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Anticipating the Arrival of a Clean-Sensitive Driving Future

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A leading automaker needed to safely study the impact of the COVID-19 pandemic upon driver and passenger experience to effectively prioritize future in-vehicle features related to cleanliness. In this case study, we'll share our approach and retrospective learnings on how to understand, contextualize, and anticipate the impact of major societal shifts as they happen.

Keywords: Remote Methods, Diary Study, Automotive, COVID-19

How will we know when our anticipated future has finally arrived? The coronavirus pandemic suspended many aspects of life, society, and business in 2020. Hunkered down in our homes or apartments and working by Zoom, much mental energy was spent on anticipation. Initially, our anticipation focused on when we'd be back at the office. A week? Maybe a month? Slowly, anticipation shifted towards the long-term. What would our lives look like after COVID-19? How could our lives return to normal after so much had changed – and indeed, *should* we aim for a return to a reality that was so inequitable for so many?

Businesses followed a similar trajectory of anticipation. Questions about the immediate impact of the pandemic upon supply chains and manufacturing facilities gave way to questions about long-term shifts in consumer expectations and behaviors. As bellwethers of the US economy, automotive manufacturers were forced to reckon with the pandemic's impact on nearly every aspect of their businesses: operations, manufacturing, sales, design, and marketing. Automakers needed to make important decisions that would have real ramifications for employee and customer safety, as well as business performance. The trouble, of course, was that the pandemic's time horizon was (and continues to be) a moving target. When was the right moment to shift from anticipation to action?

THE PROBLEM STATEMENT: STUDYING EVOLVING BEHAVIORS AND EXPERIENCES SAFELY

In the spring of 2020, as COVID-19 spread across the United States, General Motors knew that many advanced features within its long-term research and development pipeline were about to take on heightened relevance to American consumers. These features, long in development, were being designed to address the growing desire for improved air filtration and cleaner surfaces within vehicles. Some had already been introduced in the Chinese market, where air pollution has long been a concern (Zhang et al. 2012).

We believed that American consumers would be increasingly interested in these features as well. Phrases like community spread and airborne transmission were becoming part of the

national lexicon. Americans were newly sensitized (and sanitized) to the potential health risks of sharing enclosed spaces, including cars, airplanes, and other forms of transportation. This sensitivity created a chance to learn from consumers who were suddenly interested in once-niche topics like antimicrobial surfaces and AQI (Air Quality Index), providing potentially valuable input to research and development teams, as well as design teams. But how were we to study the experiences of drivers and passengers at a moment when having a researcher in the backseat was considered a potential health risk, and as the pandemic continued to evolve in unexpected and unanticipated ways?

THE APPROACH: A REMOTE STUDY FIELDED AT A CRITICAL MOMENT

Several questions needed to be answered to prioritize in-development cleanliness features, and effectively communicate those features' benefits to consumers. How were consumer behaviors and attitudes towards car travel evolving during the pandemic? Was there variation by a demographic, agency (passenger vs. driver), or profession (for example, rideshare drivers and fleet drivers)? How long could we anticipate these new attitudes and behaviors to endure? Which features and corresponding claims could be relevant to consumers today and into the future? And ultimately, how should we proceed with regard to feature insertion (the introduction of new technology to the vehicle), UX / UI design, and marketing strategy?

Our belief was that ethnography would be a powerful way to observe emergent behaviors and attitudes during this time of sustained uncertainty at a national and global level. A small-sample (primarily) qualitative approach that was flexible, agile, and allowed participants to show and articulate their experiences in near-real time would be more fruitful than an alternative large-scale quantitative method that could capture more datapoints but would lack depth and context. Our chosen approach also gave us the ability to hypothesize and explore the longer-term implications of the pandemic. For example, at each study touchpoint we asked a set of quantitative questions designed to gauge customer sensitivity to COVID-19 overall, and the level of concern each participant had about exposure to germs and viruses while traveling in personal or professionally driven vehicles. By observing these shifts, as well as level of interest in specific cleanliness-related features, we were able to make conclusions about where consumer interest in future features might be headed and why. We will provide commentary and recommendations for measuring change over time within this study format at the conclusion of this article.

