Park Sense: Smart Parking

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MBA 1.5 Weekend

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Table of Contents

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ABSTRACT

Islamabad, Pakistan, has a severe shortage of parking spaces due to the increasing number of vehicles due to rapid urbanization. This lack of parking leads to frustration, wasted time for drivers, traffic congestion and poor conditions. A state-of-the-art green-light parking detection system has been proposed to address this critical issue. The goal is to transform parking, provide a smoother experience for motorists and improve local services. The advanced sensor system aims to solve the ongoing challenges of parking in Islamabad by providing real-time information about the availability of parking spaces. Using sensor technology, drivers can quickly spot vacancies. The integration of green lights greatly enhances this process by visually signaling vacant vehicles, thereby increasing the utilization of parking spaces This project three main objectives are as follows. First of all, it seeks to enhance the parking space by providing real-time information to better identify vacant parking spaces This increases traffic and reduces the amount of time a they navigate through congested traffic to find the parking lot. Secondly, the proposed road aims to reduce traffic congestion, which will make driving more enjoyable and fuel efficient. Finally, the project aims to improve the parking experience by implementing a green light signal system, which reduces driver dissatisfaction through clear and simple information a will be provided in terms of parking space and it is anticipated that installing a parking sensor system with a green light will have many benefits. This will shorten the time it takes drivers to find a parking spot, make parking more enjoyable, and improve traffic flow. Innovative payment solutions can help businesses generate more revenue, improve parking management and increase customer satisfaction. In addition, the project will make the city's overall urban environment more pleasant, less congested roads, and better urban planning. The project's methodology consists of ongoing monitoring and assessment, system deployment, and research and development. The project is to guarantee the green light parking sensor system in Islamabad's successful installation, long-term efficacy, and expansion by utilizing a staged method. This project intends to expand on previous research on smart parking systems through a thorough literature study and design a novel and very successful solution suited to the unique environment of parking plazas, malls, and construction zones in Karachi, Pakistan.

CHAPTER 1

1.1 Introduction

In Islamabad, Pakistan, the rapid urbanization has led to a significant problem: there is a shortage of parking spots due to the increasing number of vehicles. This issue is most evident in areas with heavy traffic, such as parking lots, business centers, and active building sites, where the need for parking greatly exceeds the available space. As a result, these deficiencies not only cause inconvenience and waste of time for drivers, but also increase the occurrence of traffic congestion, traffic congestion and environmental harm greater than. To address this important issue, focused and innovative efforts to find solutions are needed. This recommendation supports the development and implementation of state-of-the-art parking sensor systems including green light indicators. The main goal of this effort is to completely change the way parking is managed, provide a smooth experience for drivers and increase the operational efficiency of local businesses

Implementation of an advanced sensor system means that parking problems can be solved in Islamabad. This solution seeks to provide drivers with real-time information about the availability of parking spaces through sensor technology, enabling them to quickly identify empty spaces. Green light integration will provide that this practice has worked well by providing visible signals to drive traffic through empty spaces. Moreover, besides the immediate benefits for motorists, the proposed system can reduce traffic congestion by allowing vehicles to easily transport vehicles to these busy areas with reduced time hunting for parking lots not only makes it easier but reduces carbon emissions

1.2 Purpose of Project

The primary purpose of this project is threefold:

- Improve parking: Several objectives of this new initiative focus on increasing parking by providing real-time information through green lights raising signs. Around optimizing process to detect empty parking spaces, drivers will substantially reduce the length of time spent in crowded spaces looking for parking This effective approach not only makes it easier for drivers but also improves the traffic flow, making driving infrastructure more efficient and more user-friendly in the city

- Traffic congestion reduction: The proposed road can improve the current problem of traffic congestion. The decrease in time spent by cars finding parking spaces increases the flow of traffic, providing a smoother, less stressful urban route. In the immediate benefits of driving experience as it is very interesting in addition to this reduction in idle time leads to significant reductions in

fuel consumption and emissions. To promote it also helps, namely global goals a it is concerned with sustainability and consistent with local policies on environmental protection

- Enhanced Parking Experience: The main focus of this project is to transform the parking experience into a smooth and hassle-free process for all drivers. The introduction of a green light signal system changes the traditional method of parking space detection, providing vehicles with unambiguous and easily accessible parking information This effort aims to reduce the hassle and stress often associated with traditional methods of finding parking, to provide a positive and seamless parking experience. The resulting improvement in user satisfaction not only enhances the overall urban experience but also fosters a harmonious relationship between city residents and their urban environment.

1.3 Anticipated Benefits of Project

The implementation of the green light parking sensor system is expected to deliver a substantial range of benefits for Islamabad:

For Drivers:

- Reduced Parking Search Time: Drivers are expected to find parking spots 30-40% faster, saving time and reducing frustration.
- Enhanced Parking Experience: The system will provide a more convenient and stress-free parking experience through real-time information and user-friendly features.
- Improved Traffic Flow: Smoother traffic flow will lead to a faster and more pleasant driving experience.

For Businesses:

- Increased Customer Satisfaction: The enhanced parking availability and the resultant positive parking experience are poised to significantly elevate customer satisfaction levels. Consequently, this has the capacity to allure a broader clientele, promoting greater consumer traffic and consequently enhancing overall organization earnings. Our system's flawless parking experience plays a crucial role in improving the whole client trip.
- Better parking management: Implementing our system promises to be a game-changer in parking management for businesses. By collecting and analyzing useful data on parking usage patterns, organizations can make informed decisions to optimize the allocation of parking spaces This strategy goes beyond simply allocating spaces to optimize implementation, streamline operations, and improve overall efficiency.

- New revenue streams: The introduction of card and QR-code payment systems represents an important way for businesses to diversify their revenue streams. Besides the general goal of streamlining the payment system, the plan also presents possibilities for additional investment, particularly in the area of parking lots, not as roads convenient and responsive payment methods not only improve user experience but have the potential to increase overall revenue for parking management services too products

For City:

- Reduced traffic congestion: The implementation of our intelligent parking system is poised to have a transformative impact on urban mobility by significantly improving traffic flow. Consequently, the anticipated reduction in traffic congestion not only improves traffic, but can also improve air quality and improve overall quality of life in the city. Our technology plays a crucial role in reducing traffic congestion, which in turn contributes significantly to the development of a more environmentally friendly and enjoyable urban setting.

- Improved Urban Planning: In addition to the immediate advantages of decreased traffic congestion, the data collected by our intelligent parking system becomes a great resource for well-informed urban planning endeavors. City planners can make data-driven decisions through extensive knowledge gained from analyzing parking patterns, usage patterns and changing demand and consequently this enables parking robust, environmentally friendly and efficient systems. The integration of smart information into urban planning processes provides a proactive approach to the needs of a dynamic urban environment.

While addressing the city's parking challenges, this project has the potential to significantly improve Islamabad's residents, businesses and environment

1.4 Methodology

The project will be implemented in a stepwise approach:

Step 1: Research and Development

- The main objective of this first phase is to conduct a comprehensive market research, explore current parking solutions, and elaborate specific requirements in the specific parking space in Islamabad in.

- A team of experienced engineers and technical experts will inspect and prototype the green light parking sensor system. This strategy should not only prioritize efficiency and effectiveness, but should also take a comprehensive approach to innovation.

- Once the prototype is developed, a significant portion of the first phase of testing will commence in specifically selected parking areas. This methodology has two objectives: to evaluate the effectiveness of the overall system and to gather critical user feedback. By using an iterative approach, we aim to improve and optimize the system by incorporating real-world data and data. This will improve the efficiency of the system and address users' satisfaction in future implementation phases.

Step 2: Implementation plan

- Partner with key stakeholders, including parking lot owners and management agencies, to create green light parking sensor systems.
- Develop and manage detailed installation plans, ensuring seamless integration of the system with existing system installations.
- Develop and implement card- and QR code-based payment systems to provide users with convenient ways to pay for parking fees.

Step 3: System Monitoring and Evaluation

- Continuous monitoring of system performance will require the collection of data on usage, parking and traffic flow.
- Continued comprehensive data analysis to identify patterns and trends, allowing for areas of improvement to be identified and strategies for increasing system-wide improvement.
- The next phase will prioritize actively obtaining user feedback, with a strong commitment to gathering user feedback and incorporating it into the ongoing development and improvement of the system.

With a deliberately phased implementation process, which encompasses continuous research, development and improvement in different stages, this project is designed not only to optimize the implementation but also to provide green light parking sensors

1.5 Literature Review

1.5.1 Introduction

This chapter provides a comprehensive review of existing research on smart parking systems, focusing on its characteristics, advantages and limitations The main objective is to critically review the latest developments in smart parking technology to find out and define currently missing research areas. It will then serve as a guideline for designing new highly efficient parking systems specially designed for parking

lots, malls and construction sites in Karachi, Pakistan. This research approach seeks to enhance existing knowledge and lays the foundation for contextualization and innovative solutions to meet the specific challenges and needs of urban Karachi.

