly, customers who have high brand value in terms of technology and

innovation for an EV brand such as Tesla, may behave more creatively during their interaction with smart automation and connectivity features of the EV. This can lead to a positive perceived experience with the EV brand.

The discussion about smart automation and connectivity cannot conclude without discussing ethical and security issues. The IoT and IoV generate big data which is vulnerable to exploitation and hacking [50]. Therefore, EV manufacturers need to address these serious concerns about the security of the data generated and stored on their servers. Otherwise it can lead to a chain reaction of customers' reluctance to adopt these technologies [51]. In such a case, the automation and connectivity features might lead to disengaged customers.

Safety is considered another barrier to widespread adoption of EV technologies. However, previous studies show less concern with the safety of EVs from the customers' perspective (around 1 percent), but also limited awareness about safety (26 percent respondents unsure about Safety) in EVs, as compared to conventional vehicles [52]. Recently, there have been reports of crashes of semi-autonomous vehicles and there is a debate as to whether automation and connectivity can lead to safety or not. In fact, the basic premise for automation and connectivity in vehicles is safety and convenience. The majority of the studies argue for automation and connectivity based on improved safety [31,53,54]. Nevertheless, automation and connected vehicles technologies are still in the development stage and it will take time to build the ecosystem where the full benefits of smart automation and connected vehicles technologies.

The proposed model is consistent with previous findings: for example Thomas et al. found that consumers who had an exposure to, or had experience with, an EV were more decisive in their intent to buy EVs and more flexible about the issue of driving range [55,56]. Therefore, there is a strong potential of automation and connectivity features in EVs to enhance customer experience and ultimately customer engagement in EVs. Further research is needed to empirically verify the conceptual model.

5. Conclusions and Future Research Recommendations

The paper highlights the importance of smart automation and connectivity features in EVs and their direct and indirect effect on customer engagement. A conceptual model was proposed based on current literature. The model shows that smart automation and connectivity features in EVs could lead to enhanced customer experience in EVs. Enhanced customer experience increases customer engagement. Similarly, smart automation and connectivity features also directly influence customer engagement. Additionally, brand value moderates the relationship between smart automation and connectivity features in EVs and customer experience. Moreover, customer involvement in EVs moderates the relationship between customer experience and customer engagement.

The conceptual model needs empirical verification. Further, there is a need for research in this cross disciplinary area to identify the important features that will attract customers the most. As traditional cars boast reliability in terms of driving range, ICT features could make EVs gain customer attention for being safer, convenient, innovative and engaging. Such research could also help the managers of EV manufacturers in the customization of features thereby making the EV driving experience more pleasant for consumers.

Author Contributions: Asad Ullah conceived the main research idea and did preliminary literature review; Wang Aimin helped refine the idea and the conceptual model; Mansoora Ahmed helped in extensive literature review; All authors finalized the paper.

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