Foreword

In June of 2023, the Autonomous Vehicle Alliance (AVA) conducted in-depth qualitative research with key stakeholders in the evolving V2X ecosystem. The simple question that grounded our conversation was “If you had V2X as a resource what would you do with it and why?”.

Stakeholders included, but were not limited to state, regional and municipal Departments of Transportation, enabling tech and data firms, infrastructure providers and builders, and public infrastructure assets (e.g., fire departments, airports, etc.).

The core findings from that research provided a framework to understand challenges and opportunities for future V2X deployment. A framework focused on safety and efficiency as a precompetitive enabling platform that provides a scalable platform for monetization and revenue sharing among stakeholders like OEMs, Tier One suppliers, and potential retail and municipal partners.

The missing piece of the puzzle remained to be consumers. How would consumers react to use cases built from this hypothesis? What was important and why was it valued? The AVA followed the stakeholder research with deep-dive qualitative research with consumers. Additional outside companies were brought in for this research to broaden the perspectives and conversations with consumers. Those companies represented the insurance industry, tier one automotive suppliers, OEMs, and V2X technology companies. This V2X qualitative consumer research was completed in June of 2024.

Foreword

Most respondents were readily accepting of V2X features that address familiar problems (e.g., “help me see things I can’t”), while a limited number of respondents felt V2X experiences were not applicable to them (e.g., “if you’re too oblivious to it, then don’t drive”). More information that is contextually relevant to the journey is welcome, while ceding actual control of the vehicle to ‘X’ is not. Safety features are considered community necessities with community benefits; the costs for those features are expected to be shared with the wider driving ecosystem (e.g., road taxes, insurance, etc.). New revenue opportunities do exist outside of critical/safety experiences (e.g., new convenience features).

PRE-COMPETITIVE / ENABLING PLATFORM	COMPETITIVE DIFFERENTIATION
SAFETY	NEW USER EXPERIENCES
EFFICIENCY	MONETIZATION AND REVENUE SHARING
Safety and efficiency reside in the precompetitive V2X space. This could incentivize the OEMs to agree on de facto standards to enable a platform for connectivity that takes the greater good into consideration and enables baseline features that enhance the overall journey and address safety, congestion, emissions, etc.	When the precompetitive / enabling platform is built out for safety and efficiency, competition can flourish in a new connected ecosystem. This new ecosystem allows for new user experiences, differentiation, competition, monetization and revenue sharing to flourish.

Foreword

The findings were confirmational to the stakeholder research and provided us with an opportunity to refine the use cases tested with consumers for a large quantitative study which brings us to where we are today.

The Society of Automotive Engineers and the University of Michigan's MCity were key sponsors of the following V2X Quantitative Consumer Research and have made the bold decision to make the research findings completely public with no restrictions. What follows are those findings and the analysis that ties all three pieces of research together.

With vast amounts of intelligent infrastructure being deployed and invested in, this research provides us with focus and enabling business models to scale V2X at a system level.

VEHICLE TO EVERYTHING(X)
QUANTITATIVE CONSUMER RESEARCH

PREPARED FOR:

M | city
UNIVERSITY OF MICHIGAN

SAE INTERNATIONAL®

December 2024

V2X Quantitative Research

Prior research (reference)

	WHAT	WHO	OUTCOMES
STAKEHOLDER RESEARCH JUNE 2023	AVA sponsored qualitative research with key stakeholders in the V2X ecosystem, to explore its potential application and benefits.	State/muni Departments of Transportation Tech and data firms Infrastructure providers Public entities (e.g., fire departments, airports, etc.)	Study outlined a V2X deployment framework prioritizing safety and efficiency as foundational elements. This framework aims to create a scalable platform for monetization and revenue sharing to benefit OEMs, Tier One suppliers, and retail and municipal partners.
CONSUMER RESEARCH MAY 2024	The AVA and additional collaborators (Tier One supplier, insurance ompany, V2X supplier) conducted qualitative research with consumers to explore their opinions of V2X applications and benefits.	Geographic and demographically divergent cross section of US consumers, in both online and in-person focus group settings	Consumers were open to V2X features that addressed safety as well as relevant journey information. New revenue opportunities were identified in convenience features beyond critical safety functions. These findings align with prior stakeholder research and helped refine use cases for a quantitative research

V2X Quantitative Research
Project objectives and goals

BACKGROUND

POCO Labs conducted a qualitative consumer study on the topic of V2X.

The objectives were to explore 3 separate categories of V2X-enabled experiences and to gather feedback on 9 different use cases.

Leveraging insights gained from the qualitative research, this study provides quantitative results upon which future product decisions can be based.

OBJECTIVES

Quantify insights discovered during the qualitative study.

Understand acceptance/rejection of V2X in general as well as different levels of autonomous driving.

Develop archetypes for consumers who prefer the various use cases, including those who prefer full autonomy versus those who wish to remain in control.

Understand if/when mobile apps would be a preferred solution to any of the use cases.

METHODOLOGY

Online survey fielded

12/4 – 12/17/2024

N=2003 participants

2021+ MY vehicle, purchased/leased new

50+% responsible for purchase decision

Not sensitively employed

18+ years old

Data was cleaned to ensure quality responses only

Report contents

Background & Methodology

Participants were screened for specific criteria:

Non-competitive employment

Age and gender

Rural/urban/suburban user

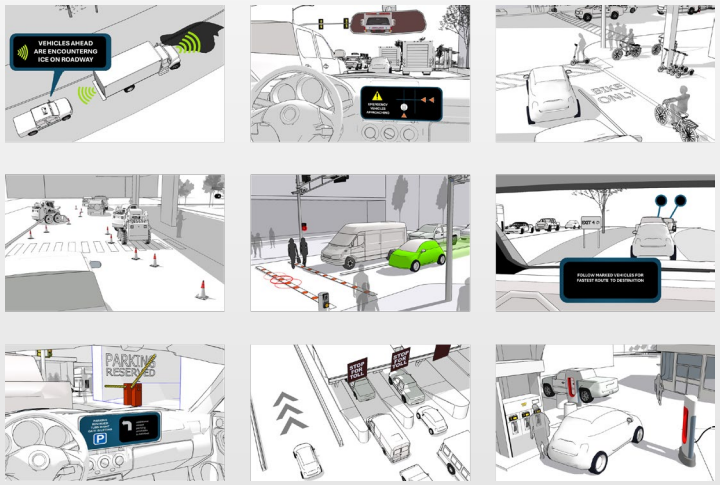
Purchased/leased 2021 or newer vehicle
principal driver and purchase decision maker

ICE / hybrid / EV

Adoption profile (early / skeptic)

Frequency and duration of use

Participants (n=2003) **reviewed nine individual use cases***, in randomized order.



Participants **evaluated each use case** individually:

interest in feature in vehicle

Expected frequency of use

Value of feature*

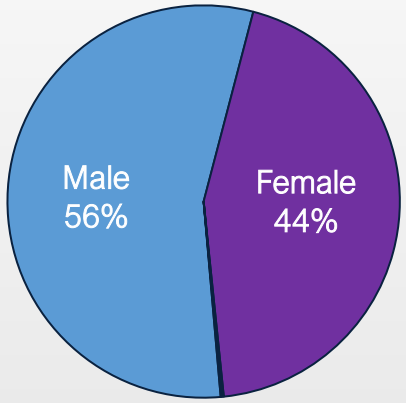
Participants **evaluated all features** to understand relative value (rating/ranking exercise)

*use case details shown on slide 20

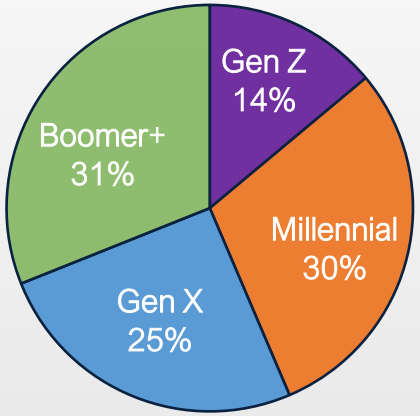
**To optimize survey length and content, questions on each feature's value and relation to each other were presented in lieu of pricing queries.

Background & Methodology

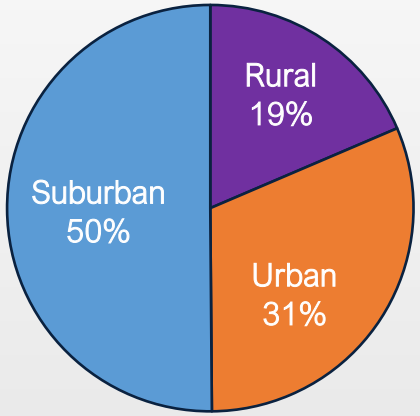
Gender



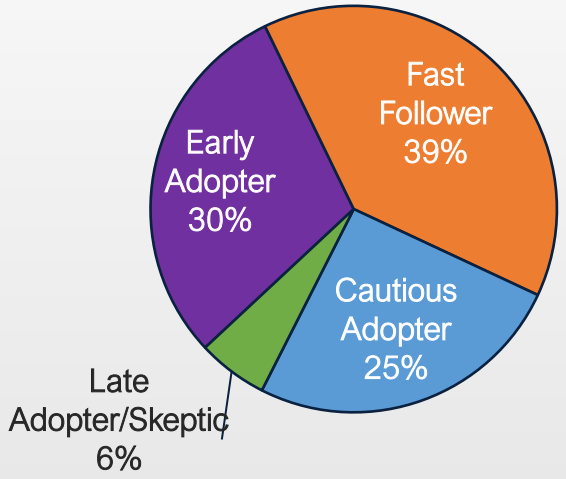
Cohort



Geo distribution



Tech adoption

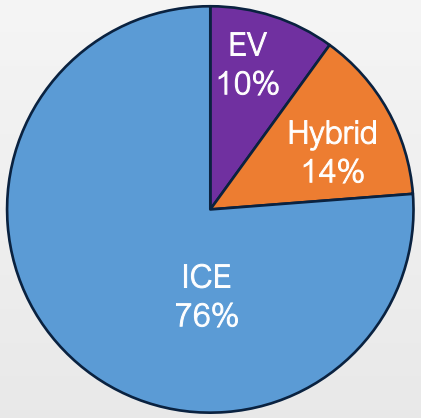


n=2003

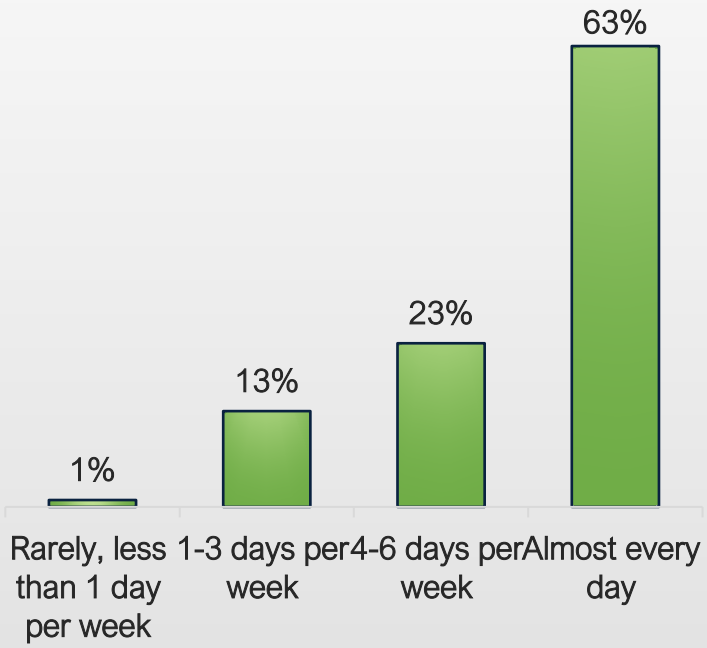
- Technology adoption is inversely correlated to age; appetite for adoption decreases with age.
- Urban dwellers are significantly more likely to be younger and Early Adopters / Fast Followers.

Background & Methodology

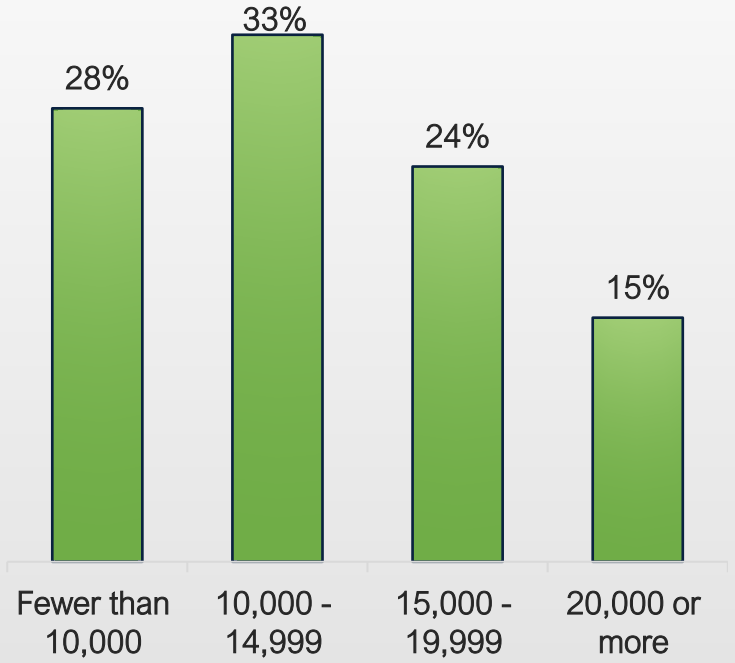
Powertrain



Drive frequency



Miles per year



n=2003

Key Takeaways

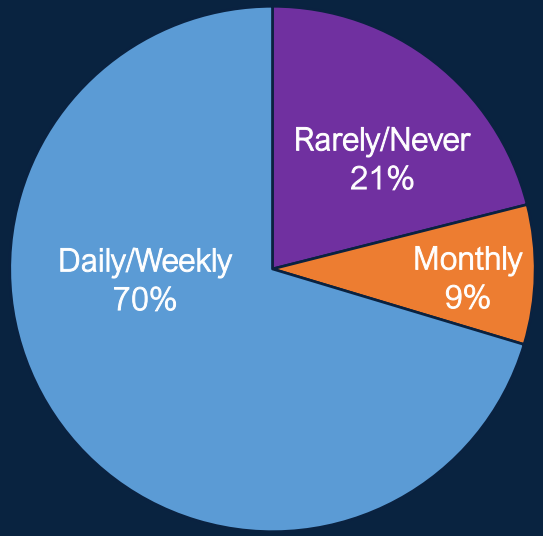
V2X Quantitative Research

Findings

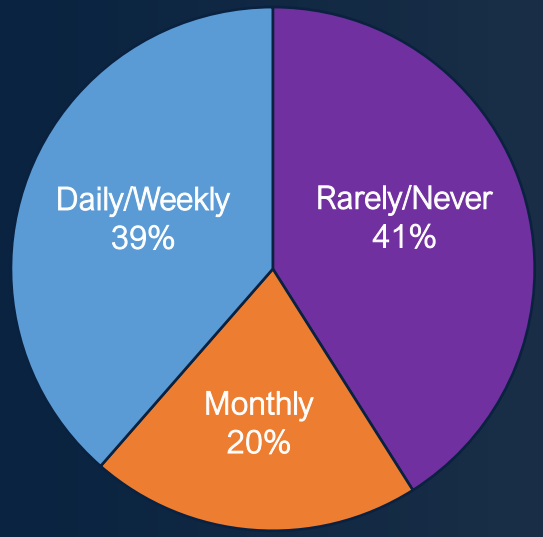
Respondents frequently drive with passengers and are more likely to drive in low visibility conditions than in unfamiliar areas.

Q: How often do you drive…?

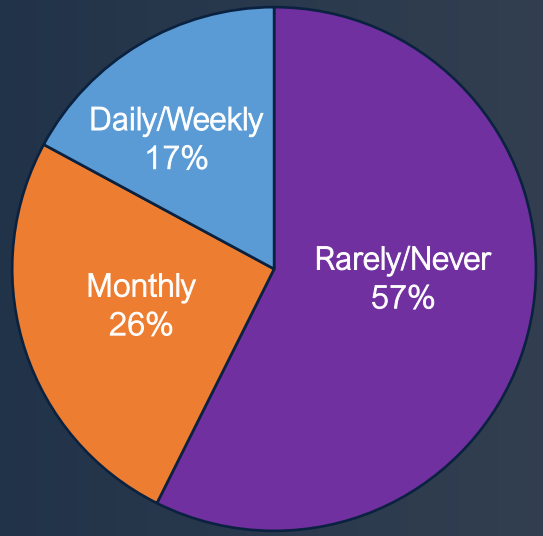
With Passengers



In Low Visibility Conditions



In Unfamiliar Areas



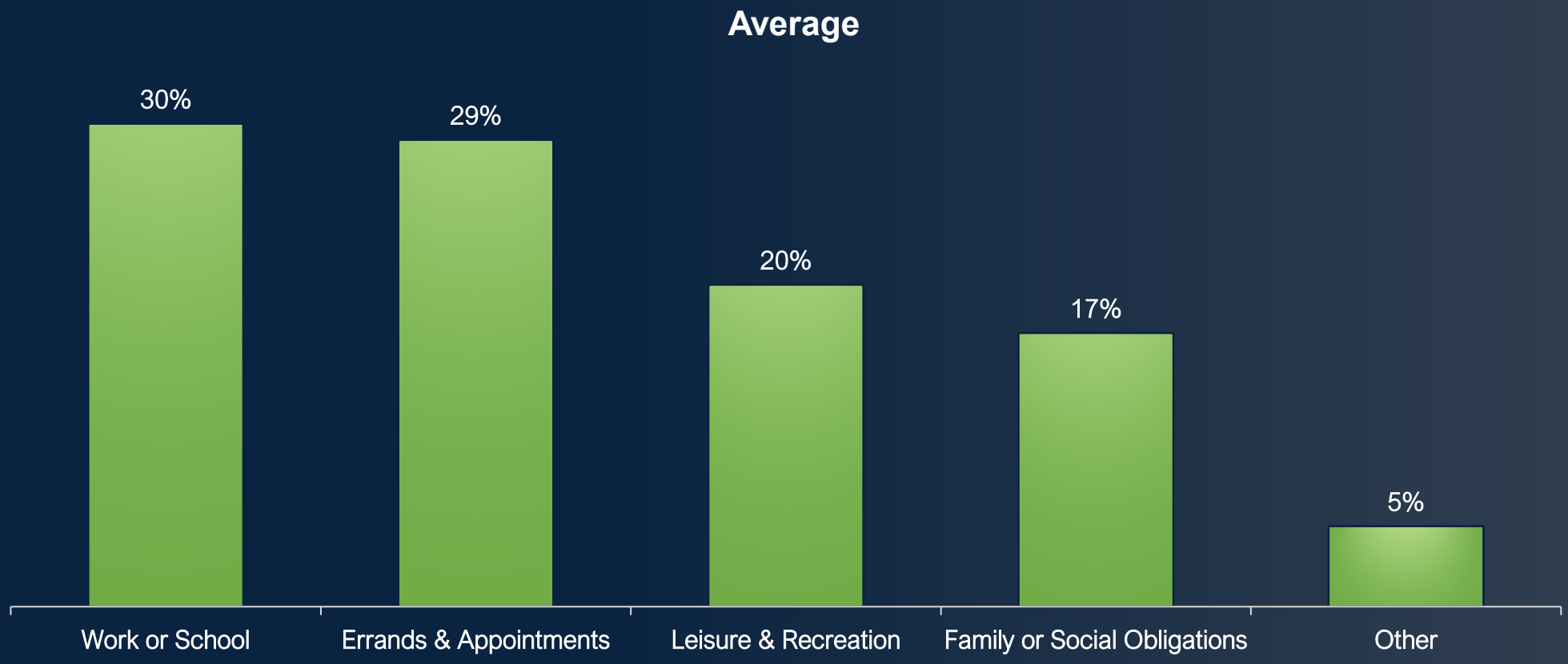
- Frequency of all 3 scenarios is inversely correlated with age and increases as tech adoption increases.
- EV drivers report significantly higher frequency of all 3 scenarios than Hybrid and ICE drivers.
- Urban dwellers drive in low visibility and unfamiliar areas significantly more frequently than those living in rural or suburban areas.

V2X Quantitative Research

Findings

Respondents drive most for work/school and errands/appointments.

Q: What percentage of the time do you drive your vehicle for the following activities?

