

### PROBLEM OVERVIEW

Given the inability of current technology to provide accurate parking occupancy rates, the city of Hamilton needs to think of new technologies to enhance the user experience. The following areas can be analyzed.

- Whether other technologies could help the city of Hamilton determine parking occupancy rates
- Whether existing data can support the city of Hamilton's goals (improve user experience)
- Whether there are other measures to improve the user experience

### BACKGROUND

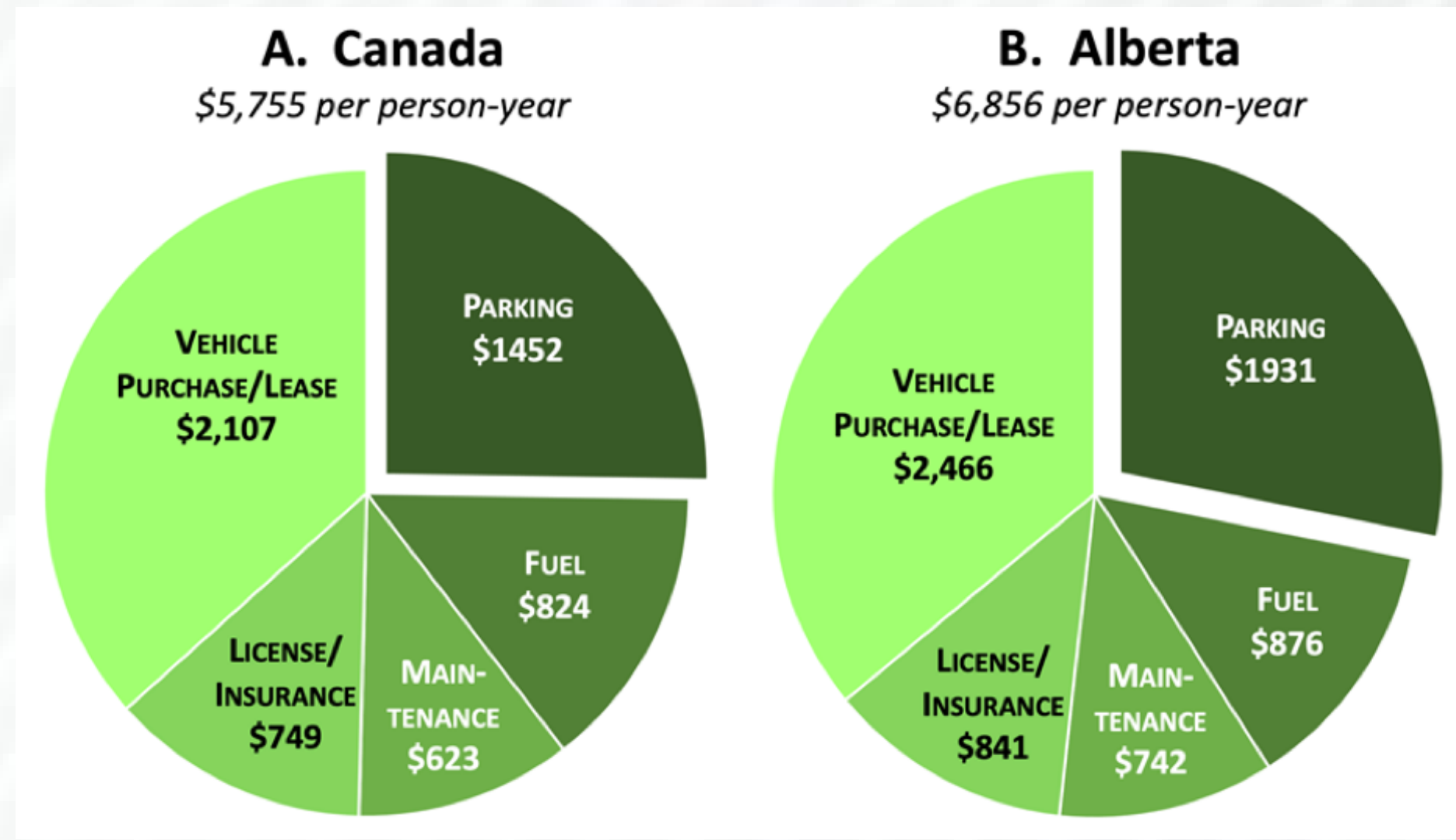
Technology is penetrating people's lives. More than 4,000 parking spaces in the city of Hamilton are being redesigned to improve operational efficiency. Currently, the city uses a payment system to determine parking space occupancy. However, this metric does not provide an accurate picture of the occupancy rate of each parking lot.

