PARKING MANAGEMENT SYSTEM: OPTIMIZING URBAN SPACES WITH SMART SOLUTIONS FOR EFFECTIVE UTILIZATION OF UNUSED PARKING SPACES

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ABSTRACT

Park dude is a software application designed to facilitate parking management and user interaction in parking facilities. The abstract of Park dude encompasses its key features, functionalities, and benefits. Park dude offers a comprehensive platform for managing parking spaces, allowing users to easily locate available parking spots, reserve them in advance, and pay for parking services seamlessly. The application provides real-time updates on parking availability, reducing the time and effort required to find parking spaces in busy areas. One of Park dude's primary features is its user-friendly interface, accessible via mobile devices and web browsers. Users can create accounts, store payment information securely, and manage their parking activities conveniently. The application also supports multiple languages, enhancing accessibility for users from diverse linguistic backgrounds. Park dude employs advanced technologies such as GPS tracking and data analytics to optimize parking operations. It generates insights into parking patterns, peak hours, and user preferences, enabling parking facility managers to make informed decisions and improve overall efficiency. Moreover, Park dude emphasizes user safety and security by implementing robust authentication measures, encrypted payment gateways, and privacy controls. It adheres to industry standards and regulations related to data protection, ensuring user trust and confidence in the platform. In addition to its practical functionalities, Park dude aims to enhance the user experience through interactive features such as feedback mechanisms, notifications, and personalized recommendations. It strives to continuously evolve and innovate, incorporating user feedback and technological advancements to deliver an exceptional parking management solution. Overall, Park dude stands out as a reliable, user-centric, and technologically advanced platform that streamlines parking operations, enhances user convenience, and contributes to a more efficient and sustainable urban environment.

Keyword: - *Parking Management, User Interaction, Real time Updates, Mobile application, Web Platform, Account creation, Payment processing, User experience, Innovation.*

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1. Need For Parking

Due to the dependence of daily life on cars, the need for parking is an important part of city planning and infrastructure. As the city's population increases and the economy grows, the need for parking solutions becomes more important. First, parking is essential to ensure easy access and mobility in the city. As people travel to work, education, shopping and entertainment, parking close to their destination is important. Adequate parking facilities not only help reduce traffic congestion, but also support essential businesses by encouraging business and

entrepreneurship. In addition, effective parking management plays an important role in solving traffic problems, which are a constant problem in crowded cities. Cities can reduce traffic congestion, improve safety, and reduce commute times by providing designated parking spaces and implementing effective traffic management strategies. It is also concerned with parking, urban land use and spatial planning issues.

As land becomes increasingly valuable in urban environments, efficient use of parkland will become important. Proper parking planning helps improve land use, prevent parking shortages in high-traffic areas, and enhance the beauty of the city's landscape. Additionally, the need for parking is linked to sustainability goals, including reducing carbon emissions and promoting alternative forms of transportation. Encouraging the use of public transportation, cycling and walking, and providing adequate parking for electric and hybrid vehicles are compatible with efforts to combat air pollution and reduce the effects of climate change.

Additionally, effective parking management can increase the sustainability of urban planning by providing revenue to the city through parking fees, fines and permits. In summary, parking demand is formed by the interaction of many factors such as urbanization, economy, transportation needs, land use planning, environmental concerns, circulation and income generation. Meeting this need requires an integrated approach that balances accessibility, efficiency, sustainability and economic viability to create a healthy society and a strong and resilient urban environment for current and future generations.

A car is a means of transportation for people and families. For daily travel, running errands and performing many activities, a reliable and safe solution is essential. Trucks, commercial vehicles and company cars play an important role in the smooth running of the business. Designated parking areas allow for efficient delivery, customer visits and employee transportation. Emergency vehicles such as ambulances and fire trucks should have easy access to the parking lot to ensure rapid response in an emergency. Similarly, traffic police should designate stations to monitor and intervene in incidents. Adequate parking directly impacts the success of retailers, restaurants and businesses that rely on foot traffic.