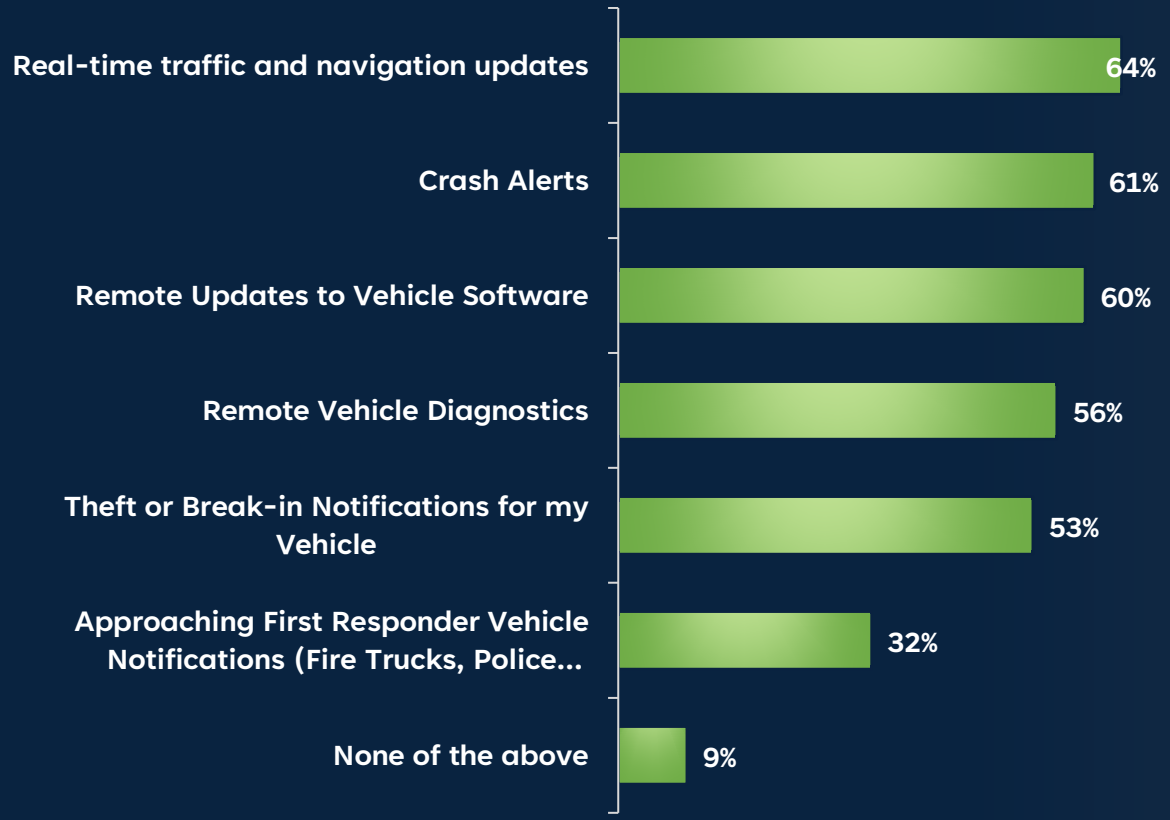


V2X Quantitative Research

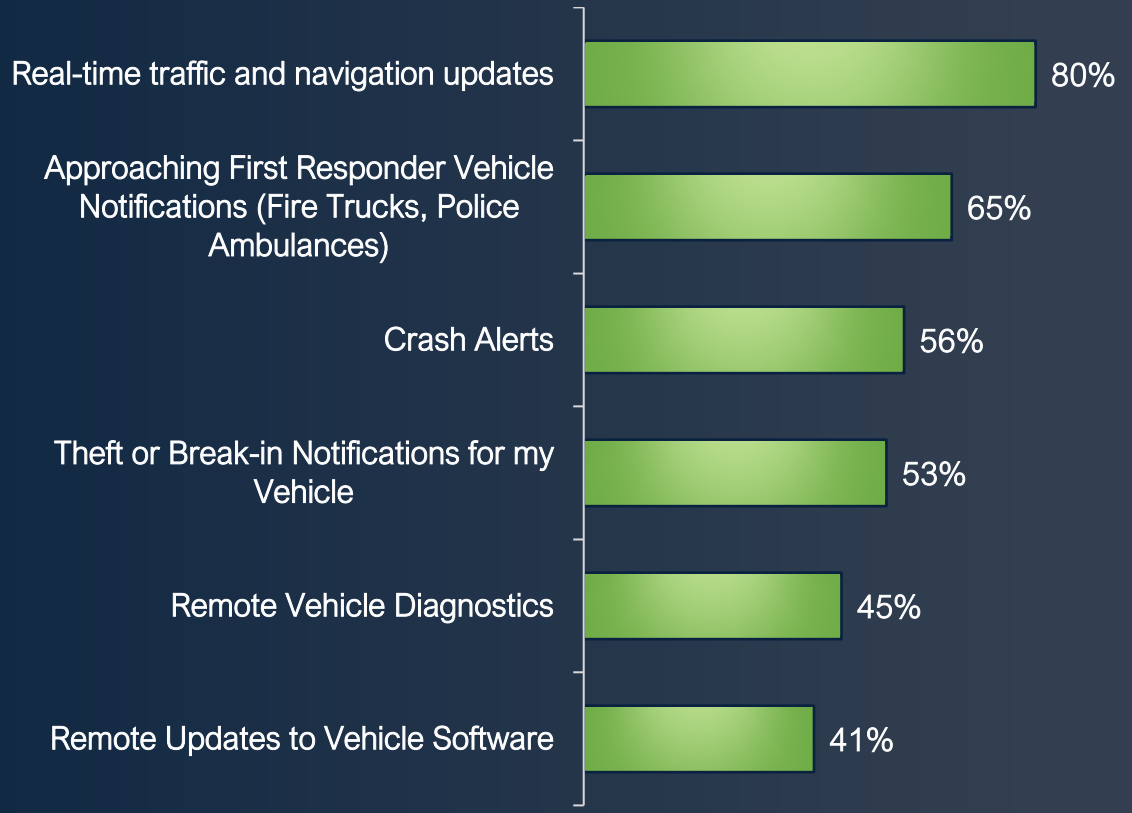
Findings

Almost 2/3 of respondents have real-time traffic and navigation updates, and 80% use it daily/weekly.

Q: Which of the following features do you have available in your vehicle?



% Used Daily / Weekly



V2X Quantitative Research

Key takeaways

SAFETY features are the clear winner

- Most desired, would be used most often, and add the most value to one's vehicle.
- Rated in the Top 4 by more than half of respondents and rank #1 most frequently for most useful and most valuable.
- Among the features tested, Road Hazard Warnings is most desired followed by Pedestrian Warnings, then Emergency Vehicle Notifications.
- Because of the broad appeal of these features, the demographics of those desiring them closely resemble the sample as a whole.

Key takeaways

EFFICIENCY use cases generally outperform Transaction use cases

- Signal Timing and Construction Notices are appreciated more than Collaborative Driving.
- While Construction Notices are considered Top 4 by almost half, very few rank it #1.
- Appeal varies by feature with Traffic Signal Timing most desired by suburban respondents and collaborative driving attracting urban dwellers and early adopters who drive significantly more highway miles.

Key takeaways

TRANSACTION use cases would be used least frequently among the use cases

- 1/3 or fewer rate any of them in the Top 4.
- Parking Locator & Payment appreciated more than Auto Pay Fuel and In-Vehicle Tolling.
- Appeals most to younger respondents who are early adopters of new technology and living in Urban areas.
- EV owners are especially interested in the Auto Pay Charging feature.

V2X Quantitative Research

Key takeaways

All of the use cases are considered **nice to have** rather than must have.

88% want features to function **independent of a mobile device**.

Gender does not play a significant role in feature appeal.

In addition to the features presented, respondents expressed interest for:

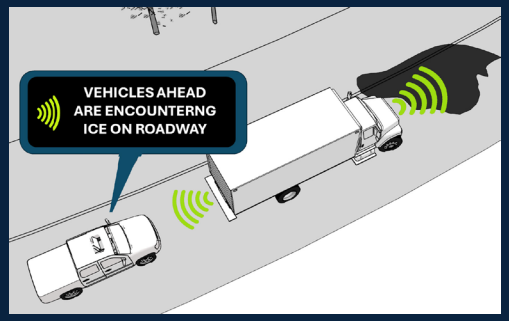
- Autonomous driving features
- Enhanced navigation
- Advanced detection systems (e.g. collision avoidance, police, wildlife, carjacker, etc.)

Use Case Comparisons

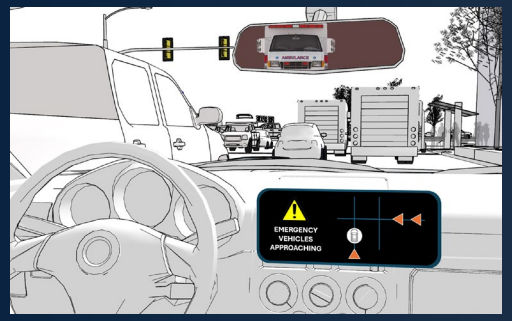
V2X Quantitative Research

Use case comparisons

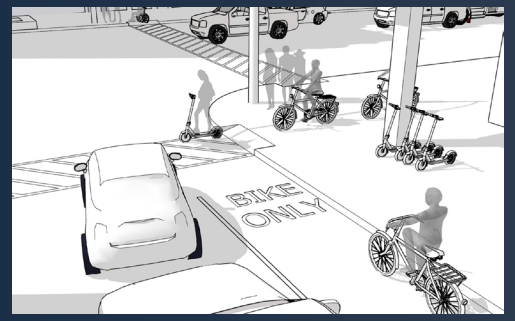
SAFETY USE CASES



1 Road Hazard Warnings

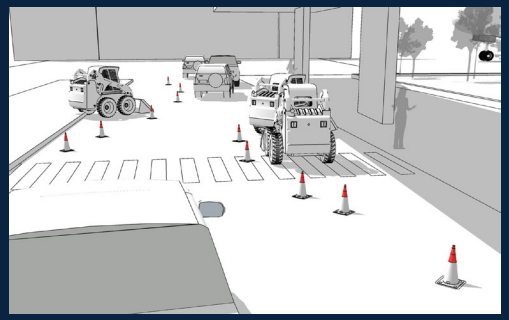


2 Emergency Vehicle Notifications

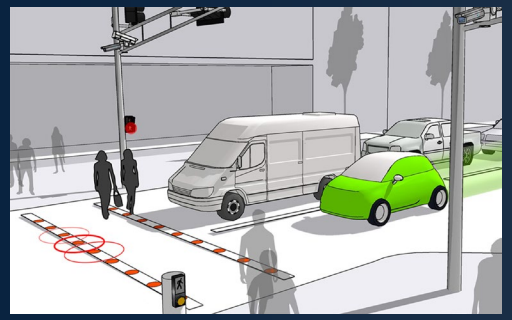


3 In-Vehicle Pedestrian Warnings

EFFICIENCY USE CASES



4 Construction Notices/Alerts

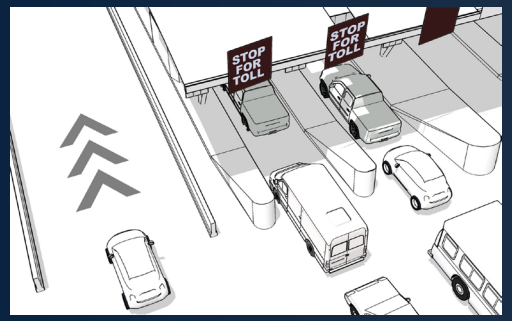


5 Traffic Signal Timing

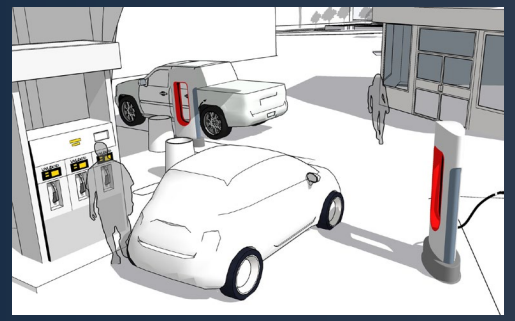
6 Collaborative Driving

TRANSACTION USE CASES

7 Parking Locator and Payment



8 Automatic In-Vehicle Tolling

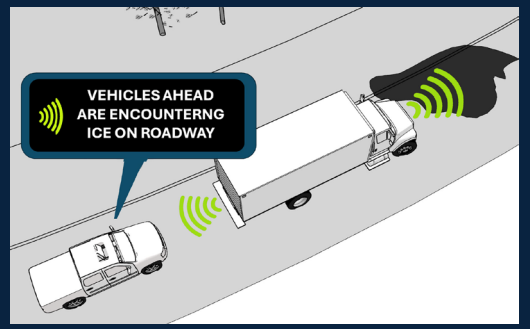


9 Auto Pay Fuel / Charging

V2X Quantitative Research

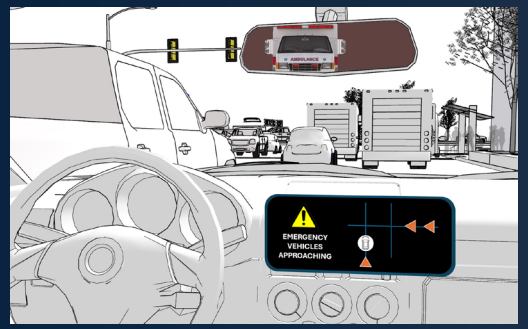
Use case comparisons

SAFETY USE CASES



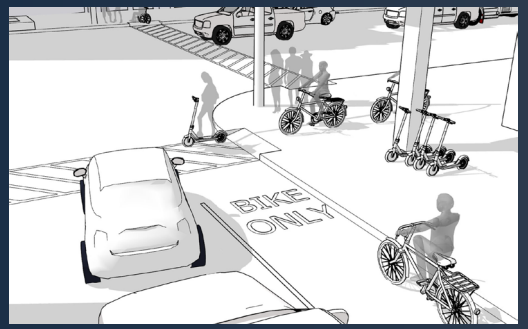
1 Road Hazard Warnings

Real-time communication between vehicles will allow you to benefit from knowing what hazards lie ahead (like fog, ice, road debris), and provide warnings to vehicles traveling behind you.



2 Emergency Vehicle Notifications

In-vehicle notifications will allow you to better understand where emergency vehicles (fire trucks, ambulances, and police cars) are, what direction they're heading or if they're stopped on the side of the road.



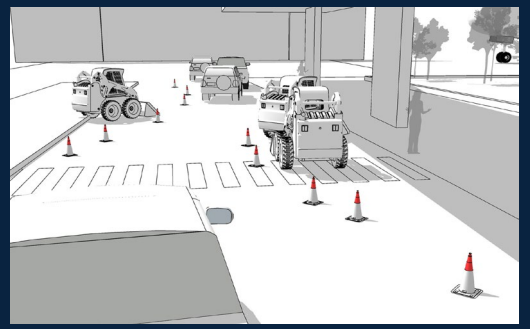
3 In-Vehicle Pedestrian Warnings

Your vehicle will be able to detect the location of cyclists, scooters and pedestrians by utilizing cameras and other technologies distributed around roadways and intersections. This will enable the vehicle to alert you to dangers that may otherwise be difficult to see.

V2X Quantitative Research

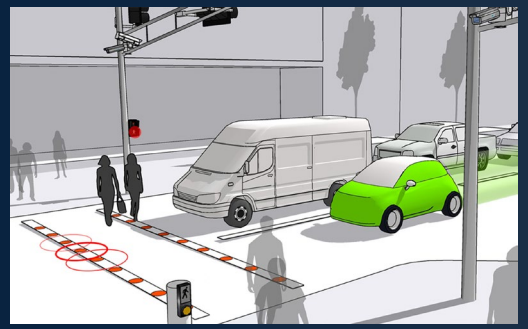
Use case comparisons

EFFICIENCY USE CASES



4 Construction Notices/Alerts

Your vehicle will receive information from another vehicle or the roadway requiring you to reduce your speed, merge lanes, temporarily stop, or other maneuvers required by the infrastructure outside the vehicle.



5 Traffic Signal Timing

All vehicles will communicate with traffic signals to improve traffic flow, reduce red light wait times, and make you aware of when traffic signal changes will happen (e.g., ‘5 seconds until red’).

6 Collaborative Driving

Your vehicle will communicate in real time with other vehicles and infrastructure to optimize routes in unusual situations (e.g., hurricane/fire evacuations, navigating crowded pick up and drop off areas like airports, road trips with multiple vehicles).

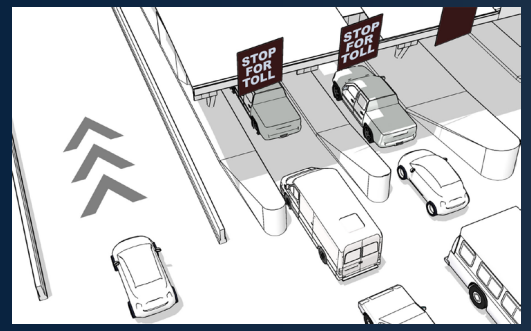
V2X Quantitative Research

Use case comparisons

TRANSACTION USE CASES

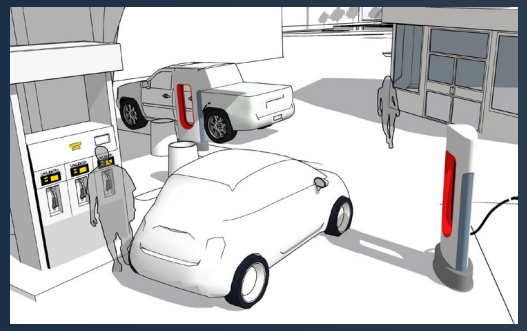
7 Parking Locator and Payment

Your vehicle will utilize parking systems and street-side cameras to identify and recommend available parking spots near your destination. The vehicle will automatically make reservations and payments without requiring your involvement. It can also identify free parking at your destination.



8 Automatic In-Vehicle Tolling

Your vehicle will automatically detect and pay for tolls, eliminating the need for you to mount devices in your vehicle, register payment methods with tolling agencies, or worry about device compatibility across states.



9 Auto Pay Fuel / Charging

Your vehicle will make secure payments on your behalf at places along your journeys as you approve them, including at gas stations and charging spots.

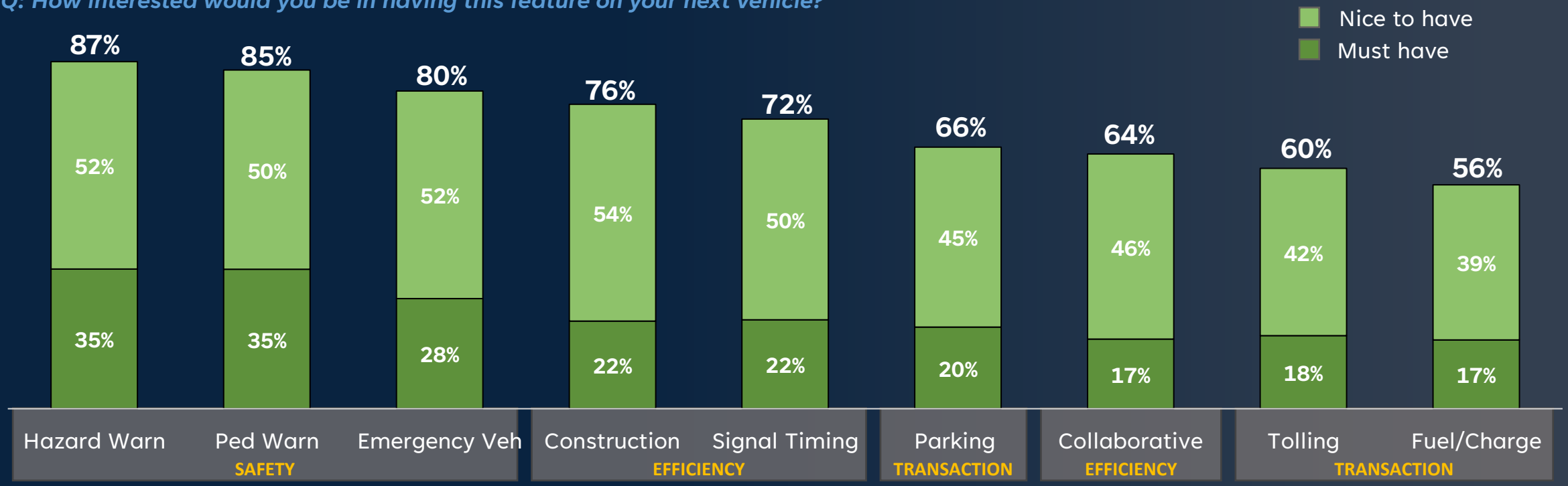
Use case comparisons

- 9 use cases were presented in random order with a photo and brief description.
- For each use case, respondents indicated their interest in the feature, anticipated usage frequency, and the value it added to their vehicle.
- After evaluating all 9 use cases, respondents selected their top 4 choices.
- Respondents then ranked their top 4 selections:
  - 1 most useful – 4 least useful
  - 1 most valuable – 4 least valuable

Use case comparisons

Respondents interested in ALL use cases, significantly most in SAFETY.

Q: How interested would you be in having this feature on your next vehicle?

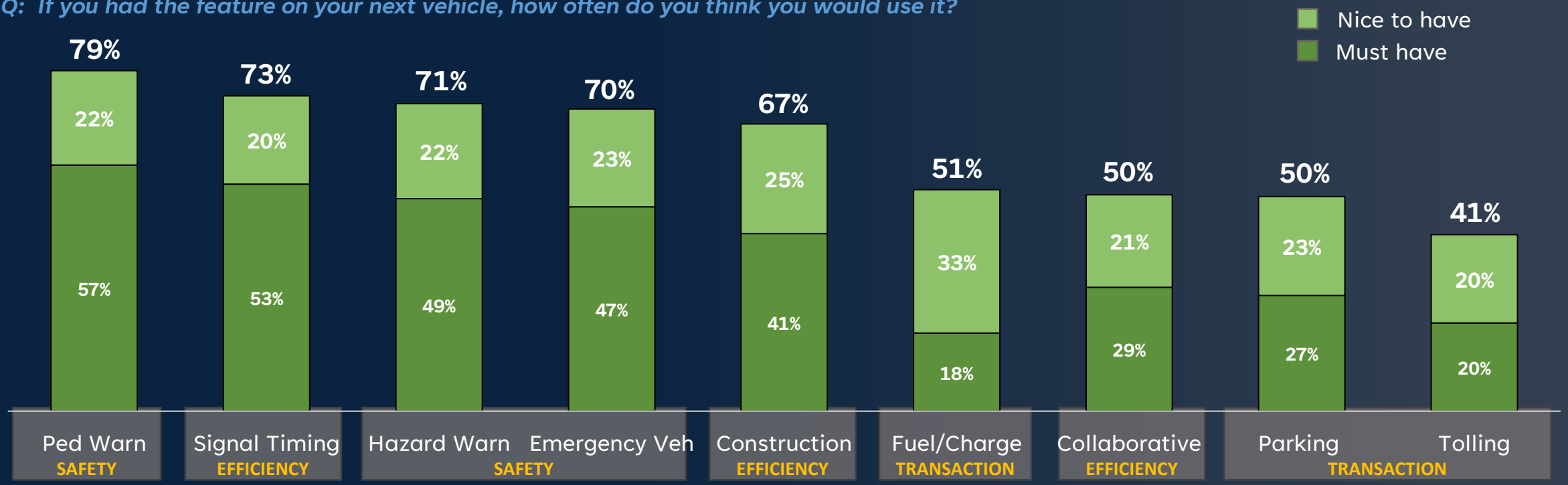


- Males express higher interest than females in signal timing, collaborative driving, auto tolling and auto-pay fueling.
- Interest in the features generally decreases with age and Boomers+ rate interest in ALL features significantly lowest among cohorts.
- Interest in all features is directly tied to appetite for new technology (i.e. early adopters express highest interest).
- ICE owners rate all features significantly lowest and Urban dwellers significantly highest among the cohorts.

Use case comparisons

Pedestrian warnings would be used most often, followed by traffic signal timing

Q: If you had the feature on your next vehicle, how often do you think you would use it?