General Motors has extensive and highly sophisticated Research and Development capabilities in-house, and a strong appetite for evidence-based decision-making. In this case, partnering with an external agency offered benefits of speed and efficiency, as well as methodological diversity. As noted by Brigitte Jordan, Christina Wasson, and Heather S. Roth-Lobo in 2015, automotive manufacturers, who have access to highly specialized engineering, research and development, and testing data, may find that ethnographic or design research methods can shine new light on known subjects by highlighting the underlying emotions and experiences of participants' "driving lives" (Jordan et al. 2015). In this case, it was clear that an ethnographic approach would be the best way to uncover how those "driving lives" and experiences of customers were shifting during the pandemic,

offering us flexibility, interactivity, rich qualitative data, and the ability to address a wide range of topics with participants.

Customer experience agency Rightpoint and GM partnered to design a study to address key questions about in-vehicle cleanliness in a safe, time-efficient way. Rightpoint also partners with GM on in-vehicle customer experience design, giving the Rightpoint team extra insight into both the business and the future-state customer experience that GM is developing for its customers. Given the safety concerns around in-person research during the pandemic, a remote diary study was established as the most feasible and effective methodology to identify, understand, and track how the vehicle experience was evolving during the second half of 2020. Selecting a representative group of participants was a major methodological focus. During the 2020 fiscal year, GM sold around 2.5 million vehicles in the United States (GM 2020 Sales Far Outperform the U.S. Industry in Fourth Quarter and Calendar Year, 2021). Consequently, designing for a diverse group of Americans and capturing diverse perspectives through the study was particularly important to the team. Participants were screened for demographics, driving frequency, whether they were in the market for a new vehicle, and travel mode (driver, passenger, professional driver). The team also screened for health conditions that would make the participant more sensitive to both COVID-19 and issues of cleanliness in the vehicle, including allergies, asthma, and heart conditions. Ultimately, the team selected a diverse group of 42 individuals that cut across demographic, psychographic, and health-based characteristics.

Table 1. Participant Characteristics

Urban Density	Suburban or Rural	Urban
	61%	38%
Car Ownership Status	Non-Owners	Owners
	12%	88%
Electric Vehicle Ownership Status	Non-EV Owners	EV Owners
	80%	20%
In-Market Status	Not Planning a Car Purchase	Planning a Car Purchase in the Next 6 Months
	43%	57%
Parental Status	Non-Parents	Parents
	57%	43%
Employment	Non-Professional Drivers	Professional Driver (Fleet, Rideshare)
	88%	12%
Rideshare Activity During the Pandemic	Non-Active Passengers	Active Rideshare Passengers
	71.5%	28.5%
Respiratory Disease	Non-Sufferers	Sufferers
	81%	19%

Allergies	Non-Sufferers	Sufferers
	55%	45%
Cardiovascular Disease	Non-Sufferers	Sufferers
	95%	5%
Personally Impacted by 2020 Wildfire Season	No	Yes
	61%	38%
Region	Northwest:12%, West/Southwest:26%, Midwest:17%, Northeast: 24%, Southeast: 21%.	
"COVID-19 has impacted me…"	Moderately: 17%, A Lot:33%, A Great Deal: 50%	
Age	Under 40: 48%, 40-60: 33%, 60+: 19%	
Gender	Male: 52%, Female: 45%: Not Specified: 3%	

Five touchpoints were fielded during the study timeframe (late August through October 2020), with each touchpoint focusing on a slightly different subject and research question. Participants were asked to respond to around 20 questions within each touchpoint; some qualitative questions required a video response (an example prompt was, "show us your cleaning routine in the car"). Other questions were quantitative, measuring interest in new vehicle features with in-market shoppers, or asking participants to select specific cleanliness claims that felt most understandable and desirable to them. These longitudinal touchpoints allowed us to touch on a variety of topics with participants without exhausting them; it also created a view of how American attitudes related to cleanliness, safety, and travel were evolving during the summer and fall of 2020.

THE PANDEMIC HAS CHANGED THE EXPERIENCE OF TRAVELING BY CAR FOR BOTH DRIVERS AND PASSENGERS.

The study was fielded from late August 2020 through early October 2020. In hindsight, this was a critical phase of the pandemic in the United States. Confirmed cases had just peaked in July, at least partially due to some states reopening prematurely during the summer months. By the conclusion of the study, the CDC had finally acknowledged that the novel coronavirus could be transmitted through airborne means, especially in enclosed spaces with ventilation (Science Brief: SARS-CoV-2, 2020) – a belated admission. The rise and fall of circumstances in the United States during these months was mirrored in the feedback we received from participants throughout the study. As one Wisconsinite told us in the study during September, "Over the last few months, it's been a rollercoaster ride."