Lack of parking kills potential customers, reduces revenue and disrupts business. Most visitors rely on private vehicles to explore. Accessible parking near restaurants, attractions, and historical monuments improves the overall visitor experience and promotes tourism, providing a positive economic impact on the village. People with disabilities often need to park close to their location. Stations have been selected to provide safe and easy access to important services and public places. Secure parking provides peace of mind for vehicle owners by preventing theft and vandalism. As cities grow, the demand for parking also increases exponentially. This is related to the need for green areas, roads and public infrastructure.

Drivers looking for a parking space cause traffic congestion, resulting in loss of time, increased fuel consumption and emissions. Upper floors can take up less space and increase parking capacity without requiring additional parking spaces. Expand floor space. This system uses technologies such as express delivery and online booking to improve space utilization and reduce time spent searching for parking. Encourage public transport, cycling and car sharing, and reduce the total number of vehicles that need to park.

Parking is still an important part of life today, facilitating personal transport, stimulating business and increasing the competitiveness of essential services. However, it is important to recognize the problems caused by limited urban space and the need for sustainable solutions. By implementing new parking management strategies, encouraging alternative transportation, and prioritizing land use, cities can tip the balance in meeting traffic demand and supporting the city's environment.

1.1 Growing Vehicle Ownership

International transportation trends show an important trend: car ownership is increasing. While this phenomenon increases personal mobility, it also creates opportunities and challenges that need to be examined closely. As the economy improves and disposable income increases, owning a car has become an easy way for many people to meet their needs. This is especially true in emerging markets such as China and India, where car ownership has increased significantly in recent years. Increasing roads and highways have made travel between cities and rural areas easier, increasing the need to own a car. Cities often grow faster than public transport. This can lead to reliance on private vehicles for daily travel, as public transport options may be limited or inconvenient.

In many societies, owning a car is associated with a sense of personal freedom, status and comfort. This cultural concept strengthens the desire to own a car. The increase in the number of vehicles on the roads has led to accidents, especially in cities. This not only increases travel time, but also causes more fuel consumption due to stop-and-go, which leads to more emissions. Exhaust gases from cars are the cause of air pollution, affecting public health and the environment. Parking allocations should be increased to build more cars. This could lead to land being parked in green areas, affecting the overall health of the city. Existing infrastructure often struggles to cope with traffic and requires significant investment in development and expansion.

Personal cars provide people with greater freedom of movement and the ability to travel to places not easily accessible by public transport. This is especially useful for those living in rural areas or those with special needs. The automotive industry plays an important role in many industries, creating jobs and contributing to the economy as a whole. The creative tool facilitates the movement of goods and services, stimulates business, and supports businesses that rely on personal transportation. Encouraging the use of public transport, cycling and car sharing can reduce the number of vehicles on the roads. Creating efficient and reliable public transportation, including buses, trains, and subways, could provide an alternative.

Using strategies such as mixed use, which integrate residential areas with commercial and industrial areas, can reduce the need for long commutes and encourage walking or cycling. Leveraging intelligent traffic management systems to optimize traffic flow and reduce congestion will improve overall traffic efficiency. The transition to electric vehicles is promising in terms of environmental problems caused by conventional gasoline. The development of electric vehicles has the potential to change transportation, which reduces traffic by enabling electric vehicles to operate in a more coordinated manner. Driverless cars can reduce accidents caused by human error. The future of car ownership will be determined by a combination of factors such as economic development, technological advances and a focus on the environment and safety.

Although private ownership will continue to play a role in transportation, the transition to efficient solutions such as electric vehicles, efficient public transportation and smart city planning will be important to solve the increasing traffic problem on the roads. and the rise in car ownership poses challenges, for better or worse. Solving environmental and infrastructure problems requires a multifaceted approach that promotes sustainable transportation, invests in public transport, and promotes responsible planning in the city. By embracing innovation and prioritizing quality solutions, we can use the growing vehicle fleet to move us into a future where personal and environmental health is critical to mobility.