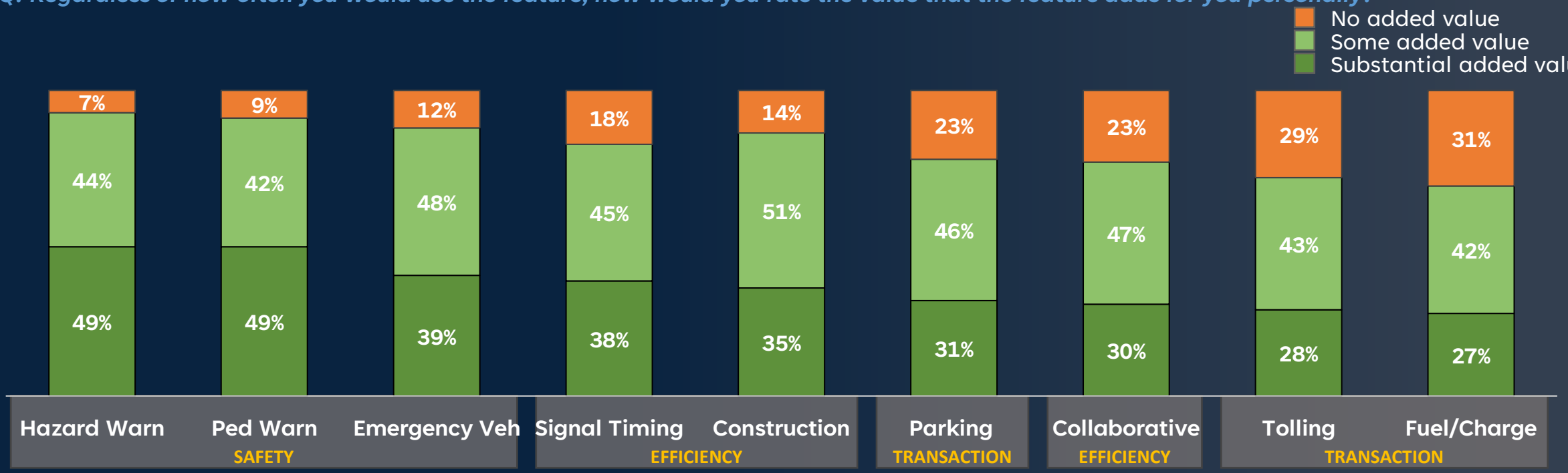


- Males anticipate using signal timing, collaborative driving, auto tolling and auto-pay fueling significantly more often than females.
- Boomers+ rate usage frequency significantly lowest among cohorts; usage frequency increases as age decreases for most use cases.
- Usage frequency increases with appetite for new technology (i.e. early adopters anticipate using all features most often).
- Urbanites anticipate using all features significantly most often and rural dwellers significantly least frequently for all efficiency and transaction use cases.

Use case comparisons

Safety features considered to add the most value

Q: Regardless of how often you would use the feature, how would you rate the value that the feature adds for you personally?

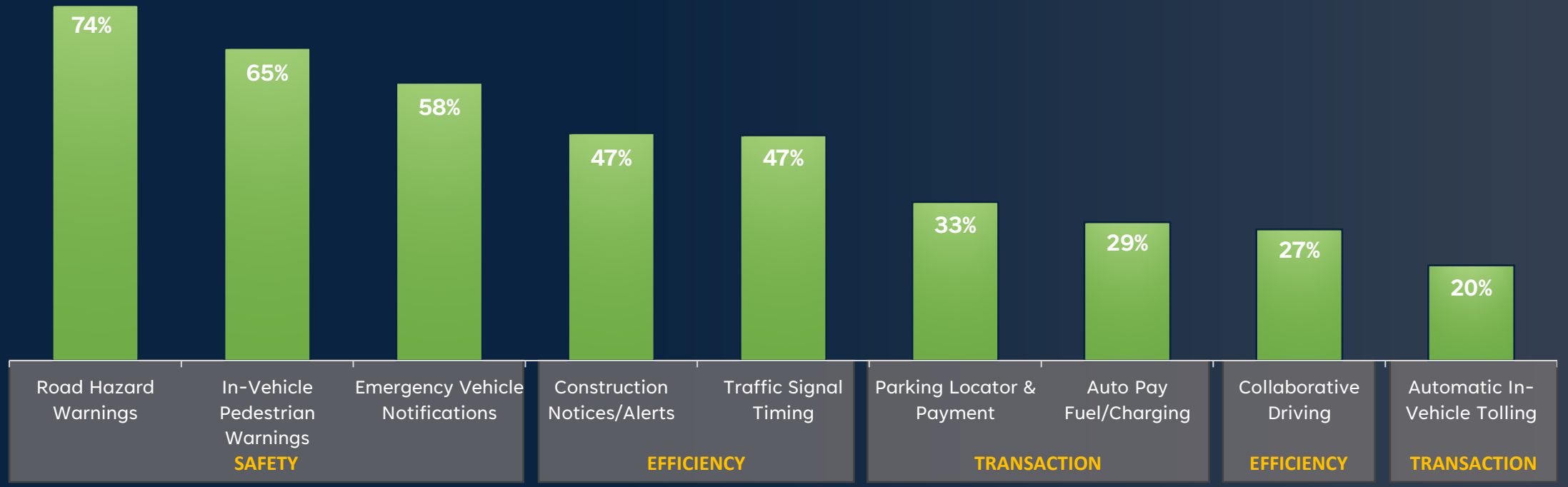


- Males significantly more likely than females to rate traffic signal timing and auto tolling as substantial added value.
- Perception of added value inversely correlated to age with Boomers+ rating each feature significantly lowest among the cohorts.
- ICE owners generally rate the added value lower than the other powertrain types.
- Added value rating is directly correlated with new technology adoption (i.e. early adopters rate added value for all features highest among cohorts).
- Urbanites rate added value for all features highest among the cohorts.

Use case comparisons

Most respondents consider all three safety use cases as ‘Top 4’

Q: Of the 9 features you just reviewed, please select the top 4 features which you would want to be available for your next vehicle.



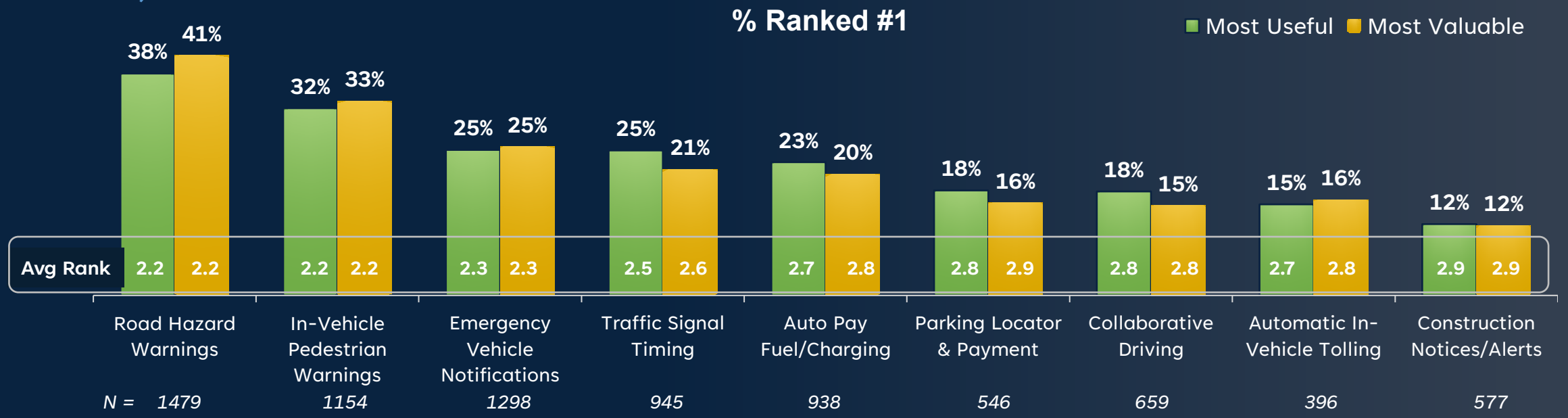
- Road hazard warnings considered Top 4 by 3/4 of participants; other safety features deemed top by over 1 / 2.
- 1/3 or fewer rate the transaction use cases or collaborative driving Top 4.
- Construction alerts and traffic signal timing also Top 4 for almost ½ of respondents.

Use case comparisons

Safety use cases ranked #1 most frequently

Q: Imagine you had these 4 features on your next vehicle and think about how useful these features would be to you personally. Please rank them from 1 (most useful) to 4 (least useful).

Q: Finally, think about the value these 4 features bring to the way you use your vehicle and rank them from 1 (most valuable) to 4 (least valuable).

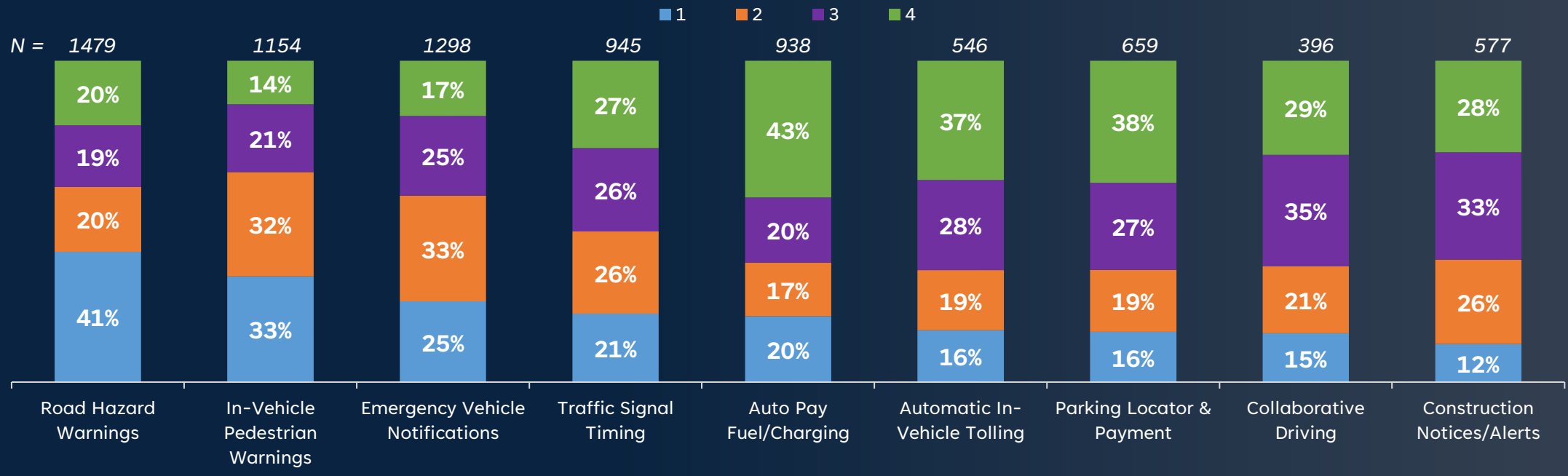


- The value a feature brings to the vehicle is closely tied to the perceived usefulness of the feature.
- All safety use cases are ranked more frequently as #1 than the efficiency or transaction use cases.
- While 47% considered Construction Notices a Top 4 feature, it receives the fewest #1 rankings of all the use cases.

Use case comparisons

Safety use cases ranked #1 most frequently

Q: Finally, think about the value these 4 features bring to the way you use your vehicle and rank them from 1 (most valuable) to 4 (least valuable).



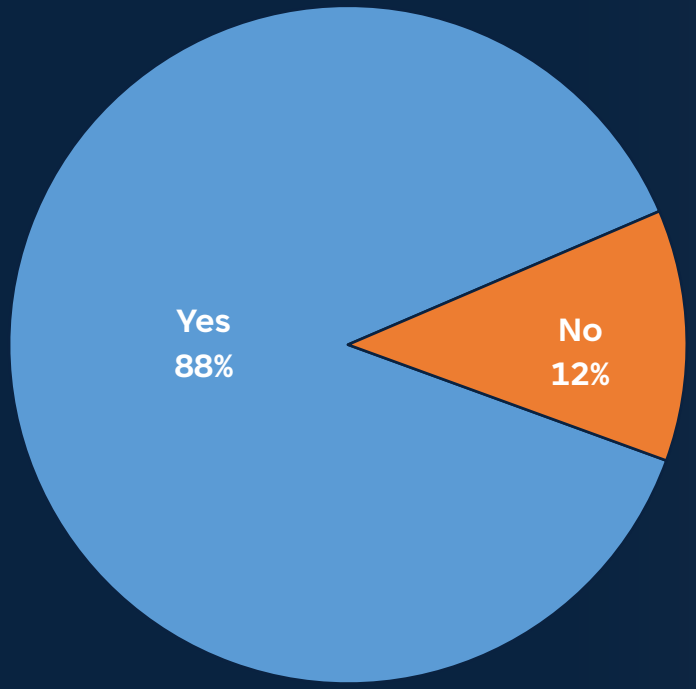
	Road Hazard Warnings	In-Vehicle Pedestrian Warnings	Emergency Vehicle Notifications	Traffic Signal Timing	Auto Pay Fuel/Charging	Automatic In-Vehicle Tolling	Parking Locator & Payment	Collaborative Driving	Construction Notices/Alerts
Average Rank	**2.2**	**2.2**	**2.3**	**2.6**	**2.8**	**2.9**	**2.8**	**2.8**	**2.9**

- Road Hazard Warnings garners the most #1 votes, but In-Vehicle Pedestrian Warnings receives the fewest #4 votes.
- Auto Pay Fuel/Charging ranks 4th significantly most often, but 20% rank it #1.
- While 47% of all respondents rated Construction Notices as Top 4, more than 60% ranked it #3 or #4 in value.

Use case comparisons

Features should work without requiring a phone connection

Q: Thinking about the top 4 features you selected, would you want them to function in your vehicle without requiring a connection to a phone?



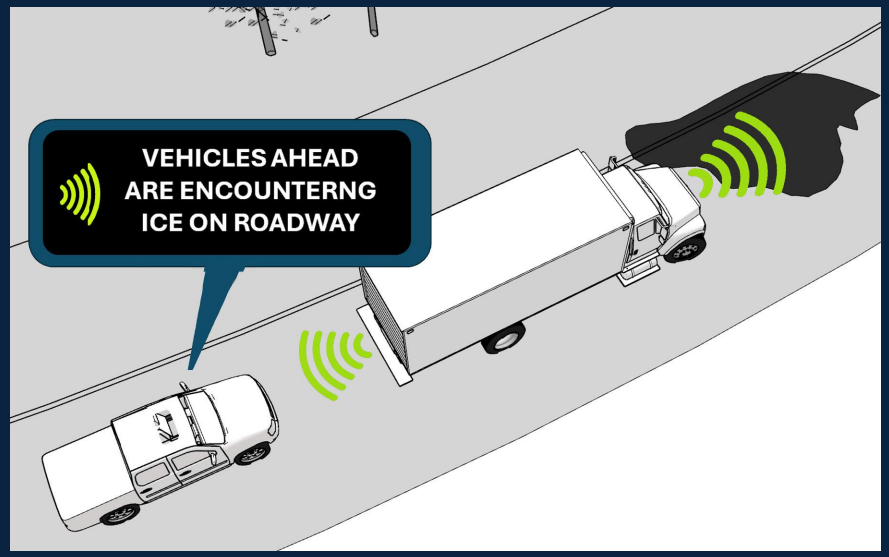
- Respondents overwhelmingly want the features to function within their vehicle, **independently** of their mobile phone.
- Responses are consistent across all cohorts with only 1 notable difference:

  Suburban respondents rate yes significantly more often than their Rural and Urban counterparts – 90%, 86%, 87% respectively.

Use Case Detailed Findings

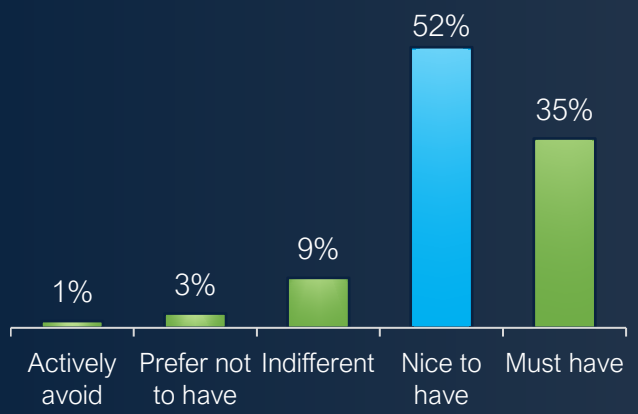
Use case detailed findings

Road hazard warnings considered nice to have and add substantial value

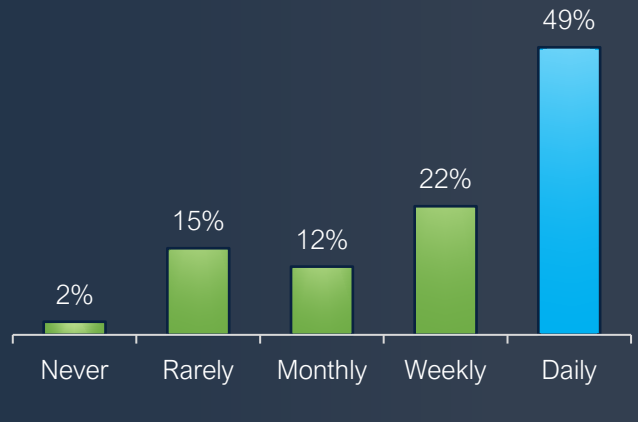


Real-time communication between vehicles will allow you to benefit from knowing what hazards lie ahead (like fog, ice, road debris), and provide warnings to vehicles traveling behind you.

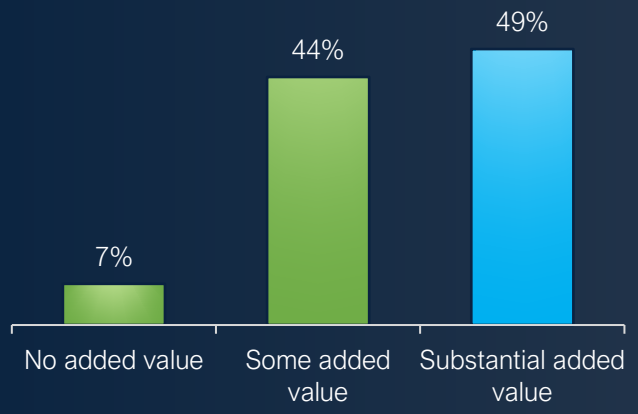
Interest *N=2003*



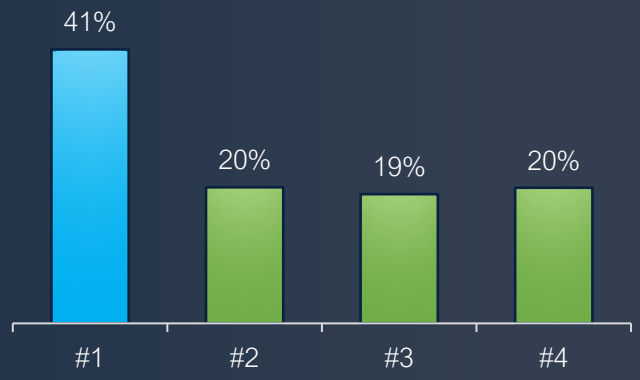
Usage *N=2003*



Value *N=2003*



Value Ranking *N=1478*

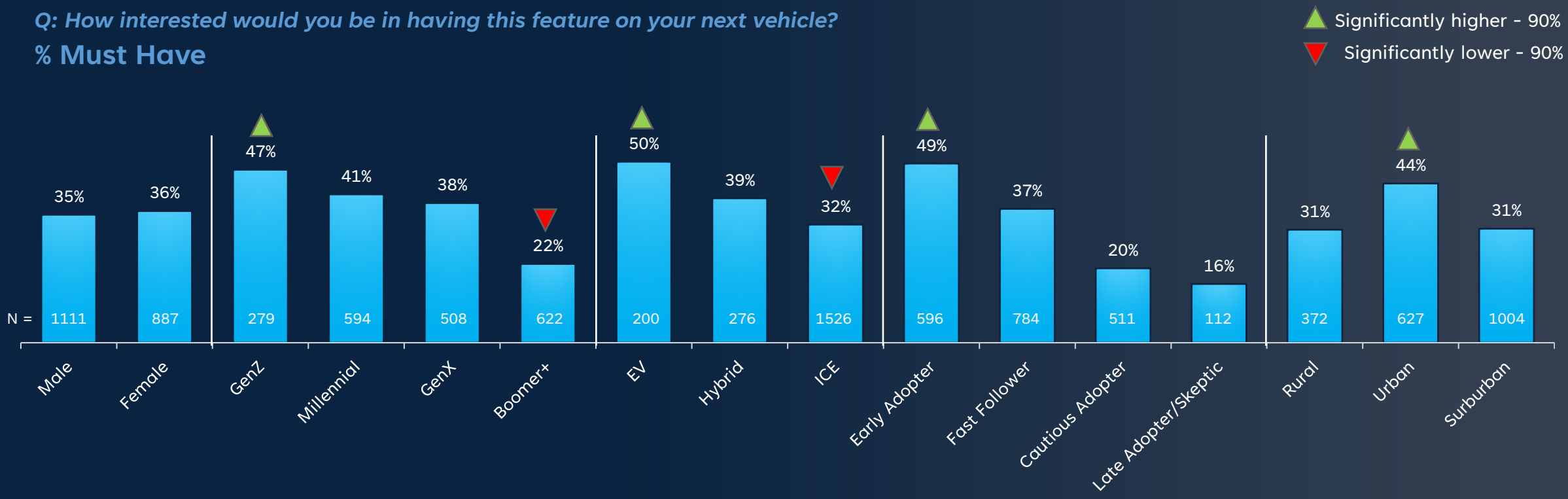


Use case detailed findings

Interest in road hazard warnings decreases with age

Q: How interested would you be in having this feature on your next vehicle?

% Must Have



- Appeals significantly most to Gen Z, EV owners, Early Adopters and Urban dwellers.
- Appeals significantly least to Boomers+ and ICE owners.