1.5.2 Existing Smart Parking Systems

Much research has been done on intelligent parking systems exploring different technologies and approaches. Key technologies include:

- Sensor-based system: This system uses sensors such as ultrasonic, magnetic and infrared sensors to detect the presence or absence of vehicles in parking lots and then real-time data from these sensors serve to direct drivers to available and improved operating parking spaces. (Selvi & Zahiruddin, 2014; Khan, Gandomi, & Shiraz, 2018; Li, Zhang, & Zhang, 2018).

- Vision-based systems: These systems rely on cameras and imaging algorithms to detect vacant parking spaces. They offer the advantage of high accuracy and the ability to track changes in the parking population in real time. (Zhang, Zheng, & Li, 2016; Chen, Li, & Li, 2017).

- Mobile application-based systems: These systems use mobile apps to provide drivers with real-time information on parking availability, trip assistance and parking payments This facilitates users and enforces parking management a encourage effectiveness. (Chen et al., 2017; Lee et al., 2018)

1.5.3 Advantages of Smart Parking Systems

Smart parking systems offer numerous advantages over traditional parking methods, including:

- Reduced traffic congestion: By guiding drivers directly to available spaces, smart systems minimize searching time and consequently decrease traffic volume and congestion. This translates into improved traffic flow and reduced fuel consumption. (Khan et al., 2018; Li et al., 2018)

- Enhanced parking efficiency: Real-time information on parking availability leads to optimal utilization of parking spaces and minimizes the number of empty spots. This translates to increased revenue for parking management companies. (Selvi & Zahiruddin, 2014; Zhang et al., 2016)

- Improved user experience: Smart systems provide drivers with convenient features such as parking space reservation, navigation assistance, and mobile payment options, thereby enhancing their parking experience and reducing frustration. (Chen et al., 2017; Li et al., 2018)

- Reduced environmental impact: By optimizing traffic flow and minimizing vehicle idling time, smart systems contribute to a reduction in air pollution and greenhouse gas emissions. (Khan et al., 2018; Li et al., 2018)

1.5.4 Limitations of Existing Smart Parking Systems

Despite their advantages, existing smart parking systems face some limitations:

- High installation and maintenance costs: The initial investment required for deploying sensors, cameras, and other hardware can be substantial. Additionally, ongoing maintenance costs must be factored in. (Khan et al., 2018; Li et al., 2018)

- Privacy concerns: Concerns regarding the collection and use of driver data have emerged, necessitating robust data security measures and transparent privacy policies. (Selvi & Zahiruddin, 2014; Li et al., 2018)

- Technical limitations: Sensor accuracy and reliability can be affected by environmental factors. Additionally, system integration and data processing can present technical challenges. (Zhang et al., 2016; Chen et al., 2017)

- Limited access: Not all users may have access to smartphones or mobile data, potentially limiting the effectiveness of mobile app-based systems. (Lee et al., 2018)

1.5.5 Research Gaps and Opportunities

After completing a comprehensive and comprehensive review of the existing literature, the comprehensive review has revealed several important gaps in the current study. This careful analysis not only revealed deficiencies in existing knowledge but also shed light on possible opportunities for further research and evaluation This comprehensive understanding highlights the importance of further research is undertaken to address this knowledge gap and to identify new opportunities for inquiry into the topic

Advances in cost-effective sensor technology:

A key avenue for further research is the search for new sensor technologies aimed at providing comparable accuracy, all while reducing the cost of installation and maintenance If they are done properly implemented, this prioritization process has the potential to significantly improve the cost efficiency and performance of intelligent parking systems and is to grow, catering to a wide range of users with needs and they want to be addressed Advanced research and developments in sensor technology have the potential to facilitate the widespread adoption of inclusive intelligent parking systems

Enhancing data security and privacy:

An important area of focus relates to increased data security measures in smart parking systems. To effectively manage privacy, it's important to incorporate strong data encryption, robust access control mechanisms, and transparent access controls procedures. This not only ensures the protection of sensitive information, but also increases the user's trust and confidence in the system.

Improving sensor reliability in harsh environments:

Another research opportunity is to explore new sensor technologies and sensitive algorithms for environmental challenges. Environmental factors such as rain and particles can significantly degrade the performance of sensors. By allocating analytical resources to address these challenges, we can guarantee the accuracy and reliability of intelligent parking systems under adverse conditions.

Creating user-friendly interfaces for different users:

One area of research is the development and implementation of user-friendly interfaces for smart parking systems, capturing a diverse range of users These interfaces should cater to a diverse range of individuals in technology knowledge and accessibility needs. By making inclusion central to the design process, we can encourage a wider range of users to use the system, and guarantee that it is accessible and convenient for a wide range of users they will be used

CHAPTER 2

PROBLEM DEFINITION AND REQUIREMENTS ANALYSIS

2.1 Problem Definition

In today's culture, the ever-increasing number of cars on the roads, especially during peak hours, has made it increasingly difficult to find adequate parking. Park Sense uses advanced sensor-based technology use to navigate the common issue of finding parking spaces effectively way. This comprehensive and sophisticated approach allows people to accurately identify roads in private parking lots and to accurately count off-road spaces. This not only speeds up the frequently laborious parking procedure but also eliminates the necessity for aimless and irritating circling in pursuit of a hard-to-find parking spot inside a vast parking area. There is a noticeable gap in the market since no company currently provides sensor-based technology for parking assistance, which would make the process more efficient and organized. In light of this favorable circumstance, our objective is to strategically position ourselves in order to efficiently tackle and resolve this evident market deficiency.

2.2 Requirement Analysis

Park Sense carefully positions itself to target prominent retail malls and wide parking plazas, taking advantage of the large number of vehicles actively searching for parking places in these busy regions. Park Sense is especially beneficial in dynamic areas, where the large number of vehicles can make finding a parking space a long and difficult task. Park Sense simplifies this process by personalizing easy access to parking spaces, avoiding the need to carefully navigate any roads to find open space In order to command awareness and acceptance industry tom is encouraged, we engage with these organizations to provide persuasive information highlighting the unique and effective benefits of our technology f Parking experience is guaranteed This focused program has been carefully developed though highlighting how Park Sense can dramatically improve overall parking in these densely populated and heavily used areas.

2.3 Human Resource Requirement

Initially, our team will consist of only three employees, who will use the facility created in Bahria to run our business strategy. This facility serves as an assembly center and warehouse, and has the equipment needed to set up sensor-based parking spaces. As our company grows, it becomes important to strategically grow our employees. We will effectively hire more employees to take care of specialized projects and we can do it internally, thus improving our overall efficiency. Additionally, as we obtain contracts to manage parking lots on behalf of our customers, we will hire contractors who are committed to keeping these

parking lots running smoothly. This flexible approach to staffing is consistent with our planned expansion and the changing needs of our organization.

2.4 Machinery and Equipment

After carefully researching the tools and equipment needed to clean up the parking lot, we put all the necessary items together into one perfect package. Specific communication assures that each unit is tailored to individual parking, and guarantees that each package has all the necessary equipment for proper parking Complete planning this thoroughly and covers all aspects of the procurement process. It also simplifies the implementation of parking systems, providing our customers with a very practical and user-friendly solution.

2.5 Supplier Requirement:

This section outlines the specific criteria and criteria that suppliers meet. After careful testing, we identified and contacted potential suppliers capable of providing the necessary equipment for our parking lots. The selection process involves a thorough review of quotes from multiple vendors, painstakingly selecting a provider that meets our organization's specific criteria. In anticipating the expansion of our company, we plan to take on increases expected in equipment orders and discussed with our current supplier. This high level of integration not only benefits us in terms of reducing costs, but also gives us mutually beneficial efficiency gains for the supplier.

In addition, as part of our strategic planning process, we recognize the strategic importance of expanding our supplier network to improve our ability to adapt to changing requirements. While our current supplier currently serves our needs well, we are actively taking steps to identify and partner with other potential suppliers who can handle the increasing amount of equipment needed to support our expanding operations have a relationship. This strategy strengthens both our product offerings and our ability to adapt quickly to the changing demands of our growing business.

2.6 Project Budget Requirement

After conducting a detailed and careful analysis of all the costs and requirements involved in starting our business, our rigorous evaluation has concluded that we need an initial investment of 4,500,000. This big budget covers everything needed to run the organization. This includes important costs for tools, buildings and people. It also covers unexpected situations to make sure our business is strong and ready to change if needed.