1.2 Demand On Parking Space

The increase in the number of vehicles on the roads brings with it the need for constant parking. This increasing demand causes major problems for today's cities, straining infrastructure and resources. Understanding the factors that lead to this demand and finding solutions are important for building a sustainable city. As mentioned earlier, economic prosperity and improvement in infrastructure have led to a strong automobile industry, especially in developing countries. Urban expansion often outpaces the development of good public transport. This situation forces people to turn to private vehicles and increases the need for additional parking spaces, especially in areas where public transportation is limited. The growth of SUVs and large cars requires larger parking spaces, resulting in an increase in the current parking shortage.

Lack of parking spaces in the city leads to a shortage of parking spaces, which leads to frustration and wasted time searching for a parking space. Drivers are constantly looking for parking spaces, causing traffic to increase. This not only increases travel time, but also results in reduced stop-start fuel consumption, impacting the personal wallet and the environment. Increased traffic emissions due to congestion cause air pollution, which is bad for public health and the environment. Due to the need for parking, cities often turn green spaces into parking lots. This not only diminishes the beauty of urban areas, but also damages the ecosystem and worsens air quality. The current road network and parking facilities cannot cope with the increasing number of vehicles. This requires significant investment in developing and expanding infrastructure and puts pressure on city budgets. Encouraging the switch to alternative modes of transport can reduce dependence on private vehicles and the need for parking.

The development of efficient and reliable public transportation, including buses, trains and subways, provides alternatives to daily commutes and reduces traffic on the roads. Creating infrastructure for cyclists and pedestrians can promote healthy transportation and reduce the need for cars. Using carpooling through support and infrastructure can encourage carpooling use and reduce the number of vehicles requiring separate parking. Using technology to optimize existing parking spaces can be very beneficial. Real-time parking information provided through digital signage or a mobile app helps drivers find a spot directly, and contactless payments that reduce parking fees eliminate the need for a ticket system and streamline the payment process. Introducing

negative parking charges adjusted to demand could create a more equitable environment by encouraging drivers to use less congested spaces during peak hours.

Create urban areas where residential and commercial spaces mix, allowing residents to access services within walking distance. provides convenience, thus reducing the need for the vehicle owner. Ideas like using multi-level parking and using negative parking spaces can maximize space utilization without sacrificing green space. Widespread use of electric vehicles can reduce the environmental impact caused by traditional gasoline-powered vehicles. Although electric cars still need to be parked, encouraging their use can help ensure safer and more efficient transportation. The development of driverless cars has the potential to revolutionize parking.

Self-driving cars can park more precisely and efficiently, potentially reducing the space required for each vehicle. Self-driving cars can be more coordinated with call time. This reduction can lead to better traffic flow and reduce the need to stop. Increasing demand for parking poses challenges for modern cities. Addressing this issue requires a range of approaches that promote sustainable transportation options, use technology for efficient park management, and future urban planning strategies. By emphasizing the balance between personal mobility and environmental sustainability, cities can respond to growing demand for parking and create a healthy future for everyone.

2. DESIGN PHASE

The design level of the ParkDude app has been updated, creating a user-friendly and efficient solution for drivers looking for parking and parking management. It is important to identify key users. Understand their pain points, such as wasted time searching for parking, parking frustration, limited information, and inconvenient payment methods. Consider the need to manage parking, set availability, and take secure payments. Gathering feedback from potential customers can help identify their specific needs, preferences, and parking frustrations. Searching for available parking spaces can reveal performance features and potential areas for improvement in the ParkDude app. This ensures satisfaction and understanding for users.