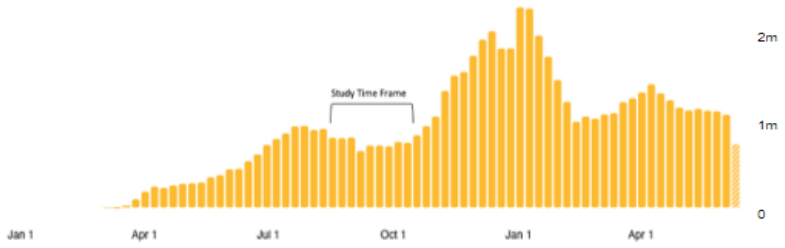

Figure 1. Image via World Health Organization Coronavirus (COVID-19) Dashboard, Confirmed COVID-19 Cases per Week, January 1, 2020 – June 15, 2021 Americas Only.

Participant concern about exposure to germs, bacteria, and viruses (as well as concern about the cleanliness of the vehicles in which they traveled) was high throughout the study. What surprised us was the divergent views participants had about their car as (quite literally) a vehicle for both risk and safety during COVID-19. Some were much more comfortable with car travel during the pandemic, others much less. An important factor was the participant's sense of individual agency within the car. People who were primarily passengers, rideshare users, or professional drivers felt much less comfortable in vehicles than did drivers. People who owned their own vehicle and had few passengers felt much more in control.

Demographics were also important in determining how concerned a participant might be about exposure. Not surprisingly, people with certain health conditions like asthma were much more anxious about exposure in the car. People who worked in high-exposure industries like healthcare or retail were also less comfortable. This heightened sensitivity to risk amongst certain segments of the population is reflected by other studies. As documented in Monthly Labor Review in June 2020, industries that are most prone to high COVID-19 exposure are disproportionately composed of workers who are younger, unmarried, and have less education, and are more likely to belong to single-parent families (Day et al. 2020). People who are working in these industries face risks from multiple angles when it comes to COVID-19. Another study of Turkish adults found that women had a significantly higher vulnerability to, perceived risk, and fear of the new coronavirus compared to men (Yıldırım et al. 2020).

Another dynamic was the participant's perception of themselves as a source of risk. When participants were asked to demonstrate their typical cleaning routines in a brief video, only 14% of participants described themselves as a source of potential contagion in the vehicle, regardless of whether they were drivers or passengers. Instead, most described *others* (family, friends, or strangers) as the source of risk. Specific driving contexts and tasks were also cited as anxiety-provoking specifically because of the exposure to people who the participant had no control over (visiting grocery stores, using a gas pump, or being a passenger in someone else's car). This desire for control was also reflected in a significant shift from public transportation to private transportation and non-motorized modes during the pandemic (Abdullah, 2020).