CHAPTER 3

DESIGN AND IMPLEMENTATION

3.1 Design

This part will give a full picture of how one parking place is set up. It will explain the important role each part plays in making it complete. Each of these components is essential for the smooth operation of the parking area, and their flawless functionality is crucial for the effective application of the technology in issue. Thorough investigations were conducted with many vendors, covering all the necessary components for the construction of Park Sense. After a thorough investigation, we have compiled a detailed inventory of essential elements necessary for the establishment and implementation of the Park Sense system. Following is the list of components that are required to implement our technology in a parking spot:

- LCD Panels
- Mega Micro Controller
- Supplier
- IR sensor
- Laser
- Camera
- Enclosure
- Back up batteries
- Hard drive
- Bulbs
- Hardware

Once all the previously described components are carefully established and smoothly integrated, the Park Sense technology will actively and independently detect the occupancy status of parking spots. The technology will swiftly and accurately update the real-time count of available parking spots in the corresponding lane when a car occupies a parking spot. This immediate update is an essential feature that ensures that the next vehicle approaching the lane is instantly notified of the availability status. Park Sense improves parking spot utilization efficiency and increases users' parking experience by giving real-time information.

3.2 Process Flow Chart

Figure 3.1: Design Model
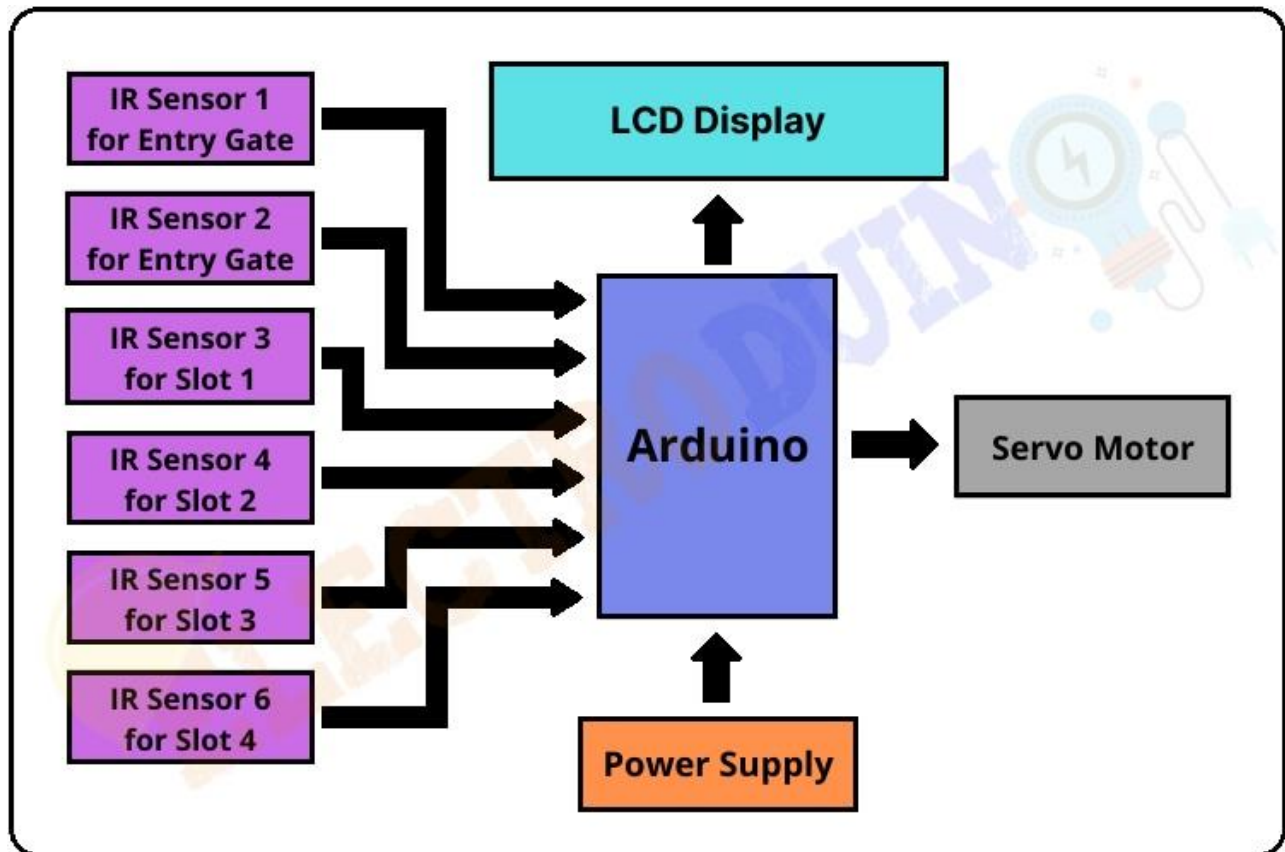
Figure 3.2: Reference Model
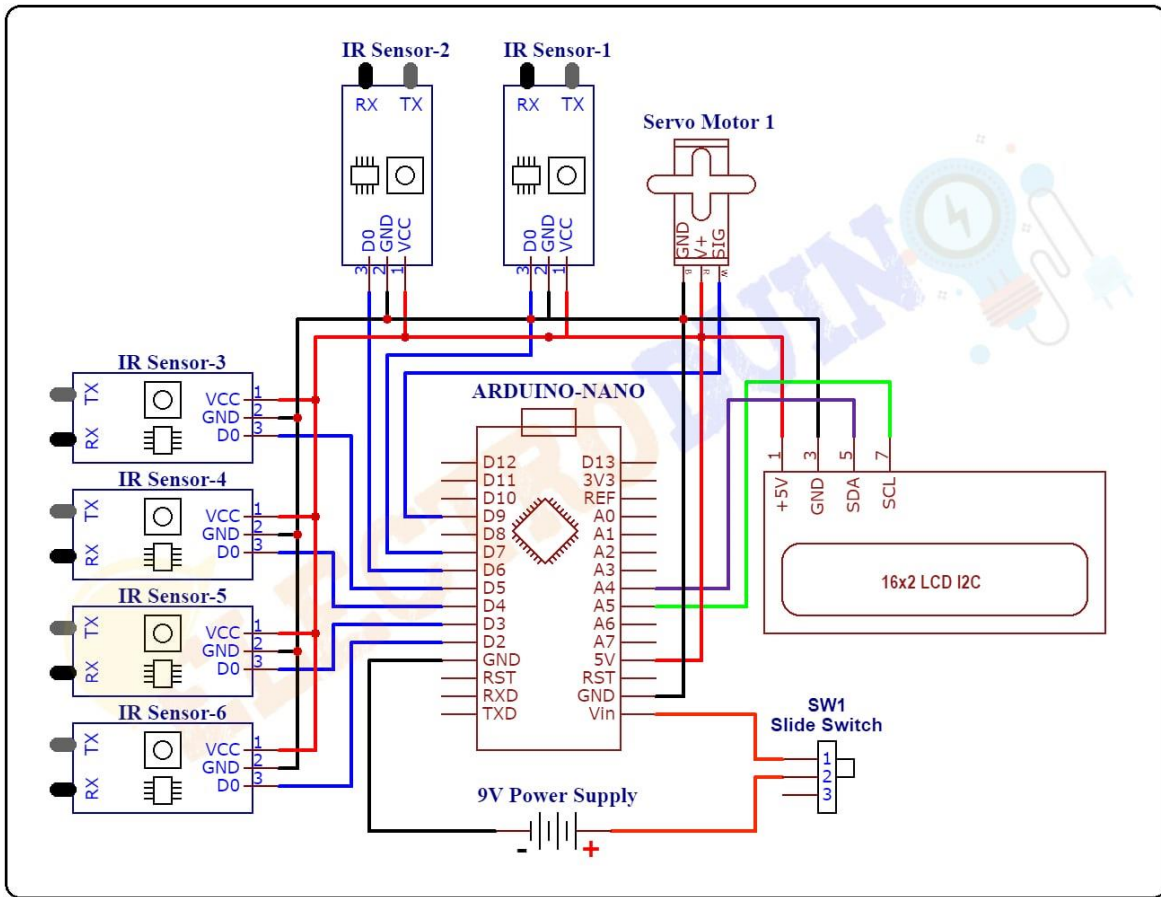
3.3 Marketing Plan

3.3.1 Market

Due to the increasing amount of traffic and the limited availability of parking spaces, people often resort to risky roadside parking or illegally occupy restricted areas, leading to a rise in traffic violations and the subsequent issuance of fines to the offending drivers. The consequences go beyond simple inconvenience, impacting consumer behavior as people deliberately avoid specific malls and shopping areas due to the combined difficulties of heavy traffic and insufficient parking amenities. The widespread shortage of parking spaces exacerbates the problem, resulting in the common occurrence of parking on the road, particularly evident in the busy Commercial Market of Satellite Town.

This evident market deficiency continues to exist without any clear solution, indicating a possible exacerbation of the situation in the future. Individuals are increasingly discouraged by the idea of maneuvering through crowded locations or spending a significant amount of time searching for scarce

parking spaces. We specifically prioritize high-traffic shopping centers in order to address the common difficulties related to parking and ensure a smooth parking experience. This technique not only eliminates the need for prolonged search attempts but also enables individuals to allocate their time and attention towards more significant and productive endeavors.