Shows real-time parking availability and pricing information. Allow users to search for parking by location, type (street parking, parking lot, etc.), and desired time. Give directions to available parking spaces. Consolidate secure payment options like credit cards, mobile wallets and booking features. It allows car owners to reserve parking spaces, schedule availability and check prices. Allow vehicle owners to view and manage private parking spaces created by drivers. It comes first and it's a clean and straightforward process to give a clear overview of the business. The application interface should be visually appealing and easy to navigate, even for non-technically proficient users.

Using clear signage provides a great customer experience and reduces the learning curve. Applications must be accessible to visually impaired or disabled users and comply with accessibility standards. These initial tests allow for early user testing and feedback before it becomes a major resource for development.

Collecting feedback from a diverse group of users helps identify usability issues and adjust the design based on their input.

The design is continually improved based on user feedback throughout the development process. It is important to maintain appropriate security to protect user information, including payment information. The application should be designed to accommodate future growth and potential integration with other smart city initiatives. In the design of the ParkDude application, a way in which the user is important should be at the forefront. By understanding the needs of drivers and car owners, conducting in-depth research and focusing on design needs, the application can be an important tool in solving the parking problem in the city and improving parking as a whole for all stakeholders.

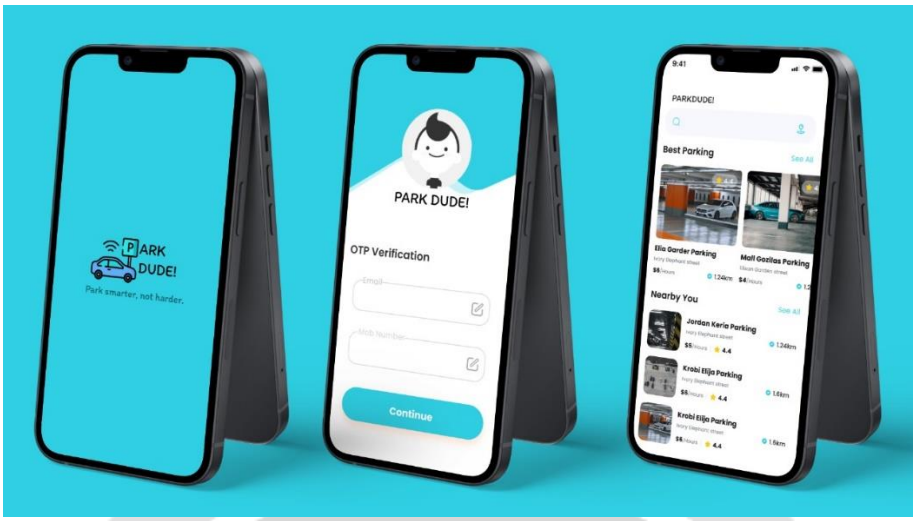

Fig -1 Design Phase

2.1 DEVELOPMENT OF PARKDUDE APP

The development of the ParkDude app represents a journey to create a user-centered, technological solution designed to revolutionize parking management. Beginning with careful planning and integration, the development process includes several stages, all of which are important in improving the application's functionality and user experience. First, conduct in-depth research to understand user needs and market conditions to form the basis for key performance and interpretation guidelines. With a clear vision, the development team set out to create an intuitive user interface focused on seamless navigation, providing useful information, and interactive content.

At the same time, the backend system is carefully designed to support the performance of the application, including powerful data management, secure payment sharing and data synchronization of time. Agile development is adopted to ensure flexibility and adaptability, allowing for iterative improvements based on user feedback and changing needs. Since there is a possibility of negative impact, stringent testing procedures, including functional testing, usability testing, and security testing, are required to ensure application reliability, performance, and performance.

As development continues it is still important to collaborate with stakeholders such as local authorities, station managers and end users Helps meet business standards, regulatory bodies and user expectations. Once completed, the ParkDude app will be a smart and efficient solution that offers drivers instant parking, seamless booking features and convenient payment options, while providing leaders with powerful tools for parking management and data-driven decision-making. Through careful development, rigorous testing and constant collaboration, the ParkDude app is a testament to innovation in parking management that promises to redefine urban transportation and improve urban living.