V2X Quantitative Research

Use case detailed findings

Road hazard warnings #1 value rank profile

Significantly higher - 90%

Significantly lower - 90%

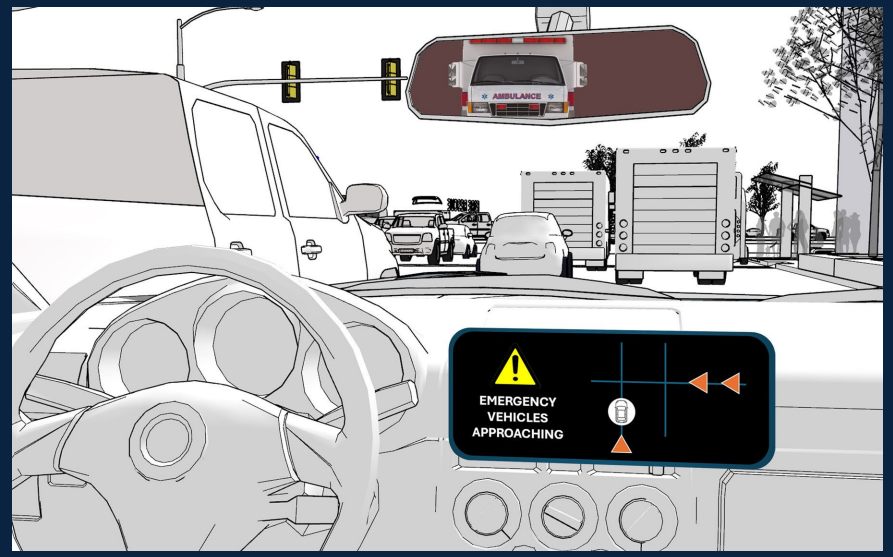
		Total Sample	Road Hazard Warning
Gender	Male	**55%**	55%
	Female	**44%**	45%
Geo	Rural	**19%**	23%
	Urban	**31%**	29%
	Suburban	**50%**	48%
Cohort	GenZ	**14%**	15%
	Millennial	**30%**	29%
	GenX	**25%**	22%
	Boomer+	**31%**	33%
Powertrain	EV	**10%**	10%
	Hybrid	**14%**	14%
	ICE	**76%**	75%
Tech	Early Adopter	**30%**	27%
	Fast Follower	**39%**	37%
	Cautious Adopter	**26%**	29%
	Late Adopter	**5%**	6%
	Skeptic	**1%**	1%
Driving majority	Mostly local	**34%**	33%
	Mostly highway	**9%**	6%
	Equal mix	**57%**	60%

			Total Sample	Road Hazard Warning
Miles / Year	<10,000		**28%**	32%
	10,000 - 14,999		**33%**	27%
	15,000 - 19,999		**24%**	25%
	20,000+		**15%**	15%
Drive Frequency	<1 day per week		**1%**	1%
	1-3 days per week		**13%**	15%
	4-6 days per week		**23%**	23%
	Almost every day		**63%**	62%
Frequency	Drive with passengers	Never	**3%**	3%
		Rarely	**18%**	19%
		Monthly	**9%**	9%
		Weekly	**44%**	42%
		Daily	**27%**	26%
	Drive in low visibility	Never	**5%**	6%
		Rarely	**36%**	36%
		Monthly	**20%**	18%
		Weekly	**28%**	29%
		Daily	**11%**	10%
	Drive in unfamiliar areas	Never	**6%**	7%
		Rarely	**52%**	53%
		Monthly	**25%**	23%
		Weekly	**12%**	12%
		Daily	**5%**	4%

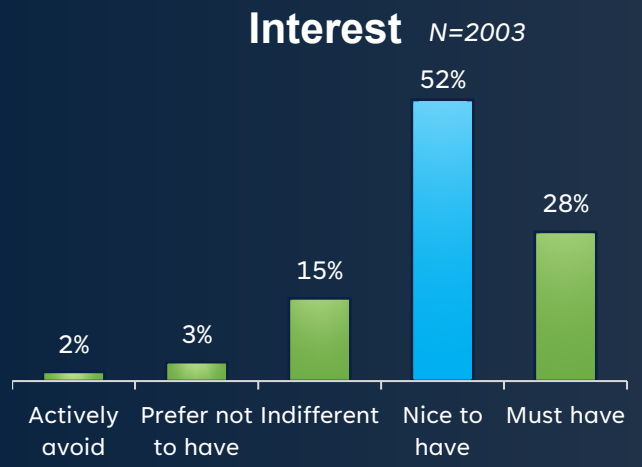
- Those who most value Road Hazard Warnings closely resemble the sample overall.
- They are slightly more of a cautious adopter, drive fewer miles per year and drive more of a mix between local and highway driving.

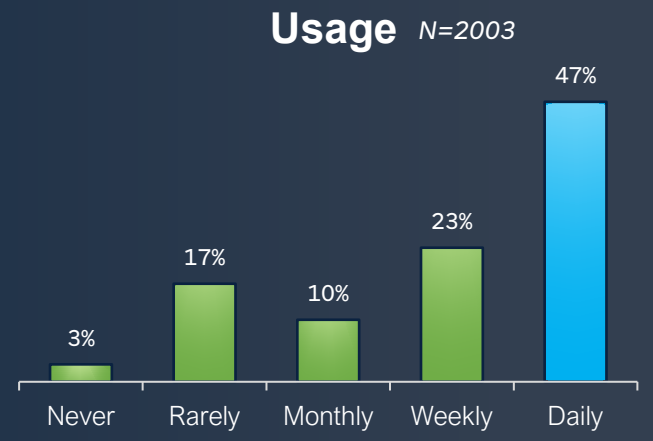
Use case detailed findings

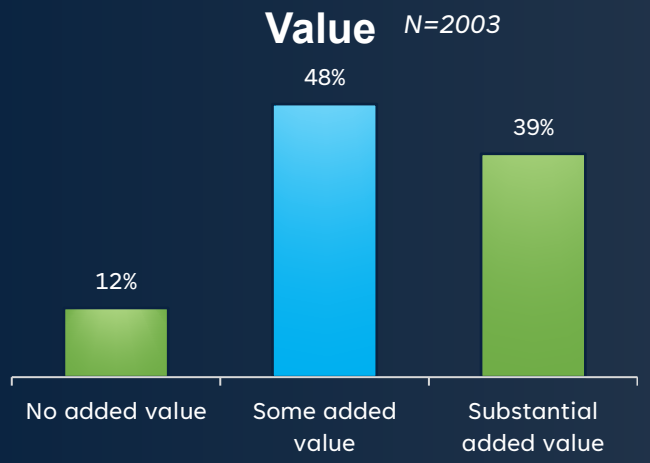
Emergency vehicle notifications ‘would be nice to have’ and ‘adds some value’

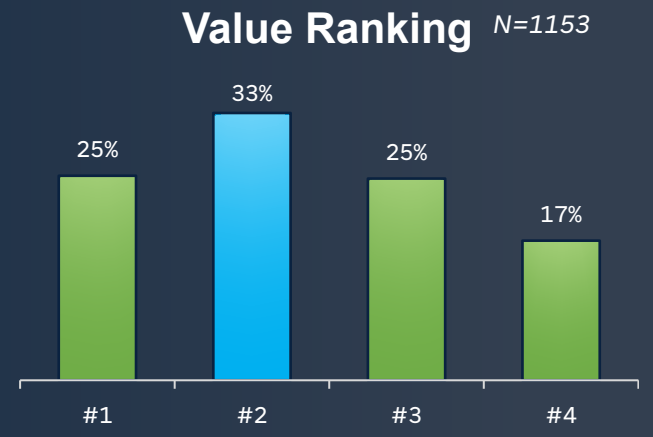


In-vehicle notifications will allow you to better understand where emergency vehicles (fire trucks, ambulances, and police cars) are, what direction they’re heading or if they’re stopped on the side of the road.







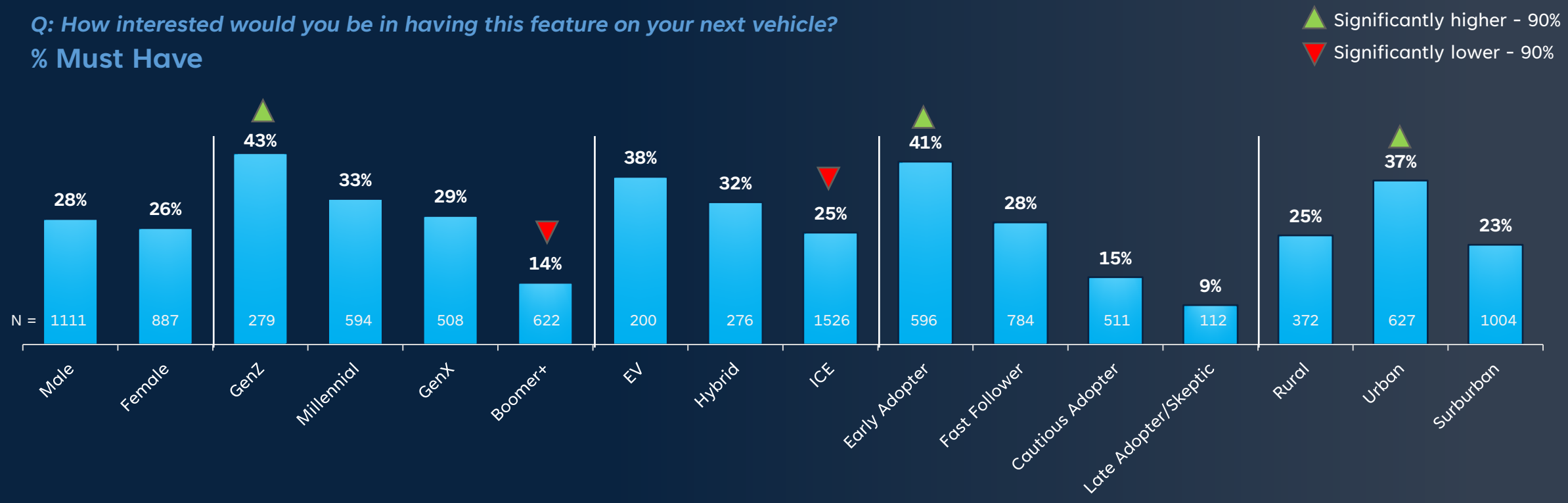


Use case detailed findings

Interest in emergency vehicle notifications decreases with age

Q: How interested would you be in having this feature on your next vehicle?

% Must Have



- Appeals significantly most to Gen Z, Early Adopters and Urban dwellers.
- Appeals significantly least to Boomers+ and ICE owners.

Use case detailed findings

Emergency vehicle notifications #1 value rank profile

Significantly higher - 90%
Significantly lower - 90%

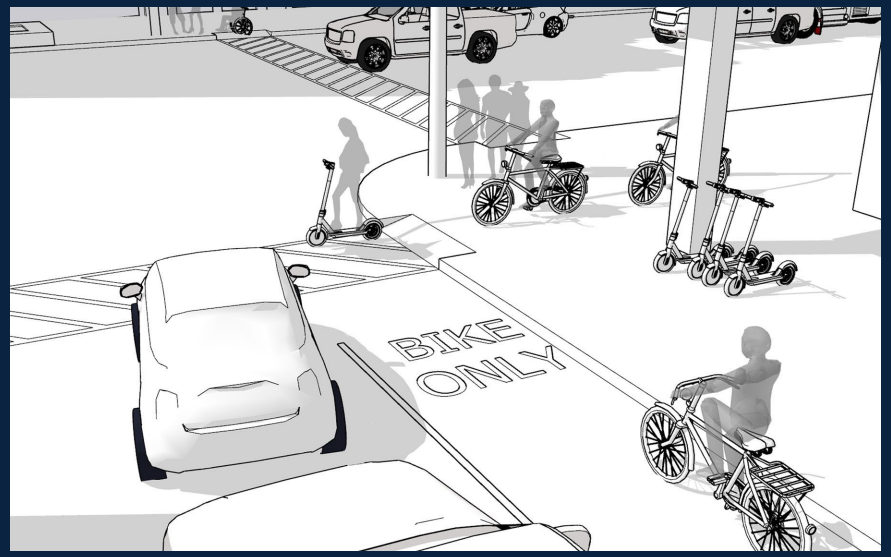
		Total Sample	Emergency Vehicle Notifications
Gender	Male	**55%**	57%
	Female	**44%**	43%
Geo	Rural	**19%**	16%
	Urban	**31%**	36%
	Suburban	**50%**	48%
Cohort	GenZ	**14%**	14%
	Millennial	**30%**	33%
	GenX	**25%**	27%
	Boomer+	**31%**	26%
Powertrain	EV	**10%**	9%
	Hybrid	**14%**	17%
	ICE	**76%**	74%
Tech	Early Adopter	**30%**	31%
	Fast Follower	**39%**	45%
	Cautious Adopter	**26%**	20%
	Late Adopter	**5%**	4%
	Skeptic	**1%**	1%
Driving majority	Mostly local	**34%**	32%
	Mostly highway	**9%**	9%
	Equal mix	**57%**	59%

			Total Sample	Emergency Vehicle Notifications
Miles / Year	<10,000		**28%**	24%
	10,000 - 14,999		**33%**	35%
	15,000 - 19,999		**24%**	25%
	20,000+		**15%**	15%
Drive Frequency	<1 day per week		**1%**	1%
	1-3 days per week		**13%**	13%
	4-6 days per week		**23%**	21%
	Almost every day		**63%**	65%
Frequency	Drive with passengers	Never	**3%**	4%
		Rarely	**18%**	18%
		Monthly	**9%**	7%
		Weekly	**44%**	43%
		Daily	**27%**	28%
	Drive in low visibility	Never	**5%**	5%
		Rarely	**36%**	37%
		Monthly	**20%**	21%
		Weekly	**28%**	24%
		Daily	**11%**	13%
	Drive in unfamiliar areas	Never	**6%**	7%
		Rarely	**52%**	49%
		Monthly	**25%**	23%
		Weekly	**12%**	13%
		Daily	**5%**	8%

- Compared to the total sample, those who most value Emergency Vehicle Notifications are more likely to live in an urban area.
- They are also more likely to be younger and a fast follower when it comes to new technology.

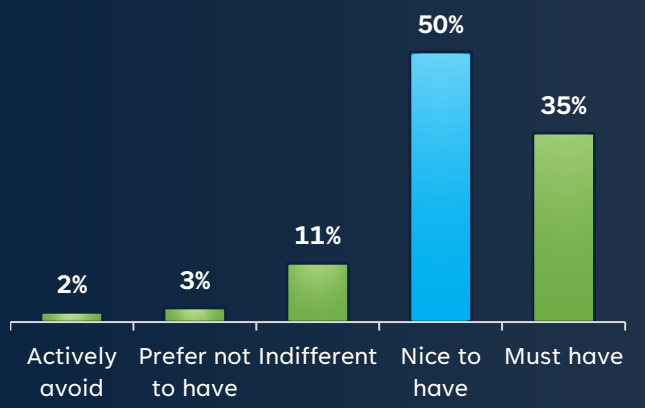
Use case detailed findings

In-vehicle pedestrian warnings would be nice to have and adds substantial value

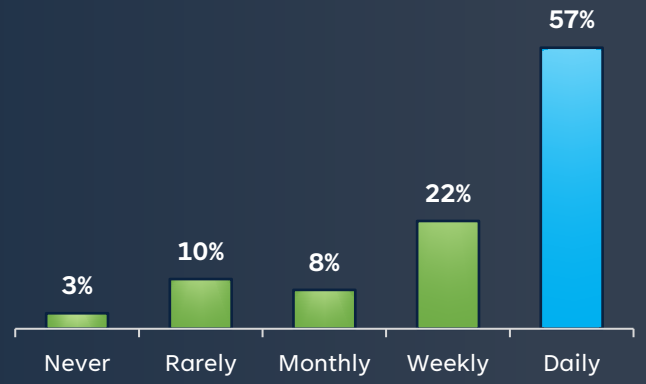


Your vehicle will be able to detect the location of cyclists, scooters and pedestrians by utilizing cameras and other technologies distributed around roadways and intersections. This will enable the vehicle to alert you to dangers that may otherwise be difficult to see.

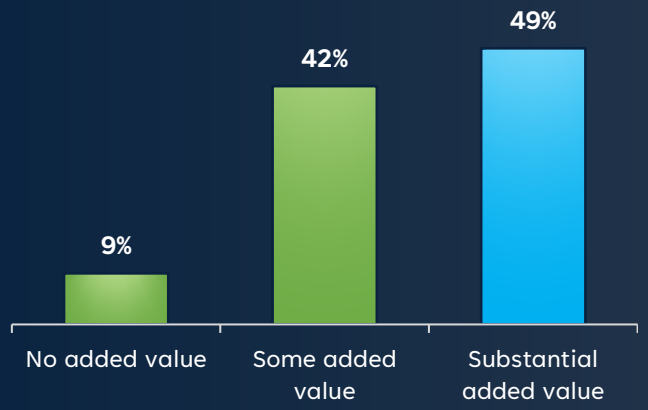
Interest *N=2003*



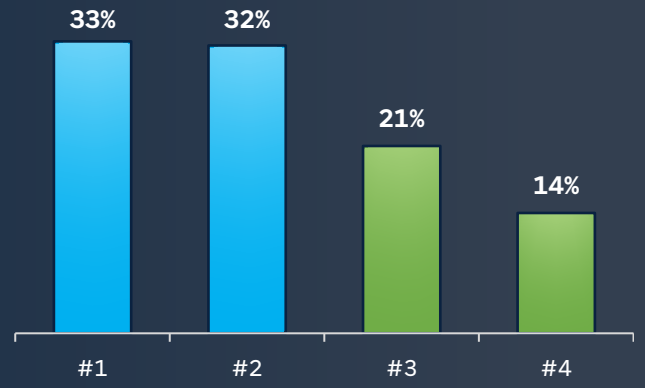
Usage *N=2003*



Value *N=2003*



Value Ranking *N=1298*

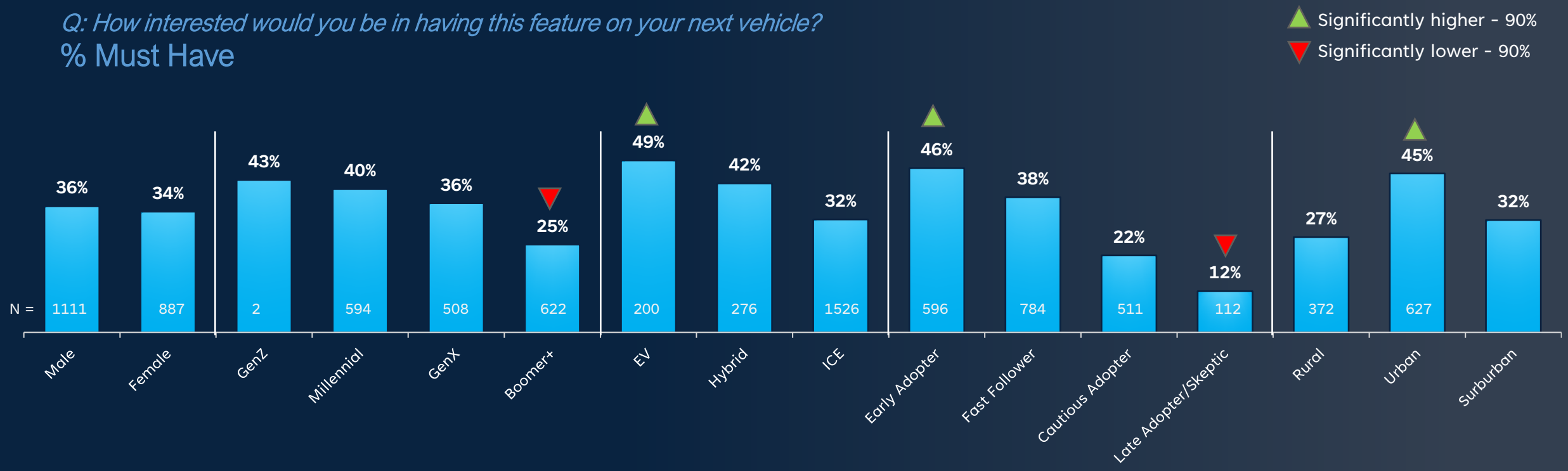


Use case detailed findings

In-vehicle pedestrian warnings appeal most to EV owners, early adopters, and urban dwellers

Q: How interested would you be in having this feature on your next vehicle?

% Must Have



- Interest is significantly highest among EV drivers, Early Adopters and Urban dwellers.
- Interest is significantly lowest among Boomers+ and Late Adopters/Skeptics.

V2X Quantitative Research

Use case detailed findings

In-vehicle pedestrian warnings #1 Value Rank Profile

Significantly higher - 90%
Significantly lower - 90%

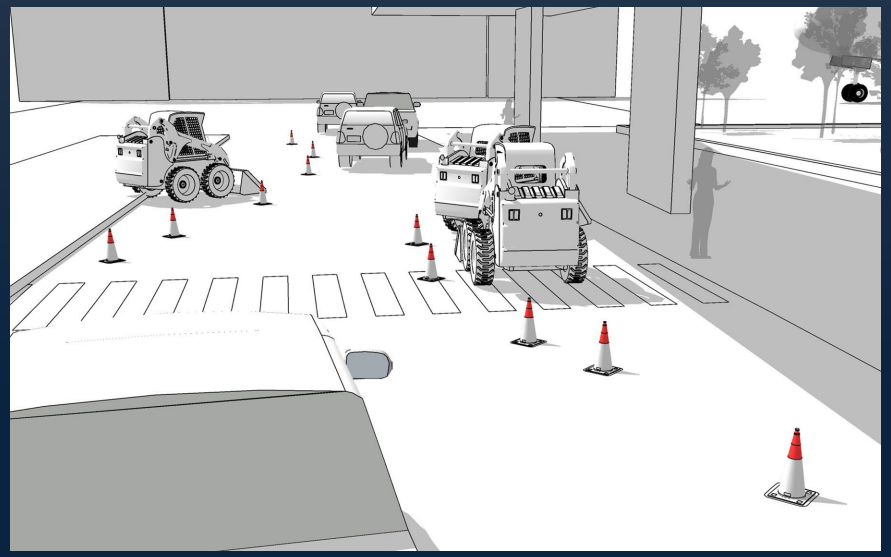
		Total Sample	In-Vehicle Pedestrian Warnings
Gender	Male	**55%**	54%
	Female	**44%**	46%
Geo	Rural	**19%**	17%
	Urban	**31%**	28%
	Suburban	**50%**	56%
Cohort	GenZ	**14%**	10%
	Millennial	**30%**	22%
	GenX	**25%**	25%
	Boomer+	**31%**	43%
Powertrain	EV	**10%**	8%
	Hybrid	**14%**	13%
	ICE	**76%**	79%
Tech	Early Adopter	**30%**	25%
	Fast Follower	**39%**	37%
	Cautious Adopter	**26%**	31%
	Late Adopter	**5%**	5%
	Skeptic	**1%**	2%
Driving majority	Mostly local	**34%**	42%
	Mostly highway	**9%**	9%
	Equal mix	**57%**	49%

			Total Sample	In-Vehicle Pedestrian Warnings
Miles / Year	<10,000		**28%**	36%
	10,000 - 14,999		**33%**	33%
	15,000 - 19,999		**24%**	20%
	20,000+		**15%**	12%
Drive Frequency	<1 day per week		**1%**	1%
	1-3 days per week		**13%**	15%
	4-6 days per week		**23%**	24%
	Almost every day		**63%**	60%
Frequency	Drive with passengers	Never	**3%**	2%
		Rarely	**18%**	20%
		Monthly	**9%**	9%
		Weekly	**44%**	45%
		Daily	**27%**	24%
	Drive in low visibility	Never	**5%**	4%
		Rarely	**36%**	42%
		Monthly	**20%**	23%
		Weekly	**28%**	23%
		Daily	**11%**	8%
	Drive in unfamiliar areas	Never	**6%**	5%
		Rarely	**52%**	57%
		Monthly	**25%**	26%
		Weekly	**12%**	9%
		Daily	**5%**	2%

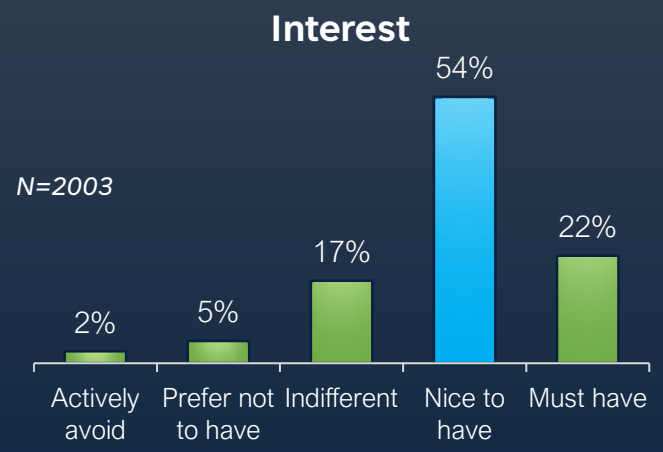
- Compared to the total sample, those who most value in-vehicle pedestrian warnings are significantly more likely to live in a suburban area, are older in age and are more likely to be a cautious adopter of new technology.
- They drive significantly fewer miles per year, drive locally more often, and face low visibility and unfamiliar areas less often.