3.3.2 Current Market

Currently, there is a noticeable absence in the market, characterized by a shortage of vendors providing services similar to what Park Sense intends to offer. Importantly, familiar commercial spaces, such as busy malls and parking lots, currently lack sensor-based parking systems so this lack presents a unique opportunity for Park Sense as a new start-up venturing into this untapped area. Our strategic advantage as a first entrant allows us to quickly capture significant market share.

Not only does this positive positioning allow us to get off to a solid start, but it also provides a unique opportunity to gather insights and further improve our service as we grow. Competitors in this niche market segment provide us with an advantageous environment for creative ideas and development, enabling us to maintain a leading position in the development of sophisticated parking solutions of the remarkable.

The efficiency and ease of use of our services are key factors in saving our clients significant time and energy. By creating a search engine for parking lots, we are effectively solving the most important problem in the market. This customer-centric strategy enhances the overall customer experience, fosters loyalty, and fosters long-term interest in our products and services.

As we begin this innovative journey, our distinct offering is positioned to firmly connect with clients, creating a strong basis for long-lasting success in the changing field of smart parking solutions.

3.3.3 Market Share

Currently, CDA is the leading player in the parking spot market share, mainly due to the lack of competitors providing a technology similar to Park Sense. We have strategic goals that go beyond simply competing with CDA. Our ambition is to not only equal but exceed the present market share held by CDA. Our strategy approach is centered around providing users with an improved and more efficient parking experience. Our goal is to demonstrate the benefits of our advanced technology and show businesses how using a sophisticated parking system can effectively increase consumer traffic through strategic collaborations and engagements.

Our main objective is to showcase the crucial function of a user-friendly and automated parking solution that relies on sensors. This solution can greatly decrease the amount of time folks spend searching for parking spaces. Through the implementation of a highly efficient and optimized parking system, we want to not only meet, but beyond the expectations of both corporate entities and individual users. This cooperative and innovative initiative strategically places us in a position to not only capture a significant but also a powerful share of the market, establishing our brand as associated with exceptional parking options.

3.3.4 Target Market

Currently, our main objective is to identify upcoming shopping malls and plazas that are currently being built. This gives us a perfect opportunity to smoothly incorporate our technology while the work is still ongoing. By adopting this proactive strategy, we ensure a thorough calibration of our system, which guarantees excellent operation well before consumers start using our parking spaces. We focus mostly on malls and plazas that have large parking lots and are currently dealing with the common problem of people wandering about aimlessly in search of an available parking spot. This common situation frequently forces individuals to participate in exasperating circular quests for parking, which may discourage them from returning to these areas in the future.

Our goal is to strategically focus on these ongoing development sites in order to proactively tackle parking difficulties and ensure a pleasant and convenient parking experience right from the beginning. This approach not only reduces the annoyance related to parking but also improves the general attractiveness of these locations, creating a favorable atmosphere for continued usage.

3.3.5 Unique Selling Proposition

Our cutting-edge sensor-based technology is the foundation of our unique market position. This state-of-the-art service enables individuals to access up-to-date information about the availability of parking spaces in a particular location. Our system not only identifies vacant parking spaces but also intelligently predicts when there are empty spaces on a particular street. This dynamic feature acts as a precaution, saving customers the hassle of searching for promising options only to be met with disappointment, a scenario often found in traditional manual parking searches in the 19th century

The profound impact of our technology lies in its ability to provide users with specific mental representations related to their vehicle choices. Before arriving at their destination, customers can clearly map the routes that offer the greatest parking opportunities and know exactly how many vacant spaces The exact and expected level of this parking solution is what they cannot be compared. When we arrive

at the desired route, our system provides continuous guidance to users by not only highlighting the availability of parking spaces but also indicating the emptiness of those right in the road as well This comprehensive plan assures a smooth, hassle-free parking lot, which sets our service apart from traditional book delivery options cars are parked there.

3.3.6 Competition

While our unique technology offerings set us apart from our competitors, it is important to understand and evaluate the competitive landscape. Local parking contractors, such as CDA, are major challenges that require careful policy analysis. To gain market dominance, it is important not only to introduce our evolving technologies, but also to successfully replace current competitors and capture market share. This requires a sophisticated competitive strategy, which highlights the importance of outperforming established and outperforming local parking operators in order to maintain access strong position in the market.

3.4 Marketing Mix

3.4.1 The Innovative Technology Underpinning Our Services

Our services are based on innovative sensor-based technologies that have the potential to completely transform the parking experience. This great flexibility is characterized by real-time capabilities, changing the approach to the parking lot in particular Its excellent functionality is mainly achieved with an LCD placed in the road pa so in the parking lot is revealed, which continues to update the condition of the parking areas The physics of the system is straightforward and efficient. If there are parking spaces on a street, the LCD display immediately sends this information to potential parkers, providing a precise number of free parking spots on that street

The ability of the system to provide rapid updates highlights its real-time performance. Once the vehicle enters a parking space, the sensors immediately transmit this information to the LCD display. Continuous data sharing assures that the next driver will be immediately notified of the current parking spaces in that particular lane Advanced sensor technology and the integration of instant data sharing goes beyond simply increasing the quality of the parking lot It enhances the overall experience of drivers in the parking lot and provides accurate and timely information. These additional features not only make parking easier, but also increase the satisfaction and convenience of individuals going through the often stressful parking lot.

3.4.2 Price

We offer two separate pricing structures for our flexible product as part of our commitment to providing comprehensive solutions. The first example involves the use of the product and maintenance work on a flexible 3-year contract. In this system, the corresponding shopping mall or street will monitor the day-to-day operation of the parking lot. On the other hand, the second model offers a complete solution, where we take full responsibility for the entire parking business from start to finish on a subscription basis. The pricing of our sensor-based technology is based on its high quality, which justifies the premium price. We believe customers will appreciate the value of investing in this cutting-edge technology, considering the unmatched convenience and enhanced parking experience it offers their customers.

Additionally, our commitment goes beyond the initial foundation, to include ongoing responsibilities such as software upgrades, routine maintenance and equipment maintenance. Our comprehensive design allows our clients to benefit from the latest technology and achieve a smooth and trouble-free process with minimal operational issues across our business unit.

3.4.3 Place

We focus our logistics program on densely populated cities with malls or streets that attract a lot of pedestrians. We specifically target areas where drivers have problems finding parking spaces in busy areas with heavy traffic. Focusing primarily on these densely populated cities, we aim to strategically target our solutions in areas where demand is most urgent. This will ensure that our state-of-the-art parking assist technology effectively addresses the challenges drivers face when traveling in more congested parts of the city. By taking this focused approach, our solutions are strategically positioned to maximize potential impact in areas facing the prevalent problem of traffic and the limited parking space.

3.4.4 Promotion

Considering our status as a startup, our primary approach entails actively participating in the development of malls that are presently being built. We will establish communication with either the construction builders or the mall owners, delivering persuasive presentations and performing product demos. The main goal is to communicate the capacity of our groundbreaking parking solution in improving the overall customer experience for their customers. As we advance and expand, we shall investigate diversification in promotional strategies. Nevertheless, during the early stage, our primary objective is to carry out promotional presentations in order to create awareness regarding our goods. Afterwards, we intend to exhibit the skills of our solution by conducting live demos, tailored to the unique interests of potential consumers, in order to cultivate a more profound comprehension of the value proposition of our product.

3.5 Marketing Control:

The incorporation of sensor-based parking technology into our current market provides a unique chance to establish market leadership, as there have been no previous commercial alternatives. Our ambitious goal is to not only get a substantial portion of the market but also maybe achieve total market dominance. This requires a strong focus to ensuring that our product provides the exact value we anticipate, together with a firm commitment to sustaining service standards that are consistent with the customer experience we have promised.

Establishing standards that ensure the efficiency of our products and deliver excellent service is critical. By establishing specific criteria for our products and services, we can objectively measure our performance against these criteria, providing valuable insight into how we have performed and met our standards according to the previously determined. Any discrepancies or deficiencies identified following this inspection will result in corrective action to ensure our performance meets specified standards and if there are no obvious problems, we will turn our attention to improvement and ongoing performance. This iterative process ensures that our customers not only receive the guaranteed satisfaction but positions us as a leader in market management through continuous improvement and customization of services.

3.6 Success Metrics

Our main aims are to be a top provider of car park services and known for giving good quality products and help. Our long-term objective involves implementing our installations in a vast number of malls and plazas throughout the twin cities. However, in the immediate future, our measures of success focus on penetrating the market and launching brand-building initiatives, with a particular emphasis on promoting awareness of Park Sense among builders, contractors, and owners of malls and plazas.