-In 2014, the city of Hamilton reported a parking shortage downtown, and in 2012, the peak utilization rate for downtown parking was 68%, which means that at the busiest times, there was still a 32% vacancy rate.

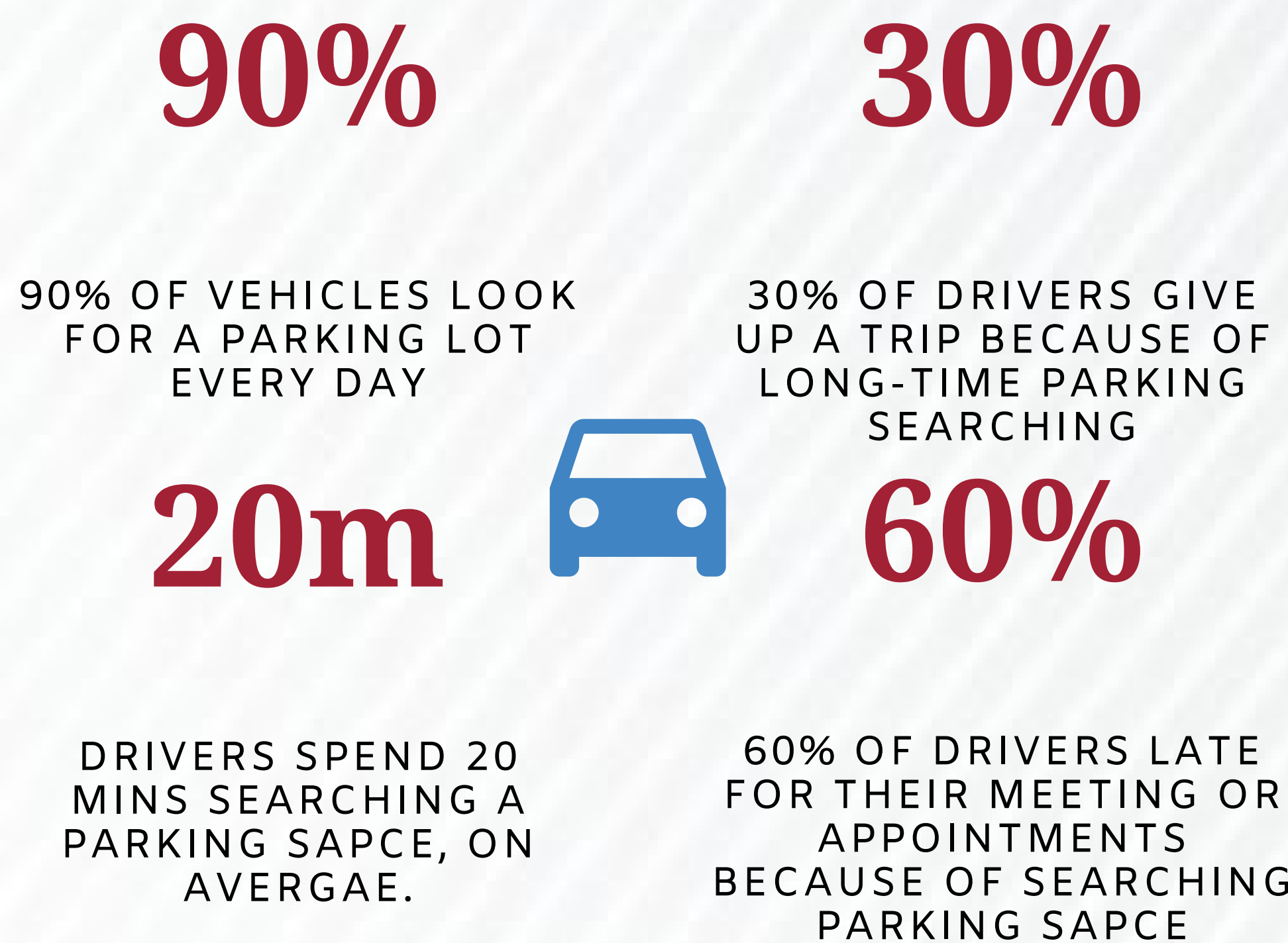
-A report suggests that peak occupancy in the Bay/King area and King William/John area will reach 85% and 84% in the next five years.