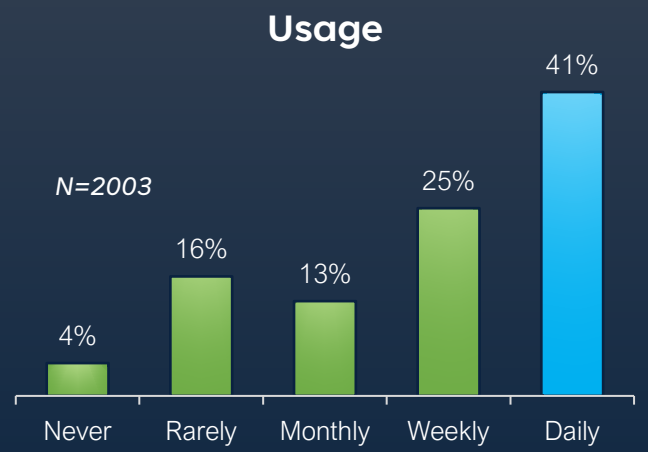
Use case detailed findings

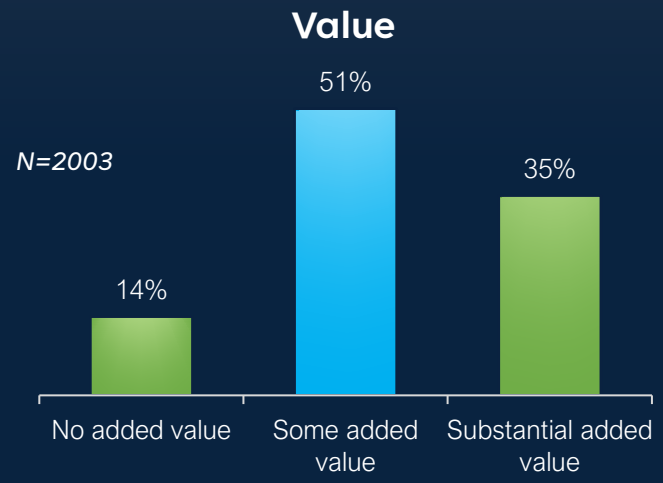
Construction notices/alerts deemed nice to have and adds some value

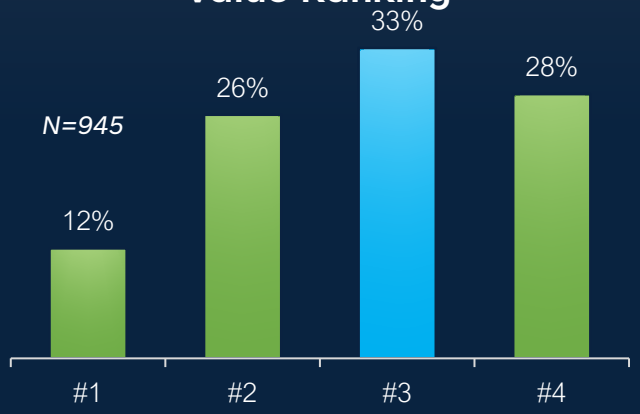


Your vehicle will receive information from another vehicle or the roadway requiring you to reduce your speed, merge lanes, temporarily stop, or other maneuvers required by the infrastructure outside the vehicle.







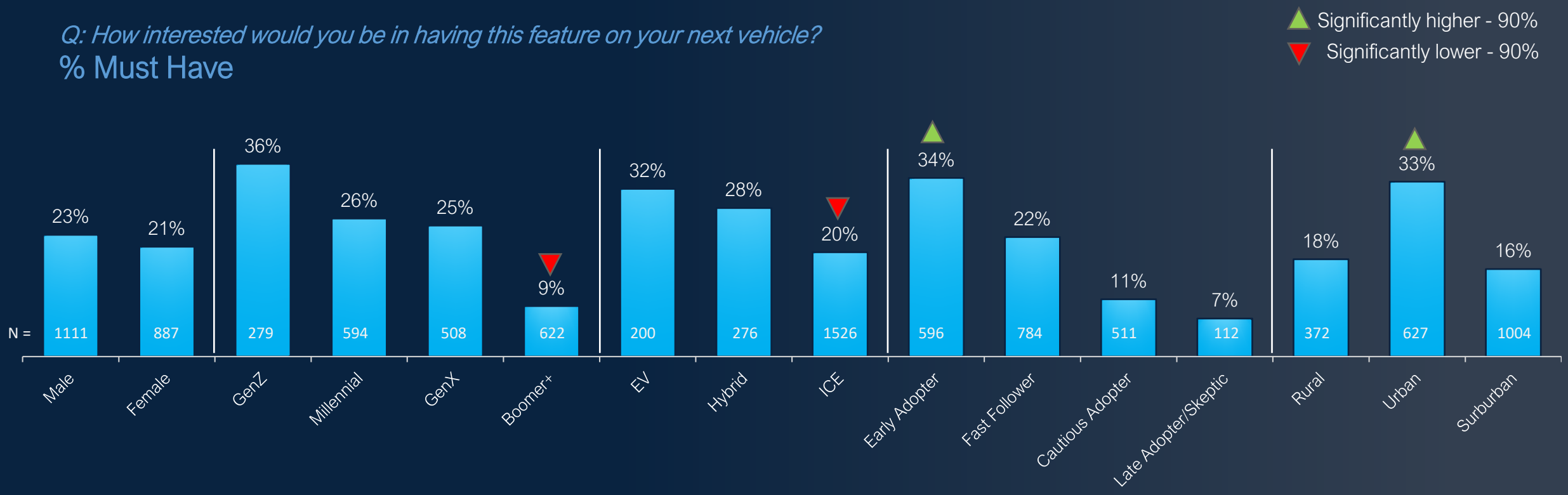


Use case detailed findings

Construction notices/alerts most appealing to early adopters & urban dwellers

Q: How interested would you be in having this feature on your next vehicle?

% Must Have



- Appeals significantly most to early adopter and urban dwellers.
- Appeals significantly least to boomer+ and ICE vehicle owners.

Use case detailed findings

Construction notices/alert #1 value rank profile

Significantly higher - 90%
Significantly lower - 90%

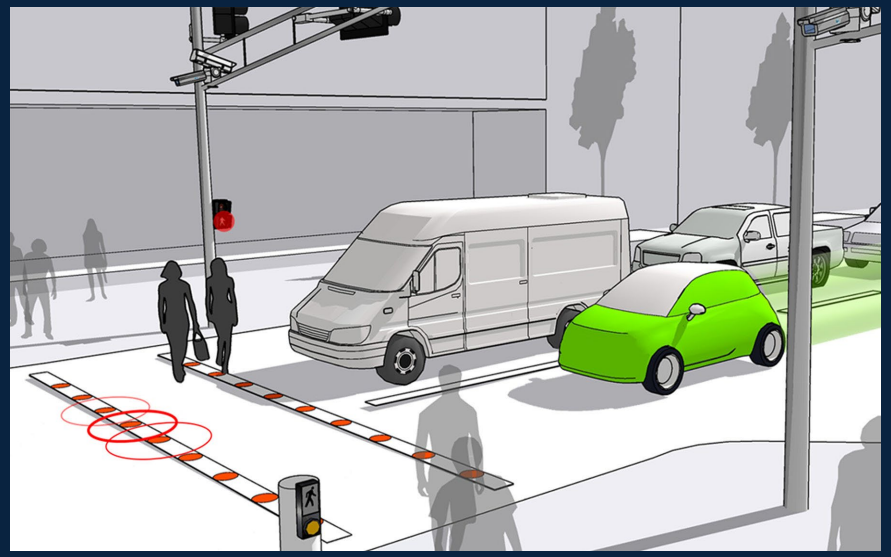
		Total Sample	Construction Notices/Alerts
Gender	Male	**55%**	58%
	Female	**44%**	42%
Geo	Rural	**19%**	26%
	Urban	**31%**	27%
	Suburban	**50%**	47%
Cohort	GenZ	**14%**	10%
	Millennial	**30%**	31%
	GenX	**25%**	33%
	Boomer+	**31%**	26%
Powertrain	EV	**10%**	8%
	Hybrid	**14%**	9%
	ICE	**76%**	83%
Tech	Early Adopter	**30%**	25%
	Fast Follower	**39%**	46%
	Cautious Adopter	**26%**	21%
	Late Adopter	**5%**	7%
	Skeptic	**1%**	1%
Driving majority	Mostly local	**34%**	30%
	Mostly highway	**9%**	14%
	Equal mix	**57%**	55%

			Total Sample	Construction Notices/Alerts
Miles / Year	<10,000		**28%**	26%
	10,000 - 14,999		**33%**	31%
	15,000 - 19,999		**24%**	26%
	20,000+		**15%**	17%
Drive Frequency	<1 day per week		**1%**	0%
	1-3 days per week		**13%**	11%
	4-6 days per week		**23%**	27%
	Almost every day		**63%**	63%
Frequency	Drive with passengers	Never	**3%**	3%
		Rarely	**18%**	18%
		Monthly	**9%**	13%
		Weekly	**44%**	40%
		Daily	**27%**	27%
	Drive in low visibility	Never	**5%**	7%
		Rarely	**36%**	26%
		Monthly	**20%**	20%
		Weekly	**28%**	38%
		Daily	**11%**	9%
	Drive in unfamiliar areas	Never	**6%**	5%
		Rarely	**52%**	57%
		Monthly	**25%**	22%
		Weekly	**12%**	10%
		Daily	**5%**	5%

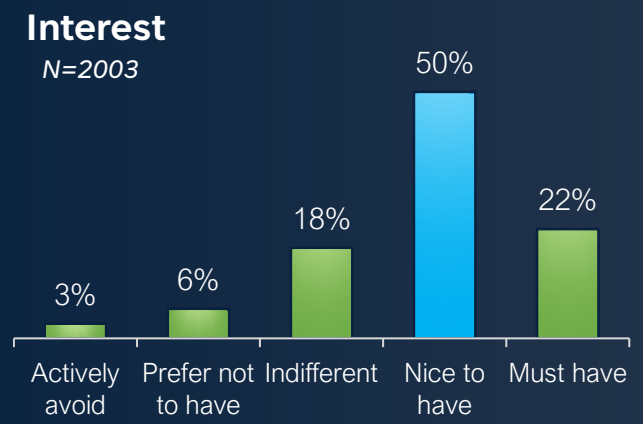
- Those who value most value construction notifications are significantly more likely to drive a vehicle powered by an internal combustion engine.
- They also drive in low visibility significantly more often than the total sample.

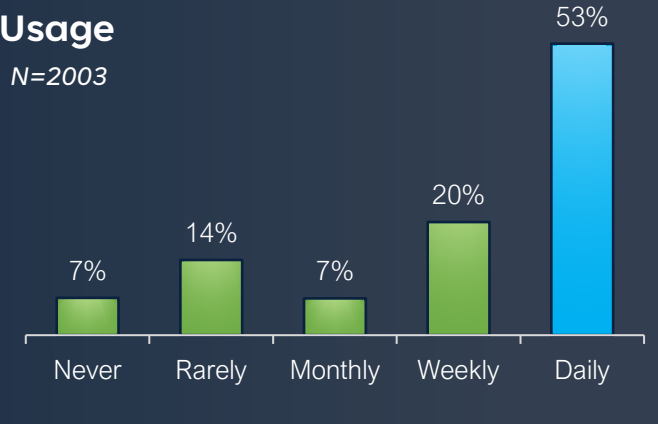
Use case detailed findings

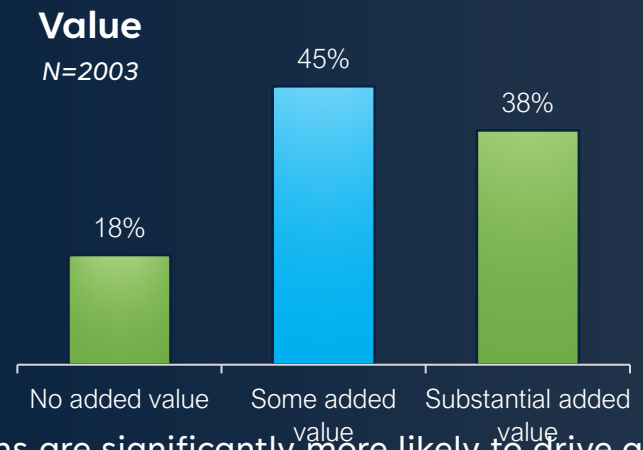
Traffic signal timing rated nice to have and adds some value

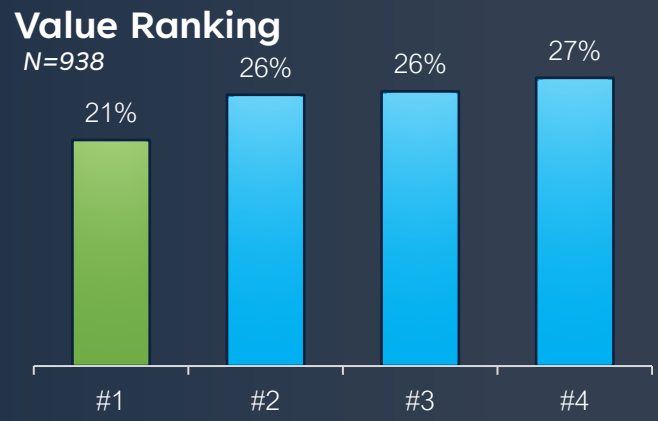


All vehicles will communicate with traffic signals to improve traffic flow, reduce red light wait times, and make you aware of when traffic signal changes will happen (e.g., '5 seconds until red').









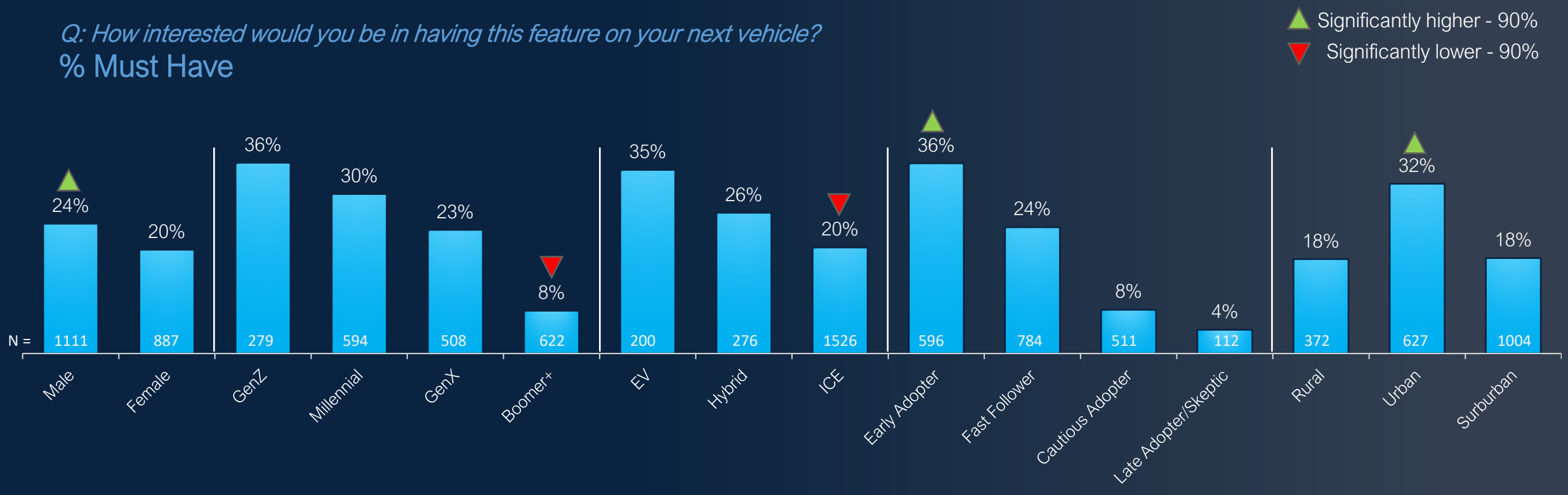
- Those who value most value construction notifications are significantly more likely to drive a vehicle powered by an internal combustion engine.
- They also drive in low visibility significantly more often than the total sample.

Use case detailed findings

Traffic signal timing appeals more to men and younger respondents

Q: How interested would you be in having this feature on your next vehicle?

% Must Have



- Appeals significantly most to Males, Early Adopters and Urban dwellers.
- Appeals significantly least to Boomers+ and ICE owners.

V2X Quantitative Research

Use case detailed findings

Traffic signal timing #1 Value rank profile

Significantly higher - 90%
Significantly lower - 90%

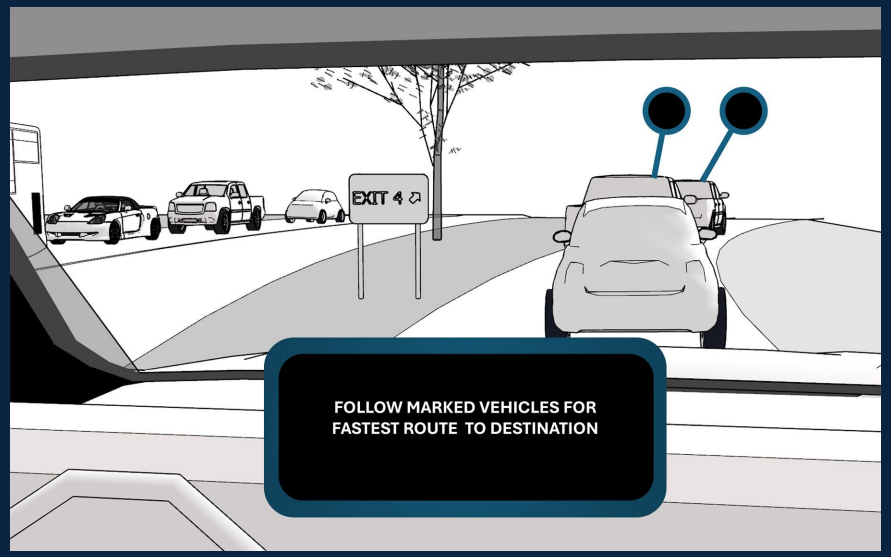
		Total Sample	Traffic Signal Timing
Gender	Male	**55%**	58%
	Female	**44%**	41%
Geo	Rural	**19%**	18%
	Urban	**31%**	25%
	Suburban	**50%**	57%
Cohort	GenZ	**14%**	18%
	Millennial	**30%**	23%
	GenX	**25%**	24%
	Boomer+	**31%**	34%
Powertrain	EV	**10%**	5%
	Hybrid	**14%**	13%
	ICE	**76%**	82%
Tech	Early Adopter	**30%**	30%
	Fast Follower	**39%**	38%
	Cautious Adopter	**26%**	28%
	Late Adopter	**5%**	4%
	Skeptic	**1%**	0%
Driving majority	Mostly local	**34%**	39%
	Mostly highway	**9%**	9%
	Equal mix	**57%**	52%

			Total Sample	Traffic Signal Timing
Miles / Year	<10,000		**28%**	23%
	10,000 - 14,999		**33%**	36%
	15,000 - 19,999		**24%**	22%
	20,000+		**15%**	18%
Drive Frequency	<1 day per week		**1%**	1%
	1-3 days per week		**13%**	10%
	4-6 days per week		**23%**	22%
	Almost every day		**63%**	66%
Frequency	Drive with passengers	Never	**3%**	2%
		Rarely	**18%**	18%
		Monthly	**9%**	8%
		Weekly	**44%**	45%
		Daily	**27%**	27%
	Drive in low visibility	Never	**5%**	3%
		Rarely	**36%**	38%
		Monthly	**20%**	21%
		Weekly	**28%**	28%
		Daily	**11%**	9%
	Drive in unfamiliar areas	Never	**6%**	4%
		Rarely	**52%**	52%
		Monthly	**25%**	26%
		Weekly	**12%**	14%
		Daily	**5%**	4%

- Respondents who most value the traffic signal timing feature are significantly more likely to live in a suburban area than the sample overall.
- They are also significantly more likely to drive a vehicle with an internal combustion engine.