The key to our success is our ability to provide outstanding value and services to our customers, guaranteeing a favorable return on investment. Consequently, this becomes the crucial element for maintaining consumer loyalty and ongoing involvement. As clients reap the advantages of our services, we expect not just their ongoing loyalty but also their tendency to utilize our offerings when considering business growth. Our strategy aims to build long-term relationships with our customers, drive growth within the business, and develop a strong entrepreneurial outlook. By establishing lasting relationships, we anticipate an environment where our growth is closely linked to the well-being and satisfaction of our esteemed customers, leading to mutual benefit

3.7 Distribution Channel

Our organizational distribution model is characterized by a complex directly complex system. The process is strategic, starting with purchasing from our trusted suppliers. Once received, these items are carefully stored in our strategically located warehouses, assuring an efficient and systematic inventory management system.

After successfully negotiating with the client, the next step is to implement our state-of-the-art parking solutions in their allocated parking space. This phase is a comprehensive planning process and is implemented to ensure that our products are successfully integrated into the customer's infrastructure.

Basically, our distribution methods can be summarized as follows: We obtain required products from suppliers, pack and store our inventory in warehouses, and then deliver our products are delivered to the user and stored. This efficient and reliable supply chain encourages good supplier-consumer relationships.

Suppliers > Warehouse > Consumer

3.8 Inventory Control

To ensure balance and efficiency between our supply chain and demand dynamics, we are dedicated to implementing a robust inventory management system that uses Microsoft Excel as a primary tool. This technology will complement our efforts, making it easier to systematically track and carefully record all important inventory information. One of the most important aspects of our strategy is to create a well-defined inventory, which is an important part of all our programs. The purpose of this restriction is to act as an early warning system, ensuring increased vigilance when inventory levels fall below predetermined levels

This mode of operation not only allows for rapid inventory checks but also acts as a way to prevent supply chain disruptions that may occur due to market distress or unexpected changes. The primary objective is to strengthen tolerance to market fluctuations through an inventory management system. By strategically implementing this program, we aim to improve our organization's ability to effectively and intelligently manage market risks.

3.9 Human Resource

Each of the three partners in the project will have specific tasks and responsibilities within their area of expertise. One partner will act as an experienced marketing manager, another will be a discerning financial manager, and a third partner will be responsible for meticulously monitoring operations Together, we will guide the operations of the organization towards optimum performance, we have diligently addressed every possible obstacle that may arise. We will systematically maintain detailed records of all operations, ensuring clear information about our operational efforts and enabling strategic decision making for robust expansion. Alongside our managerial responsibilities, we acknowledge the necessity of hiring extra staff on a contractual basis to supervise product installations and deliver crucial maintenance services.

We are dedicated not only to the internal dynamics of our collaboration, but also to the larger workforce. In light of the intense competition in the employment market, we intend to provide our employees with a remuneration package that is in line with prevailing market norms. Not only does this strategy seek to attract highly skilled workers, it also encourages long-term commitment, acknowledging the broader problem of retention. We recognize that the process of recruiting and onboarding new employees is time- and financially demanding. Having a group of employees stay with the company for the long term is important in the strategy. The accumulated knowledge of the company's operational and production data can enhance organizational stability and efficiency. These experienced professionals will also assume responsibility in training new employees and will eventually move into managerial positions as our organization grows, providing a solid foundation for long-term growth and success.

3.10 Financial Plan

3.10.1 Module 1

(system installation with 1 years maintenance)

- Costing per parking 18,000
- Assume the total vehicles are 300 (300*18,000)=5,400,000
- Costing =5,400,000 (300 Units)
- Selling Price =7,500,000 (300 Units)
- Maintenance fees = 100,000 (100,000*12 =1,200,000 For 1 years)
- Total Amount = Selling Price + Maintenance fees =7,500,000 + 1,200,000 = 8,700,000
- Profit =8,700,000 - 5,400,000 =3,300,000

Table 3.1: Projected Income Statement of Module 1

	Quarter 1			Quarter 2			Total
	Jan	Feb	Mar	Apr	May	Jun	
Revenue	2,500,000	5,000,000	7,500,000	3,750,000	6,250,000	3,750,000	28,750,000
COS	1,800,000	3,600,000	5,400,000	2,700,000	4,500,000	2,700,000	20,700,000
Gross Profit	700,000	1,400,000	2,100,000	1,050,000	1,750,000	1,050,000	8,050,000
Operating cost	140,000	135,000	138,000	136,000	134,000	135,500	818,500
PBT	560,000	1,265,000	1,962,000	914,000	1,616,000	914,500	7,231,500
Tax (10%)	56,000	126,500	196,200	91,400	161,600	91,450	723,150
Net Income	504,000	1,138,500	1,765,800	822,600	1,454,400	823,050	6,508,350

The table header row above spans "Profit and Loss Statement".

Table 3.2: Sales

Selling price per unit   25,000

Sales	Quarter 1			Quarter 2			Total
	Jan	Feb	Mar	Apr	May	Jun	
Centaurus	100		200		150		450
Giga		100	100			150	350
Dominion		100		150			250
Gulberg					100		100
	2,500,000	5,000,000	7,500,000	3,750,000	6,250,000	3,750,000	28,750,000

Table 3.3: Per unit price

Item	Per Unit Price
LCD Panel	300
Micro Controller Mega	4500
IR Sensor 150	150
Lazear for Sensor	250
Supplier (3)	7500
Wire	300
Enclosure	1500
Hardware equipment	1000
Bulb	500
Installation	2000
Total	18000

Table 3.4: Cost of goods sold

Cost of Goods Sold							
	Quarter 1			Quarter 2			Total
	Jan	Feb	Mar	Apr	May	Jun	
Total Sales	100	200	300	150	250	150	1,150
Total COS	1,800,000	3,600,000	5,400,000	2,700,000	4,500,000	2,700,000	20,700,000

Table 3.5: Operating Expense

Operating Expense							
	Quarter 1			Quarter 2			Total
	Jan	Feb	Mar	Apr	May	Jun	
Pays & wages	60,000	60,000	60,000	60,000	60,000	60,000	360,000
Rent	40,000	40,000	40,000	40,000	40,000	40,000	240,000
Utilities	20,000	15,000	18,000	16,000	14,000	15,500	98,500
Fuel	20,000	20,000	20,000	20,000	20,000	20,000	120,000
Total	140,000	135,000	138,000	136,000	134,000	135,500	818,500

3.10.2 Module 2

(Subscription Paid Parking)

- 100 RS per Vehicle Parking Max time 3hrs
- Assume Mall open for 12 hrs.
- 100 Spaces in total rotation for 12 hrs. is 300 Vehicles
- 100 RS * 100 Vehicles = 10,000 RS (For 3 hrs.)
- For 12 hrs. (10,000 * 4) = 40,000 (Per day earning for 12 hrs. with rotation)
- For month 30 * 40,000 = 1,200,000
- For a Year = 12 * 1,200,000 = 1,440, 000 RS
- For 3 years 36 * 1,200,000 = 43,200,000
- Expense for 1 month 850,000 Rs (For 100 Units)
- Expense for 1 year (12 * 850,000 = 10,200,000)
- Expense For 3 year (36 * 850,000 = 30,600,000)

Table 3.6: Projected income Statement of Module 2

Profit and Loss Statement			
	Quarter 1	Quarter 2	Total
Revenue	15,000,000	13,750,000	28,750,000
COS	10,800,000	9,900,000	20,700,000
Gross Profit	4,200,000	3,850,000	8,050,000
Operating cost	2,258,000	2,265,500	4,523,500
PBT	1,942,000	1,584,500	3,526,500
Tax (10%)	194,200	158,450	352,650
Net Income	1,747,800	1,426,050	3,173,850

Table 3.7: Sales

Selling price per unit   25,000

Sales	Quarter 1			Quarter 2			Total
	Jan	Feb	Mar	Apr	May	Jun	
Centouras	100		200		150		450
Giga		100	100			150	350
Dominion		100		150			250
Gulberg					100		100
	2,500,000	5,000,000	7,500,000	3,750,000	6,250,000	3,750,000	28,750,000

Table 3.8: Per unit price

Item	Per Unit Price
LCD Panel	300
Micro Controller Mega	4500
IR Sensor 150	150
Lazear for Sensor	250
Supplier (3)	7500
Wire	300
Enclosure	1500
Hardware equipment	1000
Bulb	500
Installation	2000
Total	18000

Table 3.9: Cost of goods sold

Cost of Goods Sold							
	Quarter 1			Quarter 2			Total
	Jan	Feb	Mar	Apr	May	Jun	
Total Sales	100	200	300	150	250	150	1,150
Total COS	1,800,000	3,600,000	5,400,000	2,700,000	4,500,000	2,700,000	20,700,000