The driver and owner user interfaces are designed using appropriate techniques. First of all, it's a clean, intuitive design with clear functionality such as a search bar, maps, booking options, and a secure payment gateway. Create server-side infrastructure to manage user accounts, maintain secure parking listings, and process reservations and payments. Integration with real-time parking data (where available) or sensor networks to provide accurate location information. APIs connect applications to various external services. Show real-time location information and provide navigation capabilities.

Integrated secure payment for booking. Enable instant updates and communication between drivers and owners. The database securely stores user information, parking details, booking history and transaction information. The warehouse must be scalable to accommodate future growth and possible integration with other systems. Rigorous testing is performed throughout the development process to ensure that applications work as expected, error-free, and comply with security standards. Once the apps are tested, they will be sent to the relevant app stores (iOS and Android) for user access.

It is crucial to comply with security measures such as data encryption, use of secure authentication protocols, and regular security audits. Architecture should be designed to accommodate user growth and increasing parking needs. Cloud-based solutions can provide the necessary scalability. Analytics tools that track user behavior, station usage patterns, and revenue to enable informed decisions and continuous improvement of app features and functionality. The development process does not end with delivery.

Continuous analysis of user feedback, troubleshooting reports, and regular release of updates with new features and improvements are critical to the success of your app's longevity. By following the development process, prioritizing user experience, and ensuring good security, the ParkDude app can continue to be a useful platform that is easy to use and provides a more efficient and safe platform for parking in the city, benefiting drivers and vehicle owners. Contributes to long distance transportation system.

S.NO	FIELD	CARS	BIKES	BUSSES
1.	Total Parking Demand	2016.82	1783.15	51.00
2.	Average Parking Duration	5.57	4.85	9.50
3.	Average Turnover	1.68	2.58	1.00
4.	Current Average Number of Parking Users	362.10	367.69	5.37
5.	Current Number of Student and Staff	6000	6000	6000
6.	Percentage of Parking Users	6.03%	6.13%	0.09%
7.	SLIIT Population Growth Rate	1.67%	1.67%	1.67%
8.	Growth of Current Population by 2025	6801.6	6801.6	6801.6
9.	Addition Due to New Building by 2025	4500	4500	4500
10.	Total Population by 2025	11301.6	11301.6	11301.6
11.	Total Parking Users by 2025	682.04	692.58	10.11
12.	Parking Space Hours Required in 2025	3798.9	3358.7	96.1
13.	Current Parking Supply (Space Hours)	1728.0	940.8	57.6
14.	Excess Demand in 2025 (Space Hours)	2070.9	2417.9	38.5
15.	Parking Efficiency Factor (Space Hours)	0.8	0.8	0.8
16.	Additional Parking Spots Required in 2025	216	252	4

Table -1

3. EXPECTED OUTCOME

Proposed outcomes of the ParkDude app include positive impacts and changes in urban transportation, parking management, and user experience. Park Dude's main goal is to change the way people interact with parking by providing solutions that increase the convenience, efficiency and sustainability of urban spaces. Through the use of technology, real-time data and user-friendly design, ParkDude strives to achieve a number of significant benefits for drivers, parking lots and communities that collectively provide more connected, convenient and efficient parking.

One of the main benefits of the ParkDude app is to improve parking efficiency and reduce congestion in the city. By providing users with instant information about parking, price and location, ParkDude allows drivers to make informed decisions and find parking efficiently, reducing the time spent finding a parking space and reducing traffic congestion and emissions from the parking cycle. Through a dynamic pricing system, incentives for alternative modes of transport and integration with public transport, ParkDude promotes a change in behavior that is important for efficient transport choice and reduces parking stress, thus facilitating mobility and improving the air quality of the city.