-In August 2020, the city of Hamilton debuted an app called "Passport Parking," which covers approximately 5,400 parking spaces. Parking users can use the app to pay quickly and efficiently at any parking lot that has the system. Also, people can recharge on the app without having to return to the parking lot to do so.

-Although the city of Hamilton is popularizing Passport Parking, most parking lots are still using traditional payment methods.

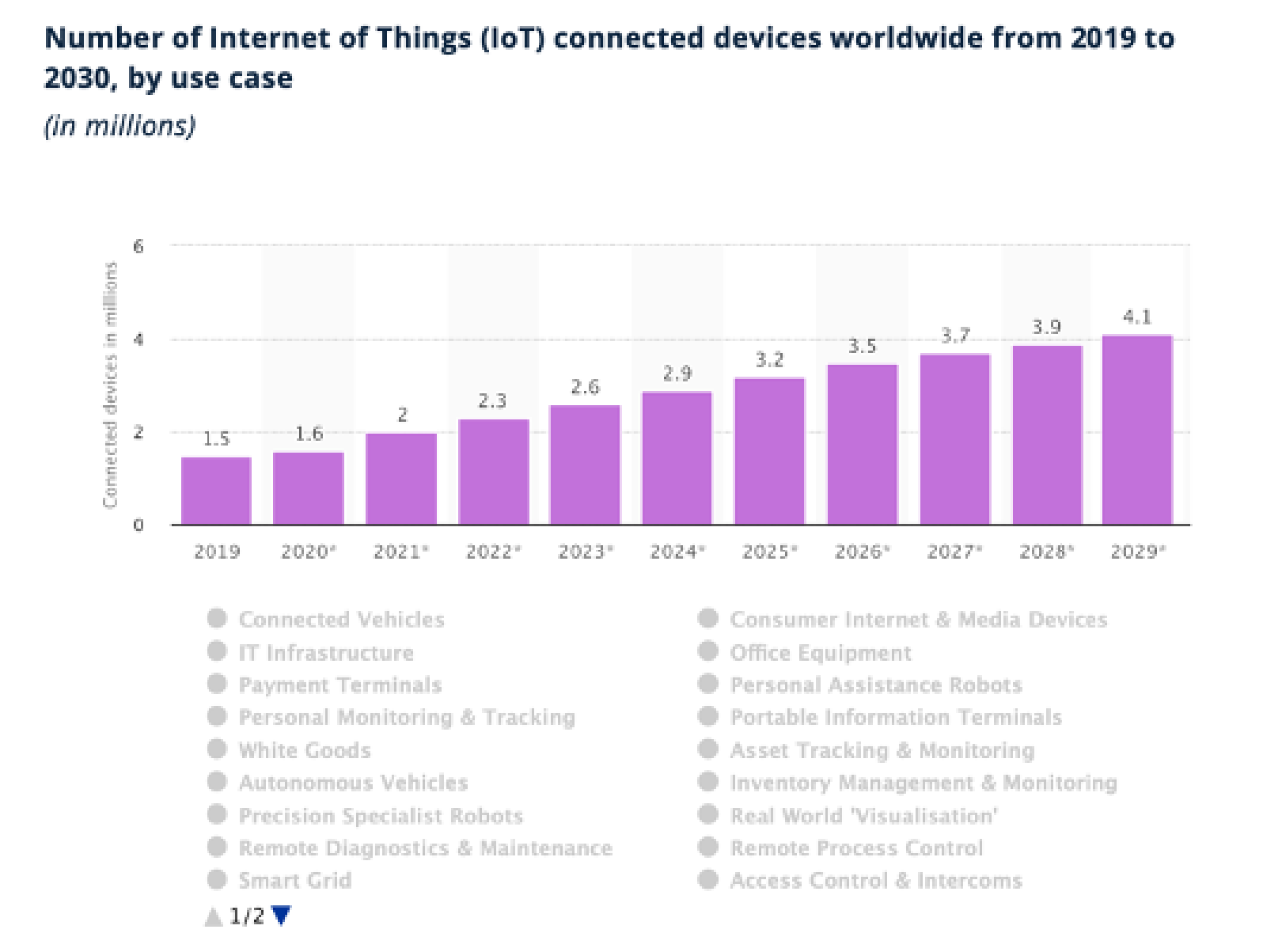


In Canada, the average Canadian for personal vehicle parking is a about \$1452 per year, which account for 25% of the cost of personal vehicle ownership