Table 3.10: Operating Expense

	Quarter 1			Quarter 2			Total
	Jan	Feb	Mar	Apr	May	Jun	
Pays & wages	150,000	150,000	150,000	150,000	150,000	150,000	900,000
Rent	40,000	40,000	40,000	40,000	40,000	40,000	240,000
Utilities	20,000	15,000	18,000	16,000	14,000	15,500	98,500
Lease	300,000	300,000	300,000	300,000	300,000	300,000	1,800,000
Power Maint.	200,000	225,000	250,000	215,000	235,000	240,000	1,365,000
Fuel	20,000	20,000	20,000	20,000	20,000	20,000	120,000
Total	730,000	750,000	778,000	741,000	759,000	765,500	4,523,500

Table 3.11: Balance Sheet

Balance Sheet					
Fixed Assets			Liabilities		
Furniture		102,000	Accounts Payable		300,000
Equip		118,000	Equity		
Vehicle		780,000	Shareholders Eq		4,200,000
Total FA		1,000,000			
Non Fixed Assets					
Cash and CE		700,000			
Inventory		1,800,000			
A.R		1,000,000			
Total NFA		3,500,000			
Total assets		4,500,000	Total L and SE		4,500,000

CHAPTER 4
TESTING AND DEVELOPMENT

4.1 Purpose

The main objective of the experiment is to critically analyze the efficiency of our technology. These assessments aim to identify any potential barriers or barriers to provide useful insights into areas that may require improvement for greater operational efficiency These tests aim to encourage active customer engagement and they have had their experience with our technology in real life situations. Feedback will be an important asset, teaching us to implement necessary changes and improvements. This iterative approach assures that every aspect of our design harmoniously matches real-world needs and expectations. Understanding the importance of these tests for our internal assessment and demonstrating the capabilities of our products and services to our customers emphasizes the critical role they play in the overall success of our operations.

4.2 Testing Method

We are using our system in a commercial parking lot to test our product. We will cover a third of the parking lot with our system and see how our system performs in a real-world situation. We will collect all feedback and use it to identify improvements or enhancements needed in the process. Driver feedback will be key to understanding how the driver perceives our product and what improvements or changes may be needed to make it a seamless experience for the driver.

Drivers can be interviewed when exiting the parking lot to gauge how their experience was with Park Sense and whether or not they would prefer Park Sense over the traditional manual parking experience. Data analytics will help us gauge the average time it took a driver to find a parking spot via Park Sense versus looking for a parking spot manually. This will allow us to see how much time is being, and help us gauge the satisfaction of people who are parking via Park Sense.

4.3 Research Analysis

The questionnaires are used to research about the current about the current market trends regarding customer preferences. It will show us the actual demand present in the market and customers led back. We got our survey filled by 102 people who live all over the city and drive car. We covered ages between 18 - 60 to keep the results affective.

Our survey covers the feedback of our respondents about the product, how often they find hard to find parking spaces. Do they feel the need for parking assistance product and their views about

store of this product?

All questionnaires were filled by drivers, but responses were similar from all age group. Everyone preferred the idea of sensor-based parking finding product as they face this issue at least once in a week. These results were positive for us as we see a very bright future for our smart parking product.
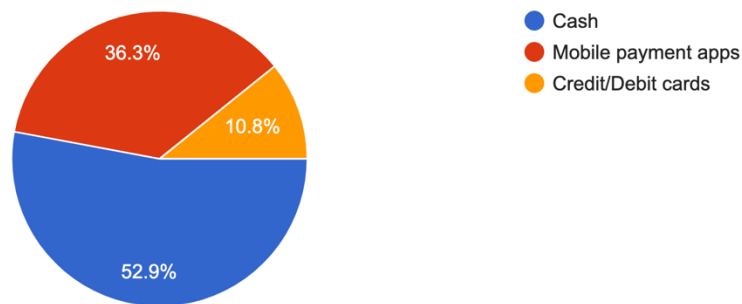
Figure 4.1

Is parking availability a significant challenge in your locality?
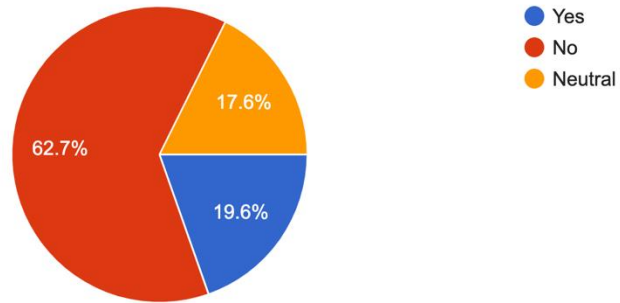102 responses

- Yes
- No
- Neutral

20.6%
9.8%
69.6%
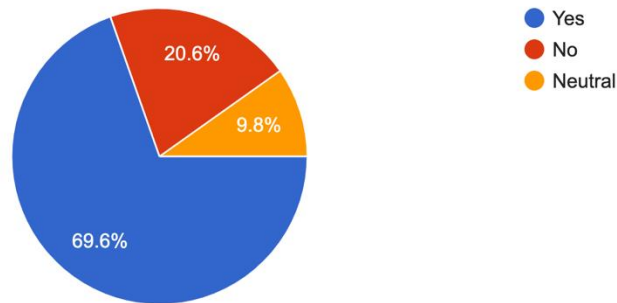
Figure 4.2

What is your preferred method of payment for parking facilities?
102 responses

- Cash
- Mobile payment apps
- Credit/Debit cards

36.3%
10.8%
52.9%

Figure 4.3

Do you feel secure about your vehicle's safety when parked in public spaces?

102 responses

- Yes
- No
- Neutral

17.6%

62.7%

19.6%

Figure 4.4

Are you aware of or have experience with smart parking solutions that assist in finding parking spaces?

102 responses

- Yes
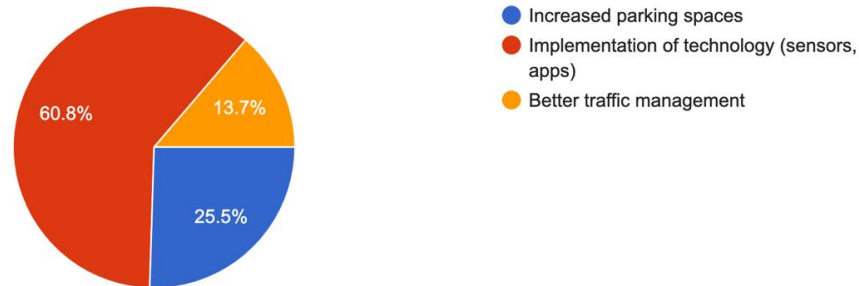- No
- Neutral

55.9%

11.8%

32.4%
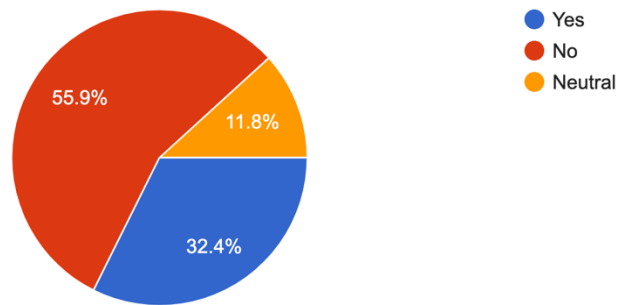
Figure 4.5

What improvements do you think could enhance the parking situation in your area?
102 responses

4.4 SWOT Analysis

4.4.1 Strengths

- This is an innovative system and is not being used in commercial parking.

- Business is scalable.

- There is a gap in the market that Park Sense can fill.

- First mover advantage in sensor-based parking technology.

4.4.2 Weaknesses

- Lack of awareness.

- High cost.

- Since we are new, we have to learn and improve as we go. There is no existing case studies in Pakistan for us to learn from.

4.4.3 Opportunities

- A lot of commercial buildings are under construction in twin cities that will require a sensor-based parking technology like Park Sense.

- We can expand into other major cities and offer our services in the commercial buildings there.

- We can expand into office districts and shopping districts that are facing a major parking problem.

4.4.4 Threats

- People are hesitant to be the first to adopt new technology.

- Can be duplicated to a certain extent.

- Real estate market going through a crisis.

CHAPTER 5

FUTURE DEVELOPMENTS AND ENHANCEMENTS

5.1 QR Code

Our strategic vision includes the integration of a QR codes-based system, which serves as a crucial element, envisioning a wide range of applications. This technology is specifically intended to accurately monitor the length of time a parked car remains and to determine the appropriate payment based on the period of occupancy. The adaptability of QR codes will be utilized to enable online payments for parking, going beyond just tracking. This innovative method not only simplifies and updates our operational procedures but also represents a substantial advancement towards automating our processes. Our goal is to leverage QR code technology to convert critical aspects of our business to a digital format, thereby promoting effort, accuracy and a smooth experience for our customers.