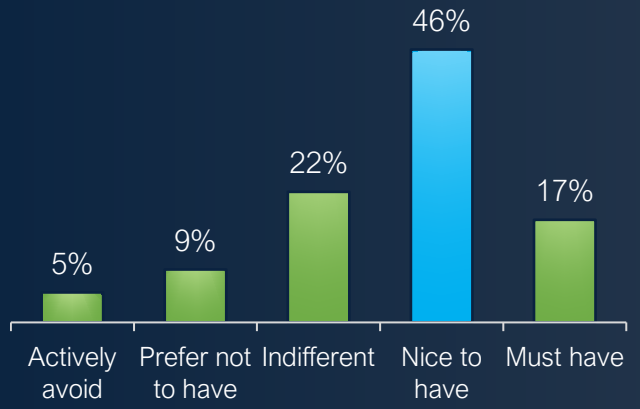
Use case detailed findings

Collaborative Driving considered nice to have and adds some value

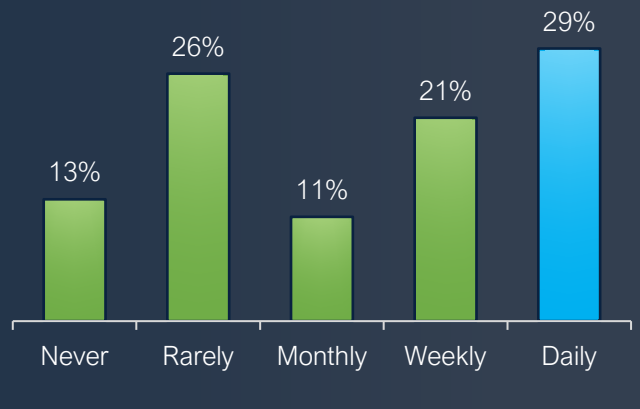


Your vehicle will communicate in real time with other vehicles and infrastructure to optimize routes in unusual situations (e.g., hurricane/fire evacuations, navigating crowded pick up and drop off areas like airports, road trips with multiple vehicles).

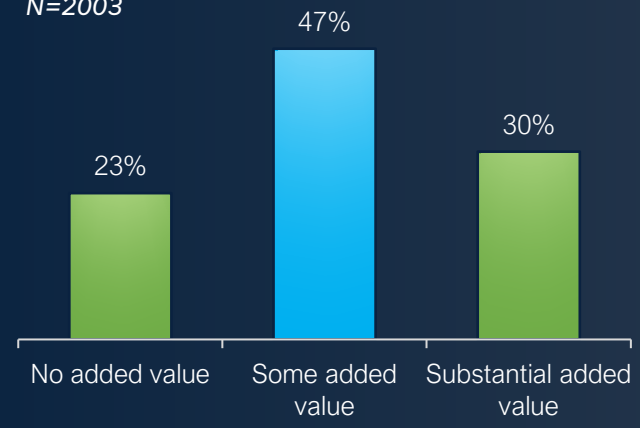
Interest
N=2003



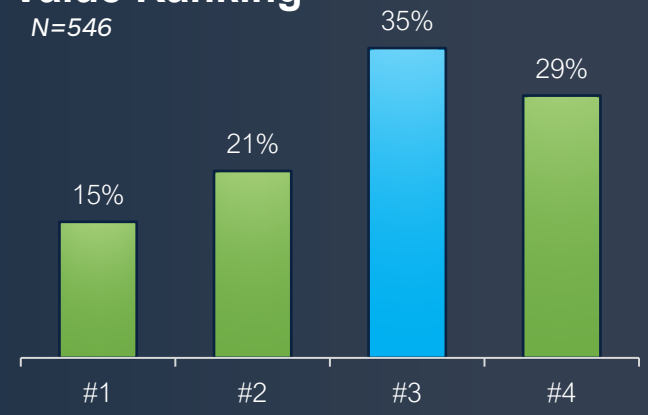
Usage
N=2003



Value
N=2003



Value Ranking
N=546

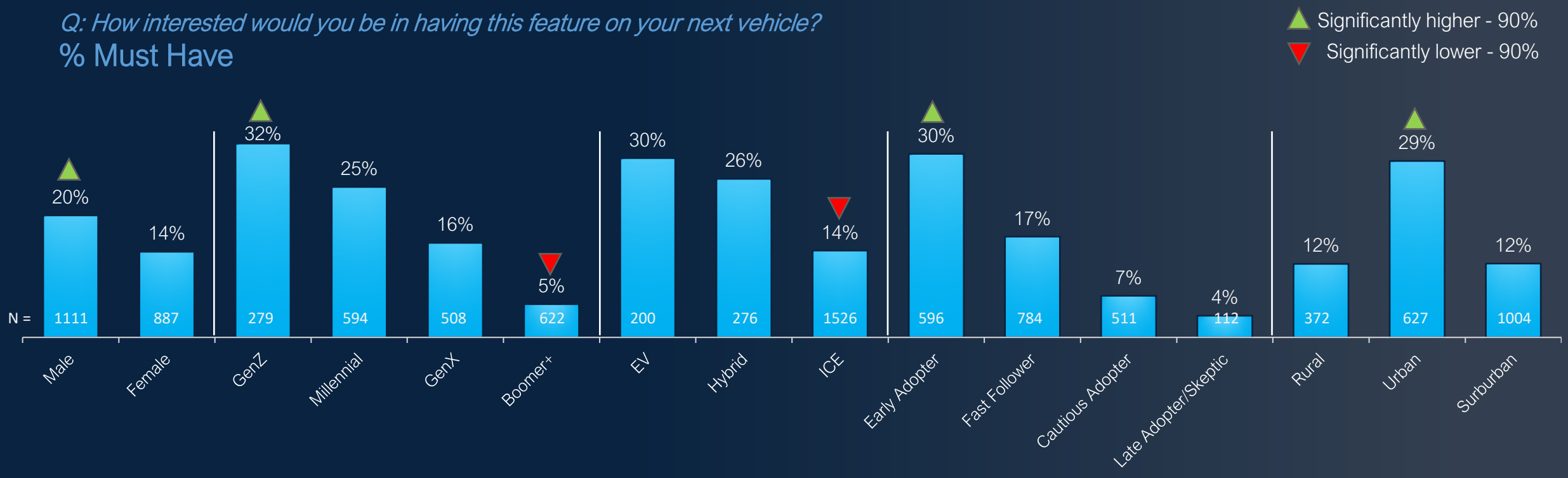


Use case detailed findings

Collaborative Driving garners higher interest among men and younger drivers

Q: How interested would you be in having this feature on your next vehicle?

% Must Have



- Appeals significantly most to Males, Gen Z, Early Adopters and Urban dwellers.
- Appeals significantly least to Boomers+ and ICE drivers.

V2X Quantitative Research

Use case detailed findings

Collaborative #1 value rank profile

Significantly higher - 90%
Significantly lower - 90%

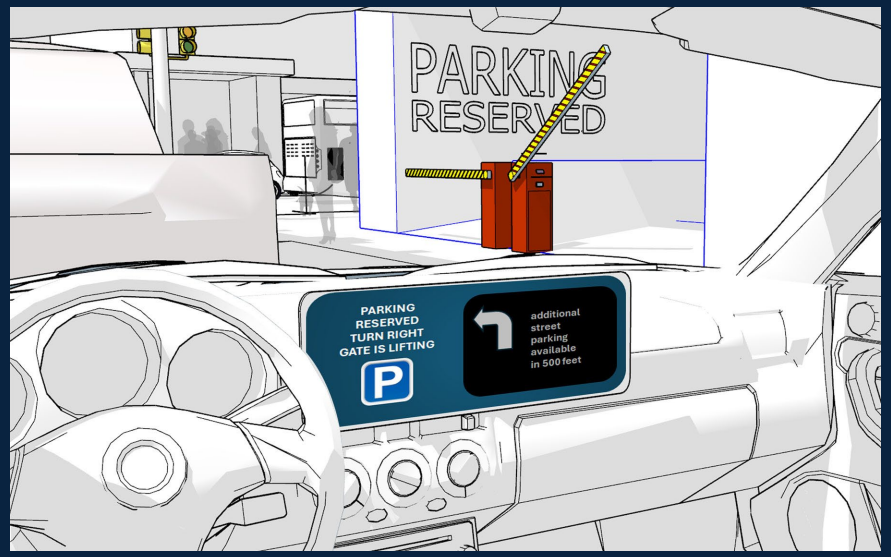
		Total Sample	Collaborative Driving
Gender	Male	**55%**	60%
	Female	**44%**	40%
Geo	Rural	**19%**	16%
	Urban	**31%**	42%
	Suburban	**50%**	42%
Cohort	GenZ	**14%**	14%
	Millennial	**30%**	37%
	GenX	**25%**	33%
	Boomer+	**31%**	15%
Powertrain	EV	**10%**	18%
	Hybrid	**14%**	11%
	ICE	**76%**	71%
Tech	Early Adopter	**30%**	39%
	Fast Follower	**39%**	40%
	Cautious Adopter	**26%**	20%
	Late Adopter	**5%**	1%
	Skeptic	**1%**	0%
Driving majority	Mostly local	**34%**	17%
	Mostly highway	**9%**	10%
	Equal mix	**57%**	73%

			Total Sample	Collaborative Driving
Miles / Year	<10,000		**28%**	13%
	10,000 - 14,999		**33%**	40%
	15,000 - 19,999		**24%**	29%
	20,000+		**15%**	18%
Drive Frequency	<1 day per week		**1%**	0%
	1-3 days per week		**13%**	8%
	4-6 days per week		**23%**	23%
	Almost every day		**63%**	69%
Frequency	Drive with passengers	Never	**3%**	2%
		Rarely	**18%**	11%
		Monthly	**9%**	7%
		Weekly	**44%**	51%
		Daily	**27%**	29%
	Drive in low visibility	Never	**5%**	2%
		Rarely	**36%**	30%
		Monthly	**20%**	22%
		Weekly	**28%**	33%
		Daily	**11%**	13%
	Drive in unfamiliar areas	Never	**6%**	0%
		Rarely	**52%**	48%
		Monthly	**25%**	33%
		Weekly	**12%**	13%
		Daily	**5%**	6%

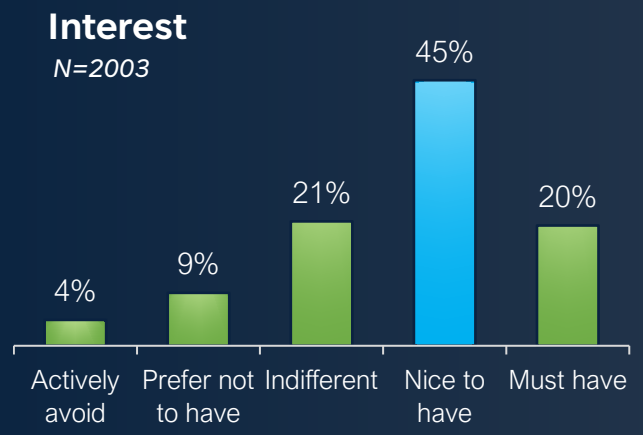
- Compared to the total sample, participants who rank collaborative driving #1 in value are significantly more likely to live in an urban area and drive an equal mix between local and highway.
- They also skew younger, are early adopters of new technology, and drive more miles per year.

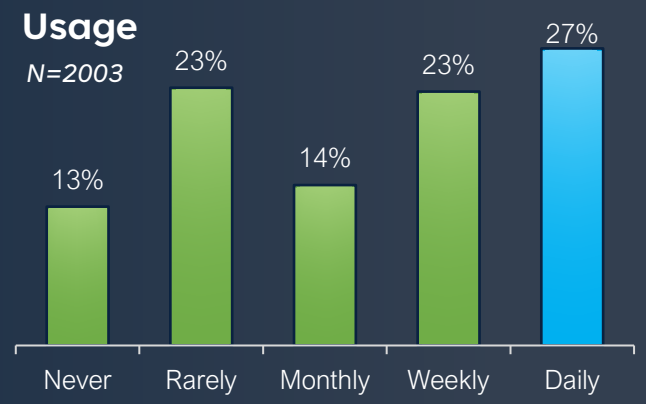
Use case detailed findings

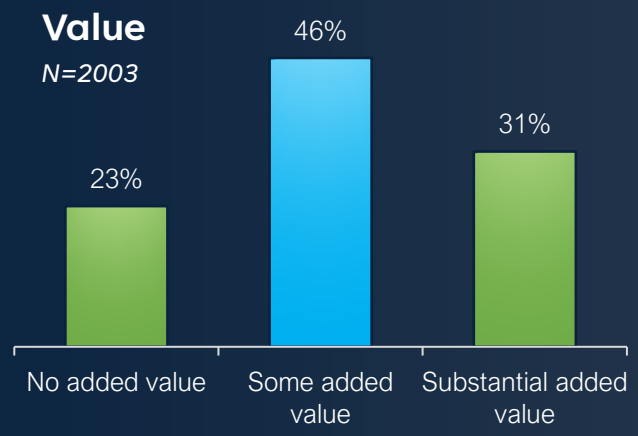
Parking Locator and Payment regarded as nice to have and adds some value

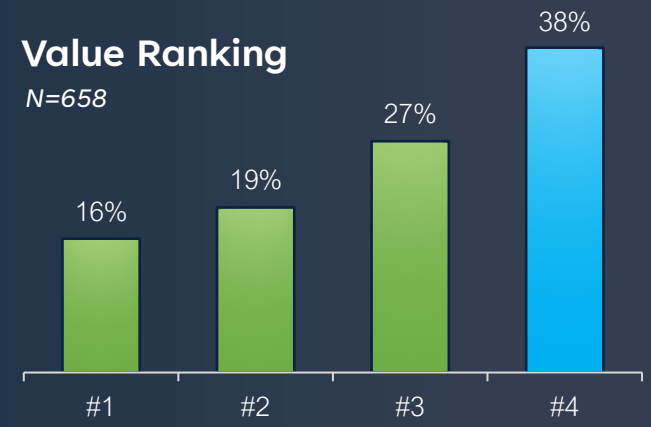


Your vehicle will utilize parking systems and street-side cameras to identify and recommend available parking spots near your destination. The vehicle will automatically make reservations and payments without requiring your involvement. It can also identify free parking at your destination.







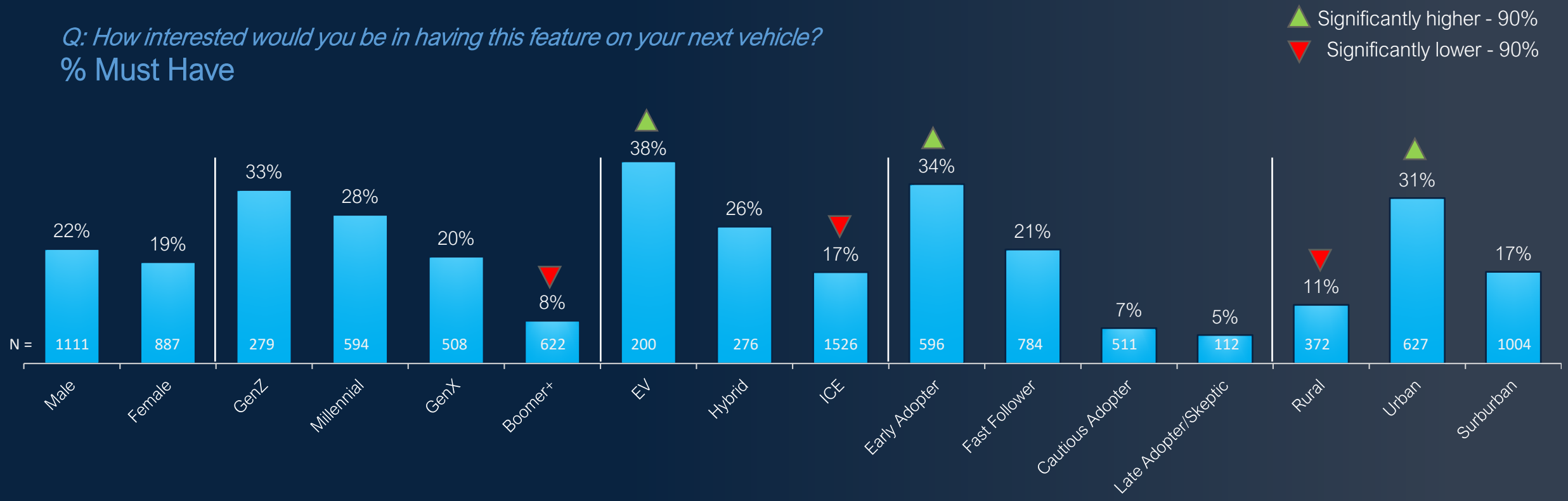


Use case detailed findings

Parking Locator and Payment appeals most to EV owners, early adopters, and urbanites.

Q: How interested would you be in having this feature on your next vehicle?

% Must Have



- Appeals significantly most to EV Drivers, Early Adopters and Urban dwellers.
- Appeals significantly least to Boomers+, ICE owners, and those living in Rural areas.

V2X Quantitative Research

Use case detailed findings

Parking Locator and Payment #1 value rank profile

Significantly higher - 90%
Significantly lower - 90%

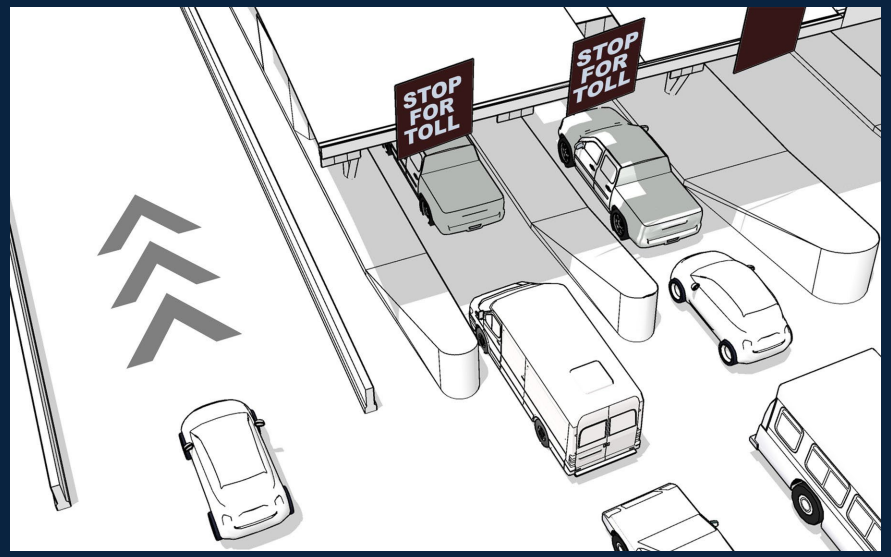
		Total Sample	Parking Locator & Payment
Gender	Male	**55%**	53%
	Female	**44%**	46%
Geo	Rural	**19%**	13%
	Urban	**31%**	40%
	Suburban	**50%**	47%
Cohort	GenZ	**14%**	25%
	Millennial	**30%**	25%
	GenX	**25%**	30%
	Boomer+	**31%**	20%
Powertrain	EV	**10%**	15%
	Hybrid	**14%**	9%
	ICE	**76%**	75%
Tech	Early Adopter	**30%**	42%
	Fast Follower	**39%**	36%
	Cautious Adopter	**26%**	19%
	Late Adopter	**5%**	3%
	Skeptic	**1%**	0%
Driving majority	Mostly local	**34%**	30%
	Mostly highway	**9%**	12%
	Equal mix	**57%**	58%

			Total Sample	Parking Locator & Payment
Miles / Year	<10,000		**28%**	19%
	10,000 - 14,999		**33%**	34%
	15,000 - 19,999		**24%**	31%
	20,000+		**15%**	16%
Drive Frequency	<1 day per week		**1%**	0%
	1-3 days per week		**13%**	9%
	4-6 days per week		**23%**	23%
	Almost every day		**63%**	68%
Frequency	Drive with passengers	Never	**3%**	5%
		Rarely	**18%**	16%
		Monthly	**9%**	7%
		Weekly	**44%**	44%
		Daily	**27%**	28%
	Drive in low visibility	Never	**5%**	8%
		Rarely	**36%**	29%
		Monthly	**20%**	22%
		Weekly	**28%**	27%
		Daily	**11%**	14%
	Drive in unfamiliar areas	Never	**6%**	8%
		Rarely	**52%**	38%
		Monthly	**25%**	27%
		Weekly	**12%**	19%
		Daily	**5%**	8%

- Respondents who most value the parking locator & payment feature are significantly more likely to live in an urban area and belong to Gen Z than the total sample.
- They also strongly identify as early adopters, drive more miles in a year, and drive in unfamiliar areas slightly more frequently.

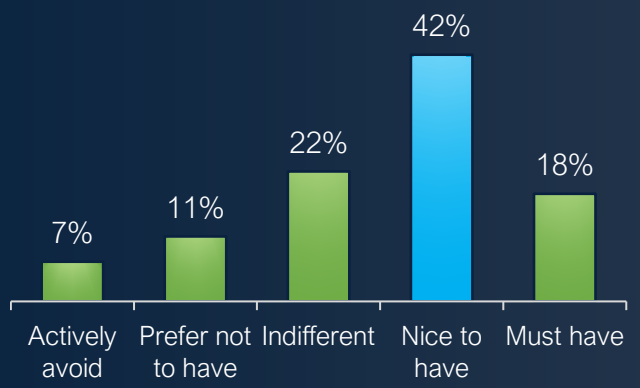
Use case detailed findings

Automatic In-Vehicle Tolling would be nice to have and adds some value

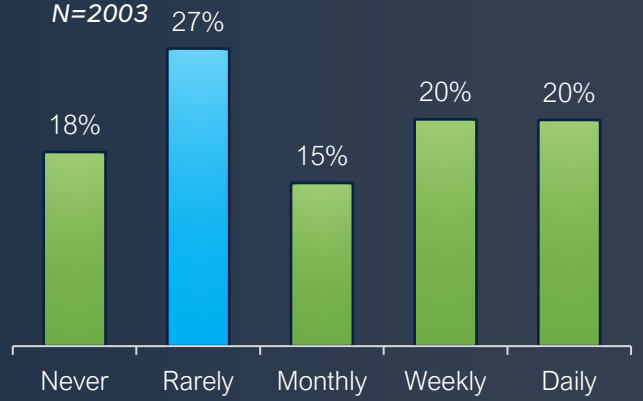


Your vehicle will automatically detect and pay for tolls, eliminating the need for you to mount devices in your vehicle, register payment methods with tolling agencies, or worry about device compatibility across states.