Additionally, the ParkDude application aims to increase customer convenience and satisfaction by simplifying and streamlining the parking process. ParkDude reduces parking-related friction and uncertainty with features like reservation and reservation deposit, seamless payments, and personalized recommendations, allowing users to park in advance, make easy payments, and access the information they want and need. ParkDude builds relationships with users by prioritizing user experience and convenience, encouraging continued use and adoption of the platform by encouraging loyalty and engagement.

Additionally, the intended benefits of the ParkDude application include supporting transparency, responsibility and trust in the parking ecosystem. With features like ratings and reviews, real-time updates, and two-way communication, ParkDude encourages open dialogue between users and park staff, enabling feedback, problem solving, and continuous improvement. ParkDude promotes transparency and accountability, maintaining park staff to maintain high standards of service quality, cleanliness and customer satisfaction, while encouraging users to make informed decisions and contribute to shared knowledge that benefits the entire community.

The ParkDude app aims to support sustainable urban development by encouraging efficient use of parking spaces, reducing dependence on individually managed vehicles, and encouraging transportation options. By partnering with local governments, public transportation agencies, and sustainability planners, ParkDude advocates for policies and investments that prioritize pedestrian-friendly infrastructure, bicycles, public transportation, and shared tourism services to promote a fairer, more convenient, and environmentally friendly urban environment. ParkDude is committed to a more sustainable approach to urban mobility that matters for people, planet and environment, in line with sustainability goals and wider initiatives.

In addition, the ParkDude application aims to drive innovation and digital transformation in cities using technology, data analysis and predictions used as a model to support the development of the parking industry. ParkDude uses the power of artificial intelligence, machine learning, and Internet of Things (IoT) tools to predict future parking needs, develop pricing strategies, and improve service. Works well for brake drivers. ParkDude positions itself as a leader in the digital parking space by pioneering new features, functions and solutions to meet changing customer needs, technological advancements and urban transportation through continuous research and development.

In summary, the benefits of the ParkDude app include positive impacts and changes that make parking more efficient, effective and convenient for urban communities. ParkDude enables people to access, navigate and use park spaces by optimizing park use, improving user convenience, promoting transparency and accountability, promoting urban sustainability and fostering innovation in the parking industry, ultimately creating a livable, equitable and resilient urban environment. aims to change its shape for all.

4. CONCLUSIONS

As a result, ParkDude remains at the forefront of urban transportation and parking management by providing solutions that solve complex problems faced by drivers. With its innovative features, user-friendly design and commitment to excellence, ParkDude has the potential to improve parking, increase transportation efficiency and

contribute to the creation of a healthier, safer and connected city. ParkDude's main goal is to improve the overall quality of life for city residents and visitors by optimizing park use, reducing accidents, and promoting transportation options.

Using advanced technologies such as artificial intelligence, machine learning and real-time data analysis, ParkDude allows users to make informed decisions, have good access to parking spaces and reduce the impact of traffic in the urban environment. One of the key benefits of ParkDude is its ability to provide communication and user experience, simplifying the parking process and improving driving pleasure with ease. ParkDude allows people to easily find, book and pay for parking by reducing the friction and uncertainty around parking with features like instant parking transfer, booking and booking features, and seamless payment.

Additionally, ParkDude promotes transparency, accountability, and trust in the parking ecosystem through its evaluations and analysis, two-way communication on the road, and relevance to users. By providing a platform for users to share their experiences, provide feedback and interact with parking drivers, ParkDude is able to engage in constructive dialogue, continuously improve rides and ensure stations meet the highest quality standards and services. In addition, ParkDude is committed to supporting innovation and digital transformation in the parking industry through strategic partnerships, technological advancements and insight. By partnering with local governments, public transportation agencies, and technology providers, ParkDude provides access to valuable resources, expertise, and data, allowing it to develop solutions, integrate existing processes, and evaluate their effectiveness.