5.2 Park Sense App

As part of our strategic goals, we want to introduce a state-of-the-art Park Sense app that aims to revolutionize the parking experience. This revolutionary application is designed to not only display the total number of parking spaces available on a particular street but also the individual free parking spaces within that street Using the Park Sense app Using it, users can find the perfect easy parking space and go directly to the unique parking lot with ease

The Park Sense app provides more than just real-time information about available parking. Users will have the ability to reserve their preferred parking spaces by pre-paying online. This function not only enables customers to easily choose the right parking space but also allows them to know its availability upon arrival. The Park Sense app offers multiple payment methods, allowing users to process their purchases quickly. Users can choose to deposit the remaining funds into the app or pay directly with their debit card or mobile wallet for better service.

The Park Sense app is designed to be more than just a tool to provide real-time parking information. It aims to be a holistic solution that gives users control, convenience and efficiency in managing their parking needs.

5.3 Security Enhancements

Our strategic plan prioritizes strengthening our security measures to ensure a safe and complete user experience. Moving forward, we plan to add new safety features to the Park Sense app and create a new

way for customers to check the condition of their parked vehicle. This innovation enables customers to continuously monitor their vehicles and act as a countermeasure to any potential problems offering a proactive approach to vehicle safety This functionality goes beyond what it does simply simplify by eliminating the need to search objectively throughout the parking lot, providing customers with accurate and up-to-date information

In addition, we plan to add QR code scanning features to the app as part of our strategic development. When users arrive at the Park Sense parking lot, they can easily scan a QR code and then drive license plate embedded in smartphone prompt. Importantly, the vehicle cannot be used inside the parking lot until the QR code is scanned at the exit. This advanced protection acts as a powerful anti-vehicle theft deterrent, assuring that only the person who enters with a given license plate has to leave with the matching license plate That day besides, we mean the use of number plates visible the state-of-the-art equipment at entry and exit points, security -In order to make tracking more efficient and convenient, it captures the vehicles the licensing process is systematically.

Implementing these new and sophisticated safety features will not only enhance our security systems but also give people unwavering confidence in protecting their vehicles. In addition, we propose to enter into a cooperation agreement with Islamabad Security Savers, with a commitment to continue providing detailed information to them. If a stolen car is found in our parking lot, this shared data could be important clues for Islamabad's security banks. It can help identify and arrest criminals by using information from app users.

In addition to security, the data generated by our application will be key to comprehensive data analytics. Systematically analyze usage patterns, including duration of supermarket visits, frequency of individual visits, and other relevant patterns. The data can be shared with retail outlets or organizations interested in obtaining valuable information, promoting cooperation and mutual benefit.

Ultimately, these forward-thinking improvements in security and strategic advancements are crucial not only for our ability to grow and gain trust in the market, but also to emphasize our dedication to provide a cutting-edge, safe, and customer-focused parking solution. Our goal is to prioritize these elements in order to build trust among users and establish Park Sense as a pioneering leader in advanced and safe parking solutions.

CHAPTER 6
CONCLUSION

6.1 Conclusion

Park Sense is a sensor-based parking technology system that allows users to check which lane has parking spots available and how many parking spots are open in a certain lane in a commercial parking lot. This allows users to directly go to that lane instead of having to manually look around for a parking spot, not knowing whether a lane has an open parking spot or not. This can be very frustrating and time-consuming for people and Park Sense aims to remove the hassle of manually looking for a parking spot by having an LCD display that shows user which lane has a parking spot open and how many spots are open in that lane.

Park Sense has two modules that customers can choose from. One module is simply an installation and maintenance module on a 3-year contract basis where Park Sense will be responsible for the installation of its product and regular maintenance of it. If any issues in the product arise, we will be responsible for its resolution.

The second module is a subscription-based model where Park Sense will be responsible for the whole operation of the parking lot, from installation to day-to-day operations. In this model, Park Sense will be the parking lot administration and handle everything related to the parking.

Park Sense is an innovative product in this market and hence requires a lot of marketing work to be done in order to build awareness and gain market share. Park Sense has the first mover advantage so it would be easier to capture market share. But the challenge is that as an new technology system, it will require a lot of effort to get people to adopt this technology as people are hesitant to be the first one to adopt an technology.

Once someone adopts Park Sense and realizes the value it provides, it will help build the trust and awareness that Park Sense needs to capture market share and grow its business. We hope to implement Park Sense into all commercial parking lots, and take majority of the market share. We hope to provide exemplary service to our customers to ensure we stay in long-term relationship and be their preferred parking lot service provider for all their expansions.

Park Sense's future plans to implement QR codes and Park Sense app will be key to Park Sense's growth and allow us to scale our business. The more ease a user faces when availing a service, the more that user would prefer to use that service over something that is a hassle, like manually looking for a parking spot

which is both time consuming and frustrating. With a seamless parking experience that Park Sense provides, we aim to help users realize how easy and smooth parking their car in commercial parking lots can be.

References

Yu, H.M., Pang, Z. F. and Ruan, D.R. (2008) The Design of the Embedded Wireless Vehicles Monitoring Management System Based on GPRS : Evidence from China. International conference on Intelligent Information Technolo-gy,Shanghai, 21-22 December 2008, 677-680.

Wang, L.F., Chen, H. and Li, Y. (2009) Integrating Mobile Agent with Multi-agent System for Intelligent Parking Ne-gotiation and Guidance. 4th IEEE Conference on Industrial Electronics and Applications, 25-27 May 2009, Xi'an, 1704-1707.

Abdallah, L., Stratigopoulos, H.-G., Mir, S. and Kelma, C. (2012) Experiences With Non-Intrusive Sensors For RF Built-In Test. 2012 IEEE International Test Conference (ITC), Anaheim, 5-8 November 2012, 1-8.

D. Kim and W. Chung (2008) Motion Planning for Car-Parking Using the Slice Projection Technique. IEEE/RSJ In-ternational Conference on Intelligent Robots and Systems, Nice, 22-26 September 2008, 1050-1055.

Zhang, B., Jiang, D.L., Wang, F. and Wan, T.T. (2009) A Design of Parking Space Detector Based on Video Image. The Ninth International Conference on Electronic Measurement & Instruments, Beijing, 16-19 August 2009, 253-256.

Sreedevi, A.P. and Nair, B.S.S. (2011) Image Processing Based Real Time Vehicle Theft Detection and Prevention System. 2011 International Conference on Process Automation, Control and Computing (PACC), Coimbatore, 20-22 July 2011, 1-6.

Zhang, X., Li, Y., Wang, J. and Chen, Y. (2009) Design Of High-Speed Image Processing System Based on FPGA. The Ninth International Conference on Electronic Measurement & Instruments, Beijing, 16-19 August 2009, 65–69.

Jermsurawong J., Ahsan, M., et al. (2012) Car Parking Vacancy Detection and Its Application in 24-Hour Statistical Analysis. 10th International Conference on Frontiers of Information Technology, Islamabad, 17-19 December 2012, 84-90,

Lin, S., Chen, Y. and Liu, S. (2006) A Vision-Based Parking Lot Management System. IEEE International Conference on Systems, Man, and Cybernetics, Taipei, 8-11 October 2006, 2897-2902.

Conci, A., Carvalho, J. and Rauber, T. (2009) A Complete System for Vehicle Plate Localization, Segmentation and Recognition in Real Life Scene. IEEE Latin America Transactions, 7, 497-506. http://dx.doi.org/10.1109/TLA.2009.5361185

Lee, K. (2012) Colour Matching for Soft Proofing Using a Camera. IET Image Processing, 6, 292-300.

Tang, V., Zheng, Y., Cao, J., Hong, T. and Polytechnic, K. (2006) An Intelligent Car Park Management System Based on Wireless Sensor Networks. 1st International Symposium on Pervasive Computing and Applications, 3-5 August 2006, Urumqi, 65-70.

Jinghong, D., Yaling, D. and Kun, L. (2007) Development of Image Processing System Based on DSP and FPGA. The Eighth International Conference on Electronic Measurement and Instruments, 16 August 2007-18 July 2007, Xi'an, 791-794.

Matjašec, Ž. and Ĉonlagiü, D. (2011) An Optical Signal Processing Device for White-Light Interferometry, Based on CPLD. 2011 Proceedings of the 34th International Convention MIPRO, Opatija, 23-27 May 2011, 60-64.

Wang, Y., Zhou, G. and Li, T. (2006) Design of a Wireless Sensor Network for Detecting Occupancy of Vehicle Berth in Car Park. Seventh International Conference on Parallel and Distributed Computing, Applications and Technologies, Taipei, December 2006, 115-118.