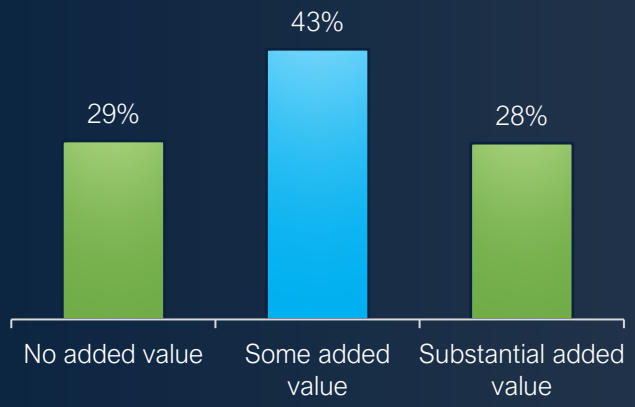
Interest
N=2003



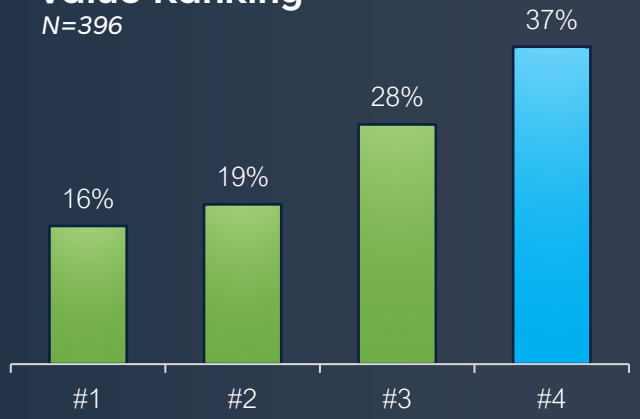
Usage
N=2003



Value
N=2003



Value Ranking
N=396

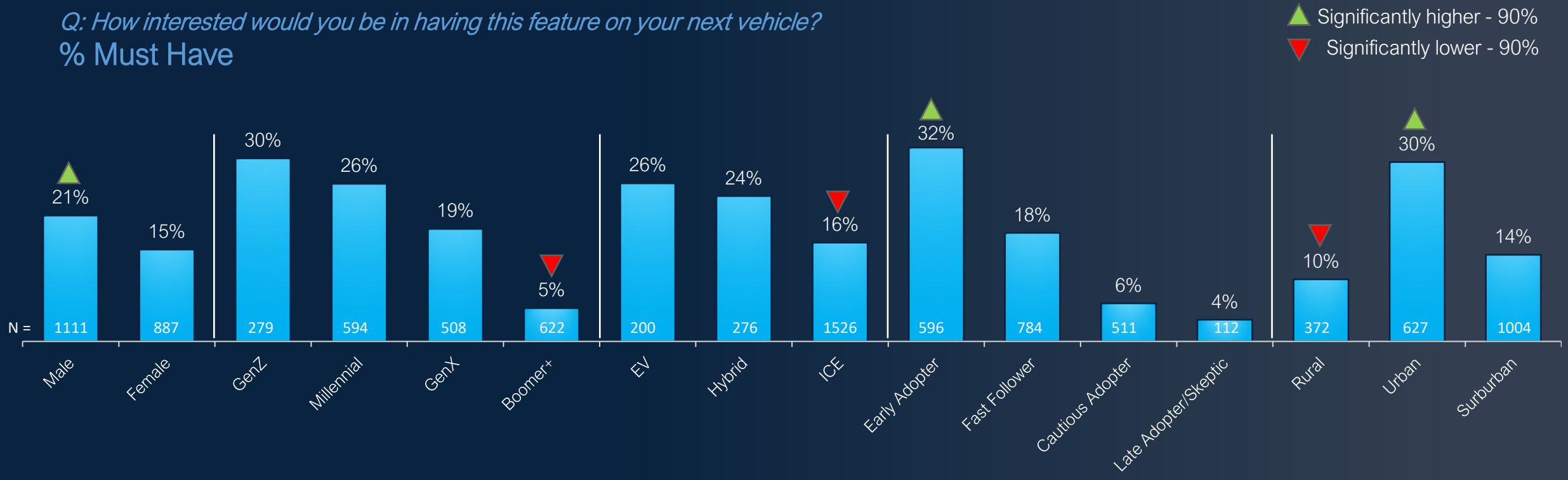


Use case detailed findings

Automatic In-Vehicle Tolling
Significantly more appealing to men

Q: How interested would you be in having this feature on your next vehicle?

% Must Have



- Appeals significantly most to Males, Early Adopters and Urban dwellers.
- Appeals significantly least to Boomers+, ICE owners, and those in Rural areas.

V2X Quantitative Research

Use case detailed findings

Automatic In-Vehicle Tolling
#1 value rank profile

Significantly higher - 90%
Significantly lower - 90%

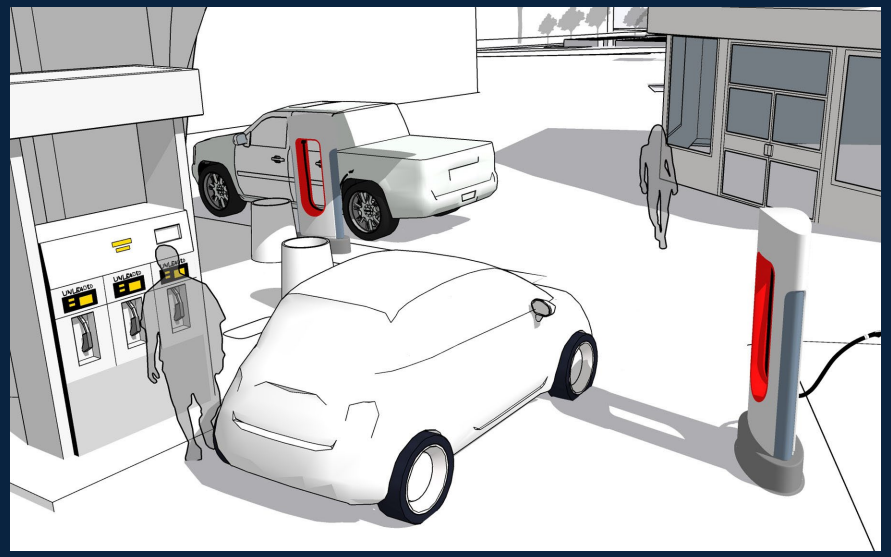
		Total Sample	Automatic In-Vehicle Tolling
Gender	Male	**55%**	55%
	Female	**44%**	45%
Geo	Rural	**19%**	16%
	Urban	**31%**	41%
	Suburban	**50%**	44%
Cohort	GenZ	**14%**	13%
	Millennial	**30%**	45%
	GenX	**25%**	23%
	Boomer+	**31%**	19%
Powertrain	EV	**10%**	13%
	Hybrid	**14%**	20%
	ICE	**76%**	67%
Tech	Early Adopter	**30%**	44%
	Fast Follower	**39%**	36%
	Cautious Adopter	**26%**	17%
	Late Adopter	**5%**	3%
	Skeptic	**1%**	0%
Driving majority	Mostly local	**34%**	38%
	Mostly highway	**9%**	11%
	Equal mix	**57%**	52%

			Total Sample	Automatic In-Vehicle Tolling
Miles / Year	<10,000		**28%**	19%
	10,000 - 14,999		**33%**	39%
	15,000 - 19,999		**24%**	22%
	20,000+		**15%**	20%
Drive Frequency	<1 day per week		**1%**	0%
	1-3 days per week		**13%**	14%
	4-6 days per week		**23%**	22%
	Almost every day		**63%**	64%
Frequency	Drive with passengers	Never	**3%**	6%
		Rarely	**18%**	11%
		Monthly	**9%**	5%
		Weekly	**44%**	50%
		Daily	**27%**	28%
	Drive in low visibility	Never	**5%**	2%
		Rarely	**36%**	34%
		Monthly	**20%**	17%
		Weekly	**28%**	33%
		Daily	**11%**	14%
	Drive in unfamiliar areas	Never	**6%**	8%
		Rarely	**52%**	34%
		Monthly	**25%**	27%
		Weekly	**12%**	22%
		Daily	**5%**	9%

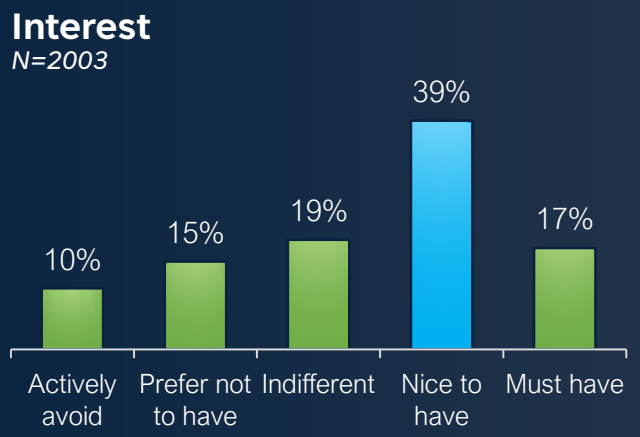
- Compared to the total sample, those who most value automatic in-vehicle tolling are significantly younger, are early adopters of new technology and live in an urban area.
- They also drive in unfamiliar areas significantly more frequently.

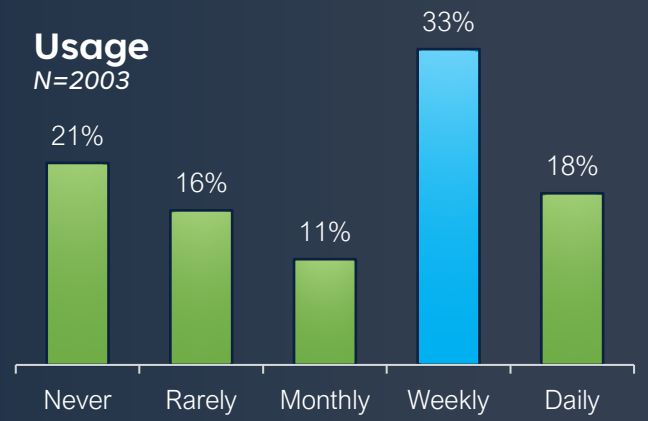
Use case detailed findings

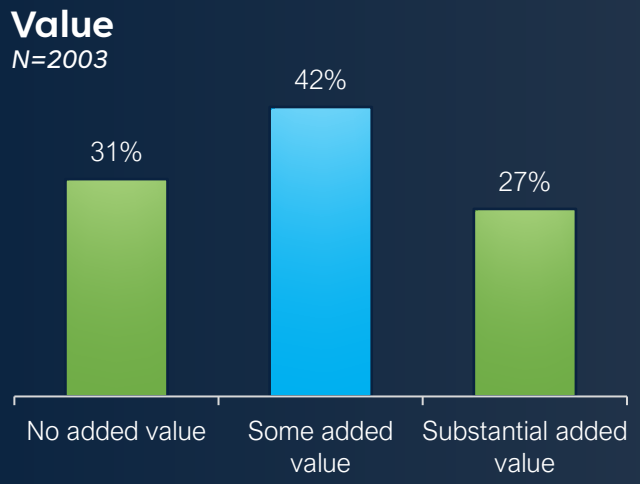
Auto Pay Fuel / Charging deemed nice to have and adds some value

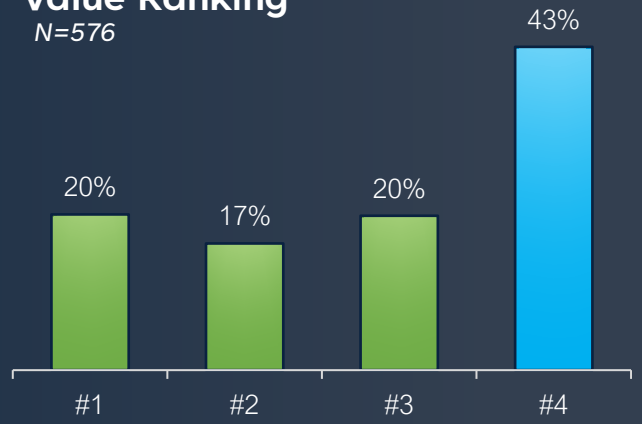


Your vehicle will make secure payments on your behalf at places along your journeys as you approve them, including at gas stations and charging spots.







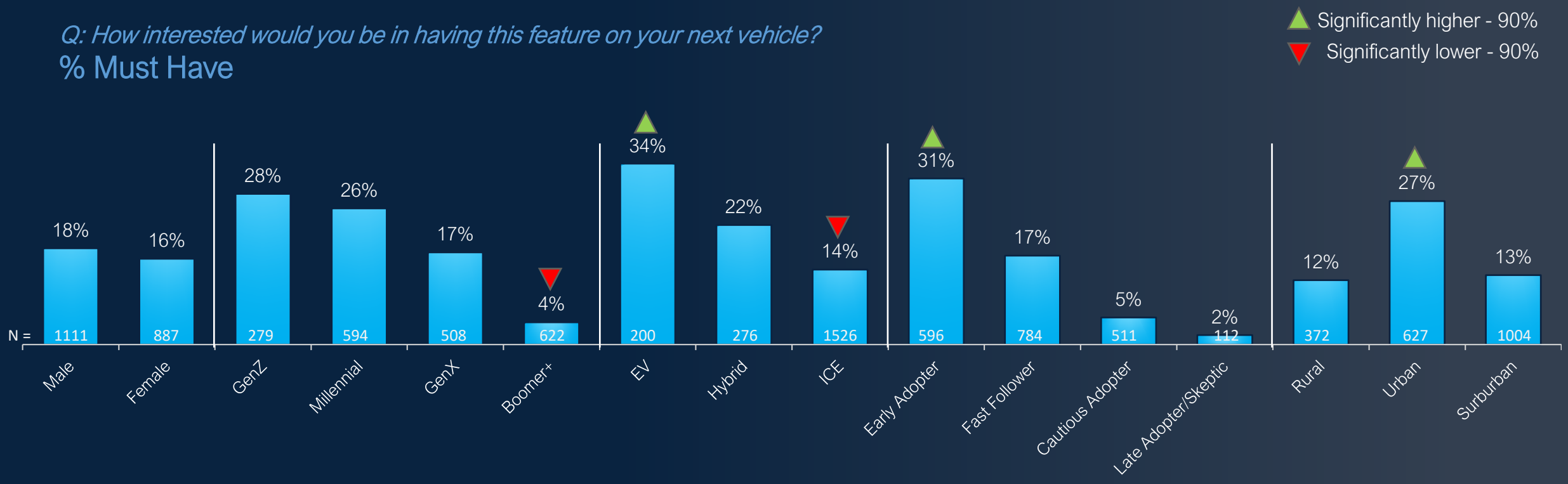


Use case detailed findings

Auto Pay Fuel / Charging
Is most appealing to EV owners, early adopters, and urbanites

Q: How interested would you be in having this feature on your next vehicle?

% Must Have



- Appeals significantly most to EV Drivers, Early Adopters and Urban dweller
- Appeals significantly least to Boomers+ and ICE owners

Use case detailed findings

Auto Pay Fuel / Charging
#1 Value rank profile

Significantly higher - 90%
Significantly lower - 90%

		Total Sample	Auto Pay Fuel / Charging
Gender	Male	**55%**	59%
	Female	**44%**	41%
Geo	Rural	**19%**	9%
	Urban	**31%**	37%
	Suburban	**50%**	53%
Cohort	GenZ	**14%**	14%
	Millennial	**30%**	43%
	GenX	**25%**	26%
	Boomer+	**31%**	16%
Powertrain	EV	**10%**	19%
	Hybrid	**14%**	14%
	ICE	**76%**	68%
Tech	Early Adopter	**30%**	44%
	Fast Follower	**39%**	38%
	Cautious Adopter	**26%**	17%
	Late Adopter	**5%**	1%
	Skeptic	**1%**	0%
Driving majority	Mostly local	**34%**	26%
	Mostly highway	**9%**	9%
	Equal mix	**57%**	64%

			Total Sample	Auto Pay Fuel / Charging
Miles / Year	<10,000		**28%**	21%
	10,000 - 14,999		**33%**	35%
	15,000 - 19,999		**24%**	29%
	20,000+		**15%**	15%
Drive Frequency	<1 day per week		**1%**	3%
	1-3 days per week		**13%**	11%
	4-6 days per week		**23%**	15%
	Almost every day		**63%**	71%
Frequency	Drive with passengers	Never	**3%**	3%
		Rarely	**18%**	17%
		Monthly	**9%**	6%
		Weekly	**44%**	43%
		Daily	**27%**	31%
	Drive in low visibility	Never	**5%**	6%
		Rarely	**36%**	32%
		Monthly	**20%**	19%
		Weekly	**28%**	27%
		Daily	**11%**	15%
	Drive in unfamiliar areas	Never	**6%**	9%
		Rarely	**52%**	47%
		Monthly	**25%**	28%
		Weekly	**12%**	11%
		Daily	**5%**	5%

- Participants who most value auto pay fueling / charging are significantly less likely to live in a rural area.
- They are significantly younger, more likely to drive an EV, and early adopters of new technology.
- They are also significantly more likely to drive their vehicle every day with their annual miles per year skewing somewhat higher and they are less likely to drive just locally.

Additional Insights

Additional respondent comments

Q: Now that you've reviewed some potential features which allow your vehicle to communicate with other vehicles, infrastructure, pedestrians, and networks, are there any additional features that you would like to see included that were not presented? If yes, please describe.

AI / ADVANCED DRIVER ASSISTANCE / AUTONOMOUS DRIVING

- *"Autonomous vehicle communication for enhanced safety, efficiency, coordination."*
- *"Hands free driving."*
- *"Auto lane correction when accidentally moving into oncoming traffic."*
- *"Self driving."*
- *"AI audio functionality."*
- *"I Would like an AI-driven predictive safety system that anticipates risks and adjusts the vehicles behavior proactively."*
- *"Driving assistant professional - this package includes features like adaptive cruise control, lane keeping assist and automatic parking."*
- *"Hands free driving."*
- *"I'd like to see enhanced AI-driven predictive traffic management, ensuring smoother flow and reducing congestion in real-time."*
- *"Self driving."*
- *"Auto stop and start for emergencies."*
- *"Communicate with other vehicles on highway to form blocks of vehicles." going same speed and direction, autonomous during that period."*
- *"Full self driving."*
- *"If the driver has an emergency and cannot drive I would like the car to take over and pull the car to the side of the road to safety."*
- *"I would like a smart summons feature."*
- *"Complete AI access."*
- *"Self driving."*
- *"In case of illness or heart attack while driving car detects a shift in weight and driving detecting an emergency and drives itself to a safe location dialing 911."*
- *"More automatic functions like auto slow down when detecting ice. In car warnings about intense weather conditions would also be very nice."*
- *"Self drive feature."*
- *"I would like to see features that allow the vehicle to better predict and respond to emergency situations in real-time."*
- *"Predictive maintenance and autonomous driving capabilities."*
- *"Would like a temporary automatic driving feature."*
- *"AI."*
- *"Self-driving would be awesome."*
- *"Self driving cars with Ai integrated."*
- *"I would like to see some kind of emergency control in case a driver gets ill or passes out. The car will take over and stop safely."*
- *"Artificial intelligence taking over control of driving in case of an emergency to avoid accidents."*
- *"I'd like to see enhanced predictive collision avoidance systems, where vehicles can anticipate potential hazards based on real- time data form other vehicles, infrastructure and presentations, improving safety and reducing accidents."*
- *"Augmented reality."*

Additional respondent comments

Q: Now that you've reviewed some potential features which allow your vehicle to communicate with other vehicles, infrastructure, pedestrians, and networks, are there any additional features that you would like to see included that were not presented? If yes, please describe.

NAVIGATION

- *"Traffic zone alerts."*
- *"I would love to my vehicle tell me when the speed limit changes and when they are activated traffic cams if I'm going too fast."*
- *"Alerting you if a round about is coming, and how heavy the traffic is in your current direction of travel, and if there is an alternate faster route including redlights."*
- *"A warning signal if another auto had crash ahead."*
- *"One feature that I would like to see is a dark mode feature where everything on the map is a different color and the base is black but looks cool."*
- *"I'd like a feature for enhanced real-time hazard alerts, including weather updates and road closures, integrated with navigation systems for seamless rerouting and safety."*
- *"Probably a feature that allows you to open up real time GPS or something like that, even though we have a GPS, just not real time."*
- *"Tell me alternate routes when there is an accident or construction delay."*
- *"Speed limit changes ahead notices. Food/gas ahead."*
- *"Alternate routes due to high traffic congestion."*
- *"Recommend attractions near me."*
- *"To avoid traffic."*
- *"I think a feature where it shows wait times for traffic would be nice."*
- *"Conducted with fastest vehicle and follow the route."*
- *"I would suggest that knowing the times that schools start and let out would be helpful because of the buses, crossing guards and guardians rushing to drop off or pick up children."*
- *"Well shortcuts on ride."*
- *"I'd like enhanced pedestrian detection, smart traffic light integration, and advanced weather hazard alerts."*
- *"I hope to see AI automatically identifying interesting restaurants or other facilities nearby for me to choose from."*
- *"Available routes and shelters during a hurricane evacuation notification."*
- *"A total map of the city where all traffic is what's heavily used and what's light."*

Additional features

Q: Now that you've reviewed some potential features which allow your vehicle to communicate with other vehicles, infrastructure, pedestrians, and networks, are there any additional features that you would like to see included that were not presented? If yes, please describe.