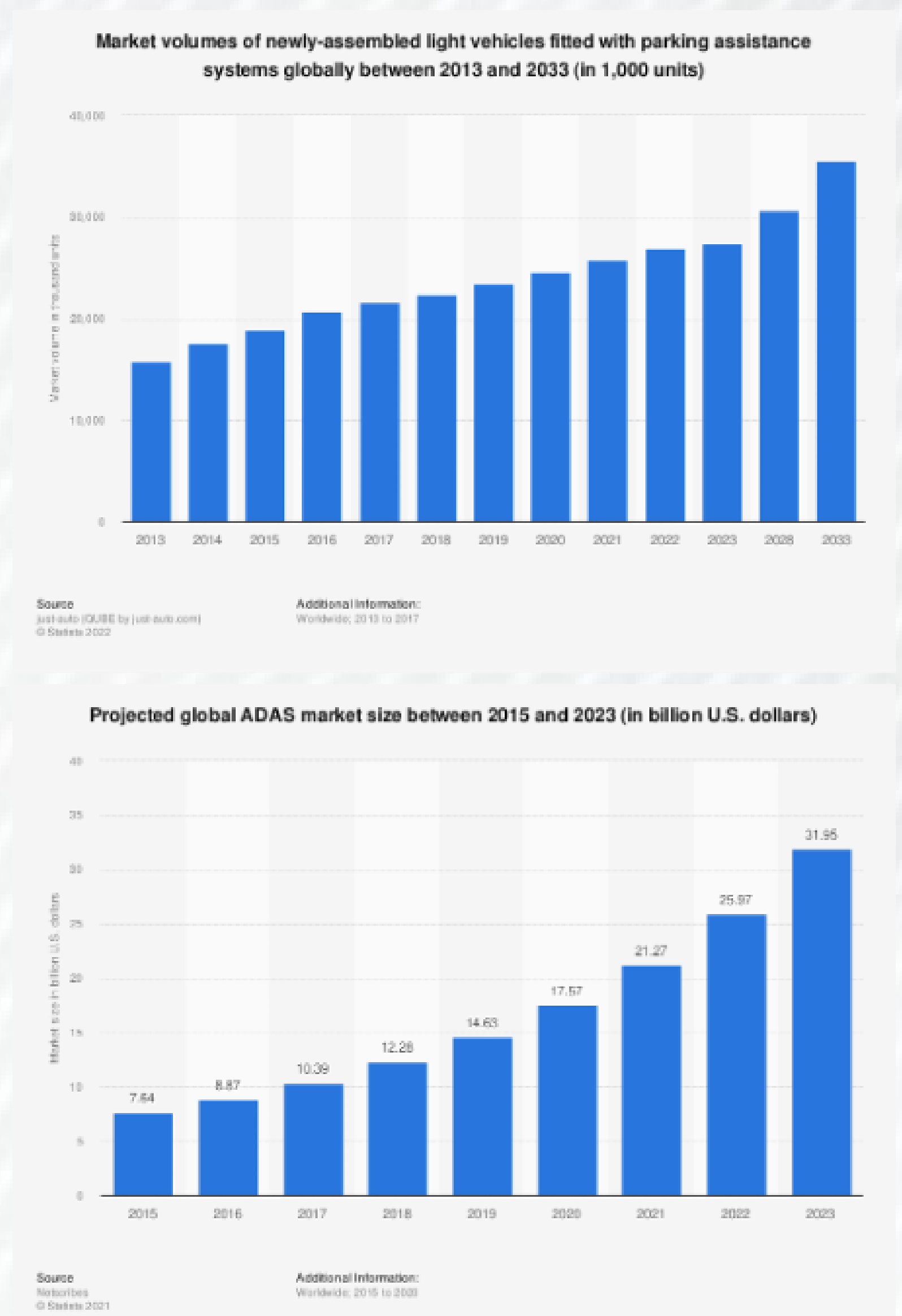


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The Internet of Things becomes a powerful technology for smart parking systems. The number of IoT connected devices increase year by year, which is a good tool for improving parking system.

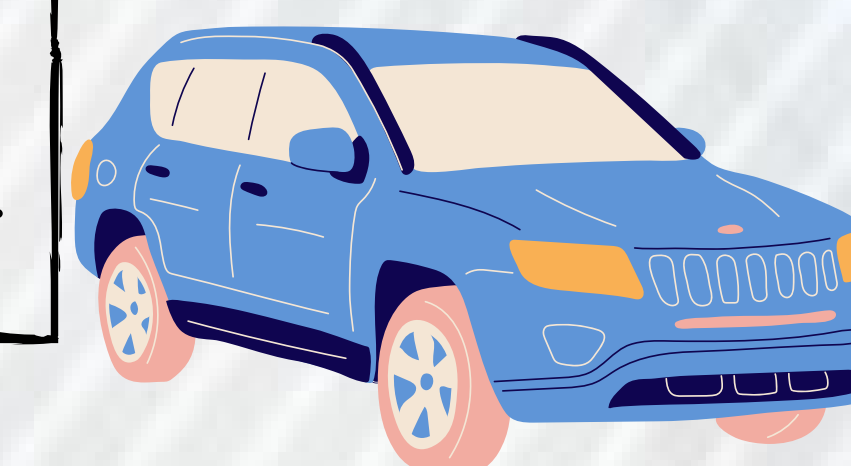


Predicted that more and more cars will equip with parking assistance systems, which can become an important part for designing a smart parking system.

### USER BEGAVIOUR



Persona for people who search park space



Male drivers are easier to be attracted by new things than female. Compared to the old, young people are more willing to use new parking system, not traditional parking lot.



Hour rate parking fee impact how people choose parking space. Low income drivers will search low-cost parking lot

### OTHER FACTORS



People consider the distance between parking lot and detestation and the time spending.



Parking time can affect the parking choice, and also for utilization ratio of the parking facilities



Parking fee also influence people's choices.



### RECOMMENDATION

- 1.**Automated robotic parking.** Intelligent robots help people to park and manage the entire parking lot. The advantage of this is that people do not have to spend a lot of time looking for parking spaces. People only need to reserve a parking space online with a license plate a few hours before they arrive at the parking lot.
2. **Place sensors above the parking space.** The sensor senses if there is a car in the current space and how long it has been there. This data can be collected and uploaded to the cloud. The parking staff can use the data to optimize the parking lot occupancy. At the same time, drivers can determine available parking spaces by the color of the sensor display lights.
- 3.**The relationship between parking time and parking fees.** To attract drivers who want to park close to their destination but are discouraged by the high parking fees, parking lots can adjust parking fees based on the length of parking, which means that the longer you park, the cheaper the parking fee will be.
- 4.**Define the target customer.** Given the very high cost of applying high technology, the government needs to upgrade parking systems in suitable parking lots. For example, parking lots around high-end shopping malls are targeted at mall-goers who have high incomes and prefer to park close to their destinations. In some remote parking lots, the target customers are more likely to be older and thus willing to use traditional parking systems.
- 5.**Additional Benefits.** For residents who live locally, the city of Hamilton can offer them a resident discount. This allows residents to drive out without worrying about parking fees. This initiative also prevents non-payment of parking fees or overtime parking.
- 6.**Parking lot car finding system.** Parking lot finder systems help drivers locate and find their cars quickly.