Funck, S., Mohler, N. and Oertel, W. (2004) Determining Car-Park Occupancy from Single Images. 2004 IEEE Intel-ligent Vehicles Symposium, Parma, 14-17 June 2004, 325-328. http://dx.doi.org/10.1109/IVS.2004.1336403

Zilan, R., Barceló-Ordinas, J.M. and Tavli, B. (2008) Image Recognition Traffic Patterns for Wireless Multimedia

H. Al-Kharusi, I. Al-Bahadly 53 Sensor Networks. In: Cerdà-Alabern, L., Ed., Lecture Notes in Computer Science Volume 5122: Wireless Systems and Mobility in Next Generation Internet, 4th International Workshop of the EuroNGI/EuroFGI Network of Excellence, Barcelona, 16-18 January 2008, 49-59. http://link.springer.com/chapter/10.1007%2F978-3-540-89183-3_5

Wolff, J., Heuer, T., Gao, H., Weinmann, M., Voit, S. and Hartmann, U. (2006) Parking Monitor System Based on Magnetic Field Sensors. Proceedings of the IEEE ITSC 2006 Intelligent Transportation Systems Conference, Toronto, 17-20 September 2006, 1275-1279. http://dx.doi.org/10.1109/ITSC.2006.1707398

Riza, N.A., Marraccini, P.J. and Baxley, C.R. (2012) Data Efficient Digital Micromirror Device-Based Image Edge Detection Sensor Using Space-Time Processing. IEEE Sensors Journal, 12, 1043-1047.

Yusnita, R., Norbaya, F. and Basharuddin, N. (2012) Intelligent Parking Space Detection System Based on Image Processing. International Journal of Innovation, Management and Technology, 3, 232-235.

Caicedo, F. and Vargas, J. (2012) Access Control Systems and Reductions of Driver's Wait Time at the Entrance of a Car Park. 7th IEEE Conference on Industrial Electronics and Applications (ICIEA), Singapore, 18-20 July 2012, 1639- 1644.

Prasad, A.S.G., Sharath, U., Amith, B. and Supritha, B.R. (2012) Fiber Bragg Grating Sensor Instrumentation for Parking Space Occupancy Management. International Conference on Optical Engineering (ICOE), Belgaum, 26-28 July 2012, 1-4.

Chien, S.A. (1994) Automated Synthesis of Image Processing Procedures for a Large-Scale Image Database. 4th In-ternational Conference on Knowledge and Smart Technology (KST), Austin, 13-16 November 1994, 796-800.

Caicedo, F. and Vargas, J. (2012) Access Control Systems and Reductions of Driver's Wait Time at the Entrance of a Car Park. IEEE 7th International Conference on Industrial Electronics and Applications, Singapore, 18-20 July 2012, 1639-1644.

Boluk, P.S., Irgan, K., Baydere, S. and Harmanci, E. (2011) IQAR : Image Quality Aware Routing for Wireless Mul-timedia Sensor Networks. 7th International Wireless Communications and Mobile Computing Conference (IWCMC), Istanbul, 4-8 July 2011, 394-399.

Gall, R., Troester, F. and Mogan, G. (2010) Building an Experimental Car Like Mobail Robot for Fully Autonomous Parking. 2010 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), Montreal, 6-9 July 2010, Montreal, 6-9 July 2010, 1081-1086. http://dx.doi.org/10.1109/AIM.2010.5695903

Chen, M.K., Hu, C. and Chang, T.H. (2010) The Research on Optimal Parking Space Choice Model in Parking Lots. 3rd International Conference on Computer Research and Development (ICCRD), Shanghai, 11-13 March 2011, 93-97.

Barton, J., Buckley, J., O'Flynn, B., O'Mathuna, S.C., Benson, J.P., O'Donovan, T., Roedig, U. and Sreenan, C. (2007) The D-Systems Project—Wireless Sensor Networks for Car-Park Management. IEEE 65th Vehicular Technology Conference, Dublin, 22-25 April 2007, 170-173.

Souissi, R., Cheikhrouhou, O., Kammoun, I. and Abid, M. (2011) A Parking Management System Using Wireless Sensor Networks. 2011 International Conference on Microelectronics (ICM), Hammamet, 19-22 December 2011, 1-7.

Srikanth, S.V., Pramod, P.J., Dileep, K.P., Tapas, S., Patil, M.U. and Sarat, C.B.N. (2009) Design and Implementation of a prototype Smart PARKing (SPARK) System Using Wireless Sensor Networks.

International Conference on Ad-vanced Information Networking and Applications Workshops, Bradford, 26-29 May 2009, 401-406. http://dx.doi.org/10.1109/WAINA.2009.53

Appendix

Date: 1st January 2024

Abul Qasim Real State & Builders
Subject: Proposal for Abul Qasim Supermarket

Dear Adil Waseem,

We are excited to extend this agreement proposal to affirm our commitment to providing cutting-edge sensor-based parking solutions for your upcoming construction projects. Our services encompass the seamless integration of sensor technology to optimize parking spaces, ensuring efficiency and convenience for both residents and visitors.

Terms of Agreement:
1. **Scope of Services:**
   - Park Sense will oversee the installation of sensor parking technology in the designated parking areas of your construction projects.
2. **Implementation Schedule:**
   - The installation process will be executed in accordance with the project timeline, ensuring minimal disruption to construction activities.
3. **Technical Support:**
   - Park Sense guarantees ongoing technical support to address any issues and ensure the continuous functionality of the sensor parking system.
4. **Cost and Payment:**
   - The cost estimate for the installation will be provided separately. Payment terms will be discussed and agreed upon before the commencement of the project.
5. **Project Coordination:**
   - Our team will closely collaborate with your construction team to ensure a smooth integration process, adhering to safety and quality standards.

We are confident that our sensor parking solutions will not only enhance the value of your projects but also contribute to the overall satisfaction of end-users. Please signify your agreement by signing and returning a copy of this proposal.

Thank you for considering Park Sense as your partner in implementing state-of-the-art parking solutions.

Sincerely,
Muhammad Hamza
Marking & Sales Head
Park Sense
+923331585426

Contact us
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42

أبوالقاسم
BUILDERS AND DEVELOPERS

Date: _3rd January 2024_   Ref:_____

Park Sense
Subject: Agreement Proposal for Abul Qasim Supermarket

Dear Muhammad Hamza,

We are pleased to inform you that your project proposal for the installation of sensor-based parking solutions has been thoroughly reviewed and accepted by our team for Abul Qasim Supermarket. We appreciate the innovative approach and commitment to optimizing parking spaces in our construction projects. We look forward to a successful collaboration with Park Sense, confident that your expertise will contribute significantly to the efficiency and convenience of our parking facilities. Thank you for your comprehensive proposal, and we anticipate a successful and beneficial partnership.

Sincerely,
Adil Waseem
Abul Qasim Real State & Builders
+923160222222
engr.adilwaseem@gmail.com
ibaduet@gmail.com

Plot No, 19-A First Floor Office No-1, Main Jinnah Avenue, Bahria Town, Karachi - Pakistan.
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Bahria University
Islamabad Campus

MBA/BBA

1st Half Semester Progress Report

Enrollment No.	AbdullahDeen , Hamza Qaiser, Syed Usama (01-321222-081) (01-321222-025) (01-321222-045)
Thesis/Project Title	Park Sense Smart Parking
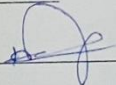
Supervisor Student Meeting Record

No.	Date	Place of Meeting	Topic Discussed	Signature of Student
1	6/oct/23	Faculty room	Proposal discussion	Abdullah
2	18/oct/23	Whats App	Topic Selection	Abdullah
3	21/oct/23	What's App	Introduction/Literature	Abdullah
4	4/nov/23	Whats APP	Model discussion	Abdullah

Progress Satisfactory [✓]   Progress Unsatisfactory [ ]

Remarks:_____

_____

_____

_____

_____

Signature of Supervisor: _____ Date: 5/Jan/2024

Note: <u>Students attach 1st & 2nd half progress report at the end of spiral copy.</u>

28

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Islamabad Campus

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2ⁿᵈ Half Semester Progress Report & Thesis Approval Statement

Enrollment No.	
Thesis/Project Title	

Supervisor Student Meeting Record

No.	Date	Place of Meeting	Topic Discussed	Signature of Student
5	6 Dec 23	Faculty room	Review of chapter 4 & 5.	Abdullah
6	21 Dec 23	Whats App	Costing Analysis	Abdullah
7	28 Dec 23	Whats App	Future Implication Discussion	Abdullah

APPROVAL FOR EXAMINATION

I hereby certify that the above candidates' thesis/project has been completed to my satisfaction and, to my belief, its standard appropriate for submission for examination. I have also conducted plagiarism test of this thesis using HEC prescribed software and found similarity index at _3%_ that is within the permissible limit set by the HEC for thesis/ project MBA/BBA. I have also found the thesis/project in a format recognized by the department of Business Studies.

Signature of Supervisor: _____ Date: 5/Jan/24

29

tgrg