In addition, ParkDude recognizes the importance of sustainable development and environmental care in shaping the future of urban transportation. ParkDude works to build cities green, with more energy that is important for the health of people and the planet, by encouraging alternative forms of transportation, promoting sustainable behavior, and promoting incentives to reduce carbon emissions and increase energy efficiency.

In summary, ParkDude represents a transformative force in the urban transportation landscape and offers a solution to the complexities of transportation management and parking in the city today. With its innovative features, user-friendly design and commitment to sustainability, ParkDude has the potential to transform the way people enter, navigate and use parklands, ultimately creating a peaceful, connected and sustainable city for many generations to come. environment.

5. ACKNOWLEDGEMENT

Going forward, there are many opportunities for ParkDude to expand its capabilities, improve the user experience, and continue to transform the parking industry. By constantly innovating and adapting to changing business and user needs, ParkDude has been able to develop its leading position in urban traffic and parking. Here are a few ideas for future work that will take ParkDude to new heights of success and influence.

ParkDude may explore partnerships with the smart city strategy to integrate its platform with traffic management, public transportation and other elements of the city. Integrate network and IoT sensors. Using data from these sources, Parking Dude can improve parking updates in real time, improve traffic flow, and encourage transportation by providing users with different options.

Based on its commitment to sustainability, ParkDude can support and promote environmentally friendly transportation options such as electric vehicles (EVs), ridesharing and micromobility services. By offering discounts, incentives or priority parking to public transportation users, ParkDude can encourage behavioral changes that reduce carbon emissions and encourage caring for the environment.

ParkDude can invest in advanced analytics to predict parking needs, improve pricing strategies and increase parking staff efficiency. By analyzing historical data, traffic patterns, and other factors such as conditions or weather, ParkDude can provide users with accurate information about parking availability and rates, allowing them to better plan their business trips.

Integrating AR navigation features into the ParkDude app can streamline the way users navigate parks and urban areas. By placing real-time parking information, directions and instructions directly on the user's smartphone

screen, AR navigation can simplify the parking process, reduce search time, locate and improve the user experience, especially in complex or unfamiliar areas.

Platform that allows users to pay for parking or certain services such as electric car charging or small bike sharing. Using blockchain technology or digital wallets, ParkDude can offer seamless, secure and low-cost payment options that meet the needs of today's urban customers. With the increase of shared services, transportation usage and payment of phone fee on last mile delivery, ParkDude can develop a new parking lot for this new model. Examples include designated parking for ride-sharing or delivery drones, automated valet parking for driverless vehicles, or passive parking for public transportation services.

Adding gaming content and community participation to the ParkDude app can encourage user participation, enhance a sense of community, and encourage participation. Always. ParkDude can ensure that its user community is strong and active by offering rewards, badges, or virtual rewards for actions such as posting reviews, sharing parking tips, or participating in challenges, leading to the success and growth of the platform. ParkDude can ensure that all users, including people with disabilities or special needs, have easy access and use of the car park by prioritizing accessibility and inclusivity in its platform design and operation. This may include features such as convenient parking spaces, seat orientation, and technology support such as screen readers or commands.

Partnering with retailers, restaurants and businesses to provide cash solutions can improve the overall user experience and drive traffic to local manufacturing facilities. ParkDude may explore partnerships to offer parking verification, discounts or special offers to users who park at participating businesses, building relationships and building customer trust. Eventually Park Dude may explore the opportunity to expand into new areas. Domestic and international and regional affairs.

By adapting its platform to local needs, requirements and preferences, Park Dude can reach new customers, retain products and establish itself as a global leader in the world of management solutions. AS a result, there are many future business opportunities for ParkDude to expand its capabilities, enhance user experience, and foster greater growth and impact in the industry. By embracing innovation, collaboration and customer service, ParkDude can continue to revolutionize city and parking management, improving cities and the international community.

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