DETECTION

- *"Automatic Collision Avoidance."*
- *"Better safety at gas stations."*
- *"Maybe alerts directly to my phone if people touch the handles of the car or lean against the glass of the car."*
- *"Integrated radar detection."*
- *"Soft towers."*
- *"Objects on the road, trucks with unsecured loads."*
- *"Pedestrian and cyclist awareness system."*
- *"Reckless drivers, people swerving or can't stay in the lane. Speeding, I'd a car blows past you at 85 miles an hour your vehicle can send a warning to vehicles ahead of you."*
- *"Signal of the car breaking before approaching a potential accident!"*
- *"I would like to see features for real-time hazard alerts from other vehicles and infrastructure."*
- *"Wildlife Warning. Alerts for an area which has active wildlife crossing."*
- *"Speed zone sensor."*
- *"Maybe tell me how crowded a freeway is before I enter it."*
- *"Maybe have a sensor to know when a vehicle in front of you suddenly stops and your vehicle will automatically slow down."*
- *"Safety features like when an accident is in the area."*
- *"Police presence."*
- *"The motion detector on the sides of the car and the advanced mirror."*
- *"Crashes on roadways ahead of you."*
- *"Abrupt stopping in front of you."*
- *"Something that indicates an approaching car when you're in a parking lot"*
- *"A way to communicate when someone ahead of you is using their brakes."*
- *"Red light cameras notification."*
- *"Possibly alert you to someone approaching your vehicle if parked or stopped."*
- *"Police alert."*
- *"Possibly warn of carjacking or crime about to happen."*

MISC

- *"Sustainability."*
- *"Working cameras that start recording in case of an accident."*
- *"Bump alerts."*
- *"Maybe adding the ability to check your engine light without using a scanner tool hooking up."*
- *"Maybe something relating to the horn, it comes on automatically in situations that a person would use their horn."*
- *360-degree automatic recording of surroundings.*
- *"Automatic climate control system. Example: turn heater up and or defroster on when outside temperature reaches a certain degree. Engage lane departure and speed controls when road conditions are poor.*
- *"A U-turn indicator."*
- *"Pre-knowledge of mechanical issues with the vehicle."*

Additional features

Q: Now that you've reviewed some potential features which allow your vehicle to communicate with other vehicles, infrastructure, pedestrians, and networks, are there any additional features that you would like to see included that were not presented? If yes, please describe.

MISC (CONTINUED)

- *"I'd like enhanced pedestrian detection, smart traffic light integration, and advanced weather hazard alerts."*
- *"There are a few additional features related to vehicle communication that could be really valuable: Vehicle-to-Pedestrian Communication: A feature that allows vehicles to communicate directly with pedestrians or cyclists (using mobile apps or smart wearables) to enhance safety, especially in crosswalks or busy urban areas. This could alert pedestrians to nearby vehicles or let them know when it's safe to cross. Weather and Road Condition Alerts: Real-time integration with infrastructure to provide alerts about road conditions, upcoming weather hazards (e.g., ice, fog, heavy rain), or construction zones. This would help drivers prepare in advance and avoid dangerous conditions. Emergency Vehicle Communication: A feature where emergency vehicles (police, ambulance, fire trucks) can communicate with surrounding vehicles to clear traffic or provide priority routing, especially in urban environments or during accidents. Eco-Driving and Traffic Flow Optimization: A feature that uses communication between vehicles and traffic lights to optimize fuel efficiency by adjusting speed to match light cycles, reducing stop-and-go driving, and lowering emissions. AI-Powered Carpooling Integration: A feature that could help connect drivers with nearby passengers or other vehicles going in the same direction to promote carpooling, reducing traffic and emissions. These kinds of features could further enhance safety, convenience, and environmental."*
- *"Collaborated with a special app all function."*
- *"Environmental Awareness, Enhanced Safety Alerts, etc. additional features that I would like to see."*
- *"Vehicle does start or work with active cell phone inside."*
- *"I'd suggest features like hazard alerts between vehicles, dynamic parking updates, optimized eco-friendly routing, pedestrian communication via smartphones, and priority signals for emergency vehicles to enhance safety and convenience."*
- *"Here are some additional features that could enhance vehicle-to-everything (V2X) communication systems, based on emerging trends and user needs: Augmented Reality (AR) Integration: Display real-time traffic data, pedestrian crossings, or road hazards on windshields using heads-up displays (HUD) for improved situational awareness. Advanced Emergency Alerts: Features that notify drivers of approaching emergency vehicles, nearby accidents, or adverse weather conditions, with precise guidance on how to react. Personalized Route Optimization: Integration of dynamic routing that adapts to personal preferences, like fuel efficiency, scenic routes, or time sensitivity, using live V2X data. Enhanced Pedestrian Safety: Systems that actively detect and communicate with pedestrians' smartphones or wearables, alerting both the driver and the pedestrian of potential collisions. Vehicle Health and Maintenance Alerts: Sharing diagnostics with service networks and other vehicles to reduce breakdowns and improve traffic flow. Energy Sharing and Optimization: For electric vehicles (EVs), features to facilitate energy-sharing between vehicles or infrastructure to help stranded EVs or optimize charging station use."*

Additional features

Q: Now that you've reviewed some potential features which allow your vehicle to communicate with other vehicles, infrastructure, pedestrians, and networks, are there any additional features that you would like to see included that were not presented? If yes, please describe.

MISC (CONTINUED)

- *"Features that improve the vehicle's security and safety should be the most beneficial. Some examples would be alert system that can predict incoming impact and crash, detection system that can run diagnostics on the car daily and inform drivers about the car's health etc."*
- *"Only the fees and price."*
- *"I'd like to see adaptive headlights that adjust to traffic and road conditions, improving visibility and reducing glare for other drivers."*
- *"Something for night blindness."*
- *"I can't think of any except maybe if the in-car warnings were attached to phone. It seems like it might make it easier for the driver, unless there is a voice activated warning for all of the issues that could happen."*
- *"I love all 9 features. I am a bit concerned about my vehicle being able to connect to everything as I worry about being hacked and the safety of my vehicle but I am also on board to these features and love the idea and working of them. I think automatic hazard road alerts and car modifications and/or switching to like 4wheel drive when needed on its own could be really cool. Or a button or safe word being used to automatically contract to police and giving them your exact location with a car tracker in bad situations like a car jacking or robbery or anything that could do harm to the driver even accidents but being able to give the dispatcher the location without having to say it to them or if driver is unable to speak. But having a live location sent to police to track the car in emergencies could be very helpful."*

COMMUNICATIONS

- *"Reckless drivers, people swerving or can't stay in the lane. Speeding, I'd a car blows past you at 85 miles an hour your vehicle can send a warning to vehicles ahead of you."*
- *"When crime is near by."*
- *"I would like a way to prevent my vehicle from participating in any of the shared information with other drivers."*
- *"Just that the mentioned features be screen and voice active."*
- *"I would love a car that can make reservations for you."*
- *"More warning sounds."*
- *"I'd like to be able to order food for pickup, pay for it with my car as I pick it up in the drive thru. Anywhere that has a drive thru."*
- *"I would like to see features that enhance vehicle communication with emergency services, providing real-time data in case of accidents or hazards, and integrating environmental sensors for improved safety and navigation."*
- *"Being able to order food from a drone in your car."*
- *"Yes , I'd like to see features that enhance privacy and data security in vehicle communication systems, ensuring sensitive information is protected."*

Additional features

Q: Now that you've reviewed some potential features which allow your vehicle to communicate with other vehicles, infrastructure, pedestrians, and networks, are there any additional features that you would like to see included that were not presented? If yes, please describe.

EXISTING TECHNOLOGIES (ENHANCED?)

- *"Additional charging outlets."*
- *"Better airbag systems. Ones that are more active."*
- *"Lights automatically come on either when wipers are activated or low light conditions."*
- *"Built in telephone/ Wi-Fi."*
- *"More back cameras and emergency functions."*
- *"Wipers that would automatically come on when there is moisture on the windshield."*
- *"Reinstall a cd player. Re add the heads-up display."*
- *"Something that notices a child in the back seat left behind."*
- *"Satellite TV."*
- *"Internet wireless connection."*
- *"Voice activation to let you know not to get into their lanes."*
- *"Through speaker of the car."*
- *"Wi-Fi in truck for use on phones as well as the additional functions of vehicle."*

WINDOW TINTING

- *"An automatic sun blocker on windshield of the car."*
- *"Window tint."*
- *"Automatic tint on the windows to be adjusted by driver."*
- *"Window tint darkness or lightness adjustable by driver at will."*

WEATHER NOTIFICATIONS

- *"Yes, I'd like a feature for enhanced real-time hazard alerts, including weather updates and road closures, integrated with navigation systems for seamless rerouting and safety."*
- *"Severe weather ahead warning."*
- *"Weather updates."*
- *"Maybe weather-related updates? Or perhaps traffic related ones."*
- *"I would like to get weather alerts ahead."*
- *"Inclement weather would be good, such as black ice."*
- *"Weather alerts."*
- *"Snow alerts."*

SILLY

- *"Floating in water would be pretty cool."*
- *"Juke box features."*

ANTI-NEW FEATURES

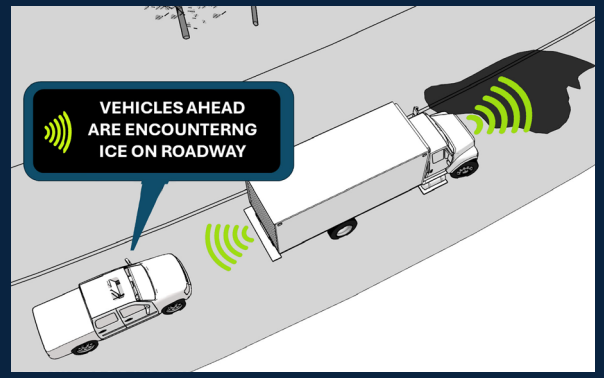
- *"No, I think the more features the more distractions."*
- *"No, I like the way cars are."*

Post-research use case notes

V2X Quantitative Research

As tested

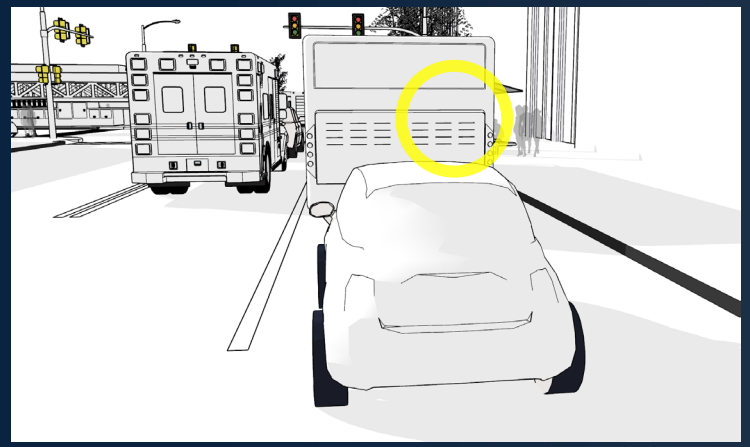
ROAD HAZARD WARNINGS



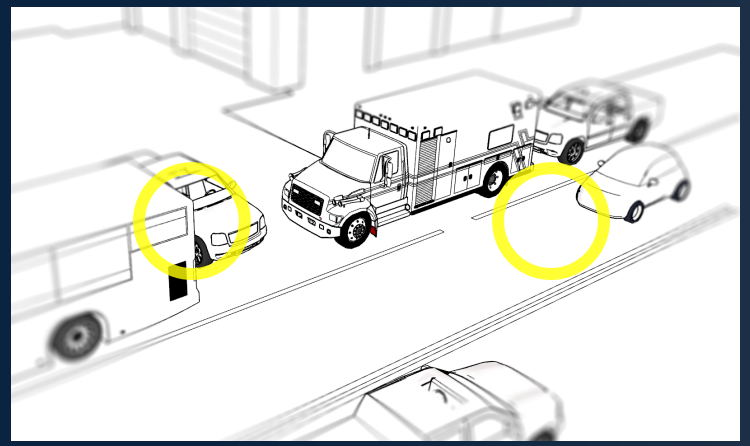
Real-time communication between vehicles will allow you to and provide warnings tbenefit from knowing what hazards lie ahead (like fog, ice, road debris), o vehicles traveling behind you.

Refined

Focus on urban environments and known risks presented by moving actors.



Vehicle ahead (bus, rideshare) will be slowing for a scheduled stop.



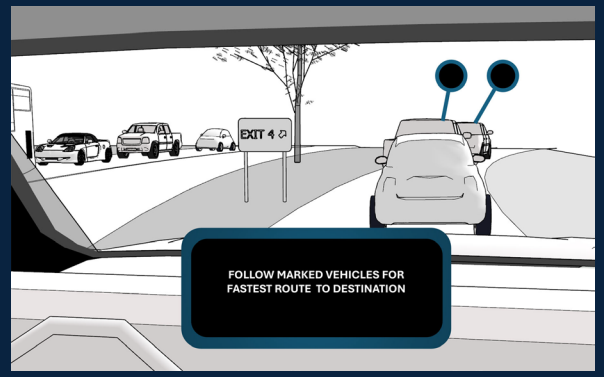
Ex: Blind cross-traffic with stopped curb lane, merging into travel lane

Jaywalking and/or non-standard VRU entry onto roadway. Use vehicles ahead or parked vehicles to detect and notify.

V2X Quantitative Research

As tested

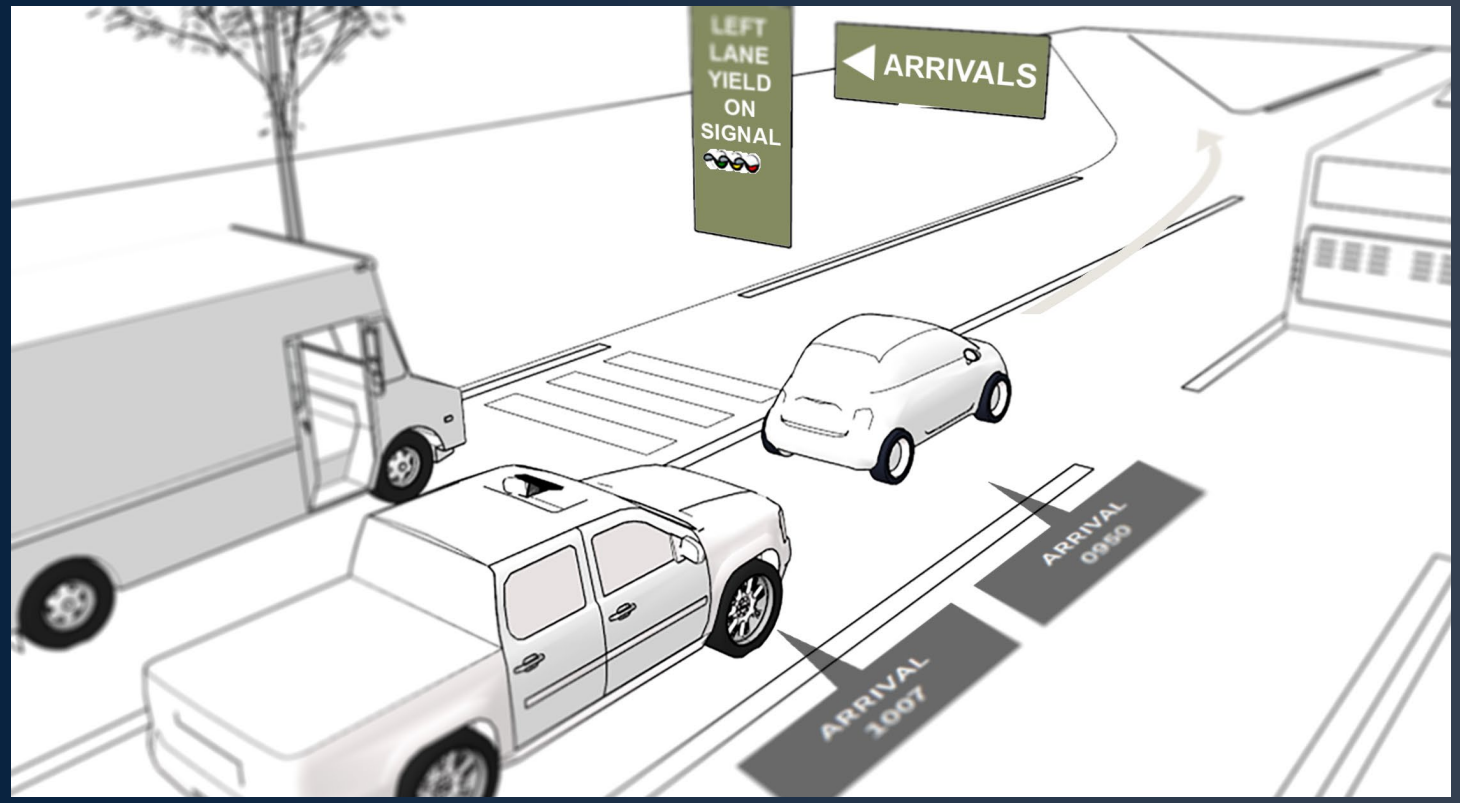
COLLABORATIVE DRIVING



Your vehicle will communicate in real time with other vehicles and infrastructure to optimize routes in unusual situations (e.g., hurricane/fire evacuations, navigating crowded pick up and drop off areas like airports, road trips with multiple vehicles).

Refined

Expectation for collaborative driving skews towards delivering convenience and efficiency.

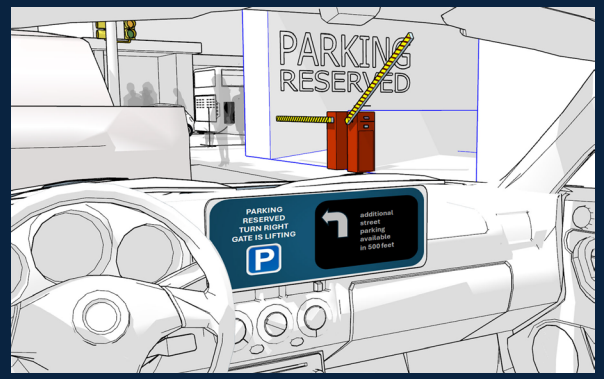


Infrastructure coordinates traffic patterns based on common journey characteristics.

V2X Quantitative Research

As tested

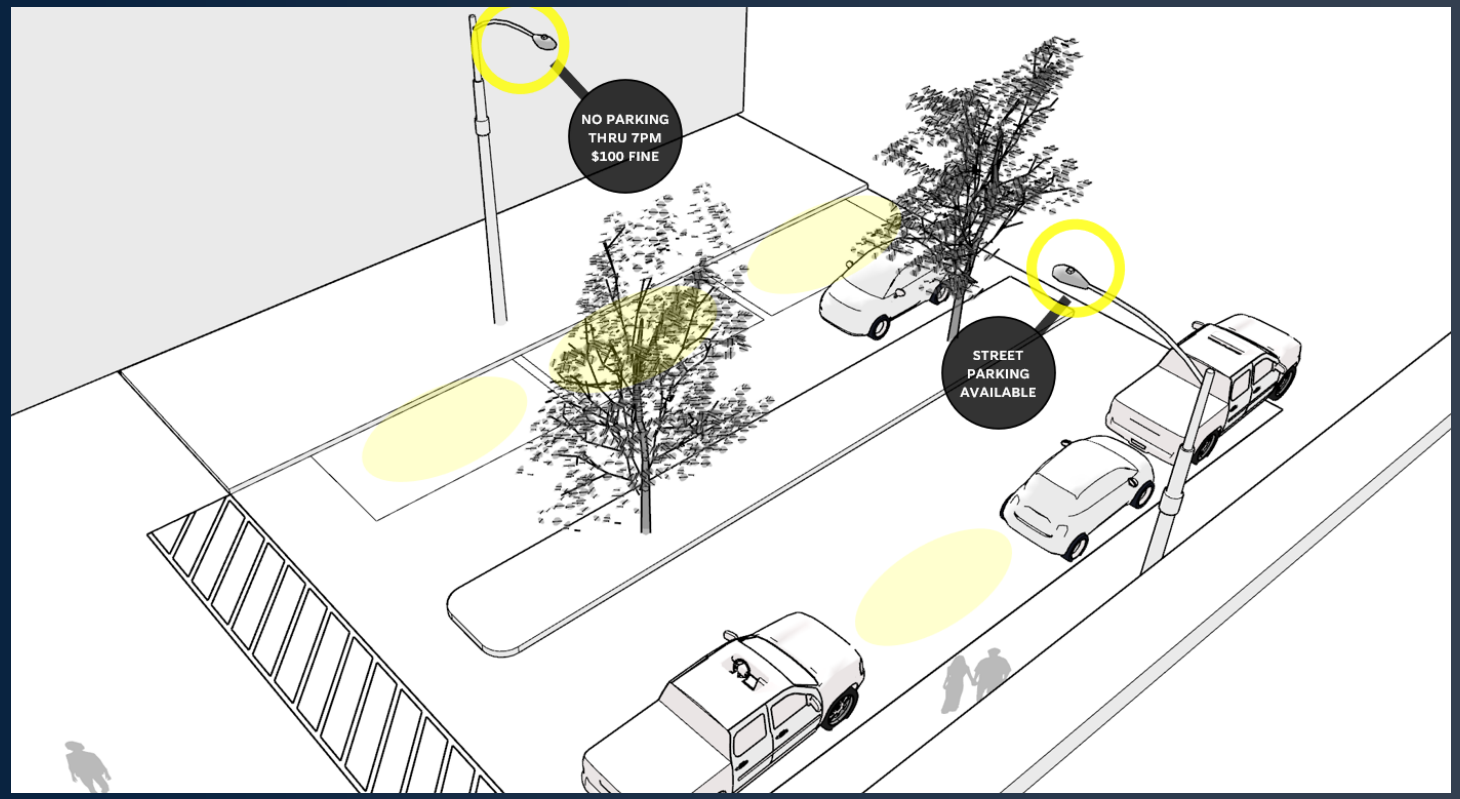
PARKING LOCATOR & PAYMENT



Your vehicle will utilize parking systems and street-side cameras to identify and recommend available parking spots near your destination. The vehicle will automatically make reservations and payments without requiring your involvement. It can also identify free parking at your destination.

Refined

Focus on new value-add X2V communications..

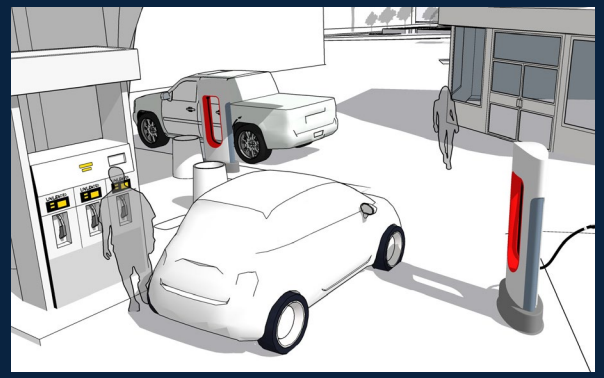


Identify parking constraints and availability beyond dedicated decks and lots.

V2X Quantitative Research

As tested

AUTOPAY FUEL & PARKING



Your vehicle will make secure payments on your behalf at places along your journeys as you approve them, including at gas stations and charging spots.

Refined

Focus on road warriors and security.

Commercial vehicles and fleet operations, efficient speed of transactions.

(end)