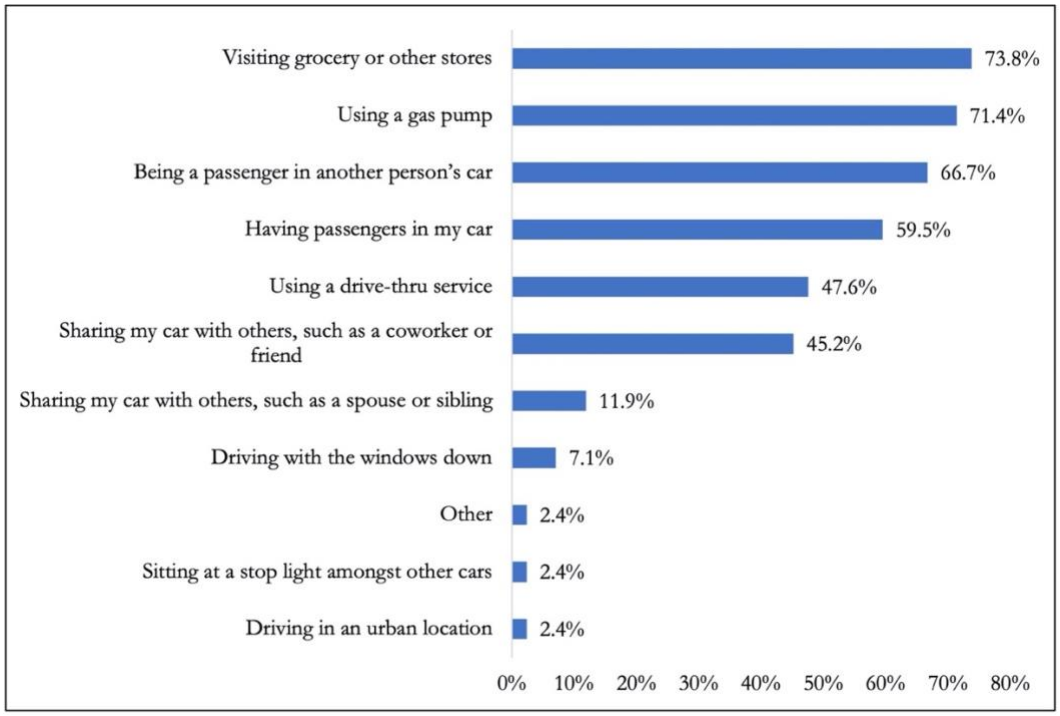

Figure 2. Participant Response to Study Question "Which aspects of the driving experience make you most concerned about exposure to COVID-19? Select all that apply."

The dynamic between control, agency, travel mode, and demographics was clearly complicated. Many have documented the tendency of Americans to perceive the car as a private space (Squires 2010). But the car is fast becoming a networked space and one that is often shared. How were we to think about designing for (and communicating with) a diversity of experiences and mindsets – not just the driver or owner? More importantly, how could we make these dynamics tangible and relevant to a company that needed to quickly understand how to empathize with both drivers and passengers? Observing the routines, behaviors, and verbal explanations from our participants, we began to see three common mental models emerge:

1. **Car as safe space:** The first is a cohort who viewed their vehicle as a safe space. These participants explained that they have been sensitive to vehicle cleanliness before COVID-19 and have long-established routines to keep their vehicle clean. As a result of these preexisting habits, they felt secure and unconcerned about either internal or external risks. As one participant told us, "I have always taken pride in having a clean vehicle. Even when my kids were babies, I taught them to throw away trash."
2. **Car as controllable space:** Our second cohort was a group who viewed their vehicle as a controllable space. This group, which included individuals working in high-risk industries like healthcare, saw the risk as external, often taking extra precautions to remove the risk from their vehicle when they enter it. Once their

routine was complete, their vehicle was considered a safe space. As one participant said, “I work in a medical office and I see about 10 to 20 patients today so I'm very conscious of what germs I may be in contact with and the ones I bring home. I use hand sanitizer and wipe down surfaces that I touch very often in the car like the door handles and such just to minimize that."

3. **Car as risk:** The third cohort was a group that was nervous about risks from both inside and outside the vehicle. Many were responsible for family vehicles with frequent passengers, like kids or elderly family members. It also included rideshare drivers and passengers. As one caretaker told us, “It feels like a recipe for disaster and the only way I can feel in control is by obsessively cleaning my surroundings which centers often in my car.”

All three of these mental models prompted participants to take cleaning seriously, but their personal experiences and demographics shaped how and why they perceived the risk of exposure.

FIGHTING AN INVISIBLE VIRUS IS A CHALLENGE WHEN WE ARE HARDWIRED TO FOCUS ON THINGS WE CAN SEE AND TOUCH.

With a clearer understanding of emerging behavioral and attitudinal shifts around in-car cleanliness, we next wanted to explore appetite for potential solutions. Generating feedback to future features and functionality would help to prioritize development efforts and craft messaging that would resonate with potential customers. We focused on two primary areas of in-vehicle features: HVAC (heating, ventilation, and air conditioning systems, including in-vehicle filtration and environmental controls) and clean surfaces (for both interior and exterior surfaces of the vehicle). Along with the actual design and functionality of the features themselves, we also set out to explore the way a user would interact with and control these features via digital interfaces or physical interactions.

Initially, participants reported a much stronger interest in sterilized interior surfaces than features relating to HVAC systems and air quality. This was reinforced by video evidence showing a majority of participants using wipes, sprays, and sanitizers on high-touch interior surfaces: steering wheel, gearshift, ignition, door handles, and seatbelts. Only 11.4% of participants showed us actions they were taking to improve in-vehicle air quality through usage of their car’s existing air filters or climate control features. Most cleaning techniques and routines focused on physical areas that the participants could see and touch – despite the airborne nature of the coronavirus.

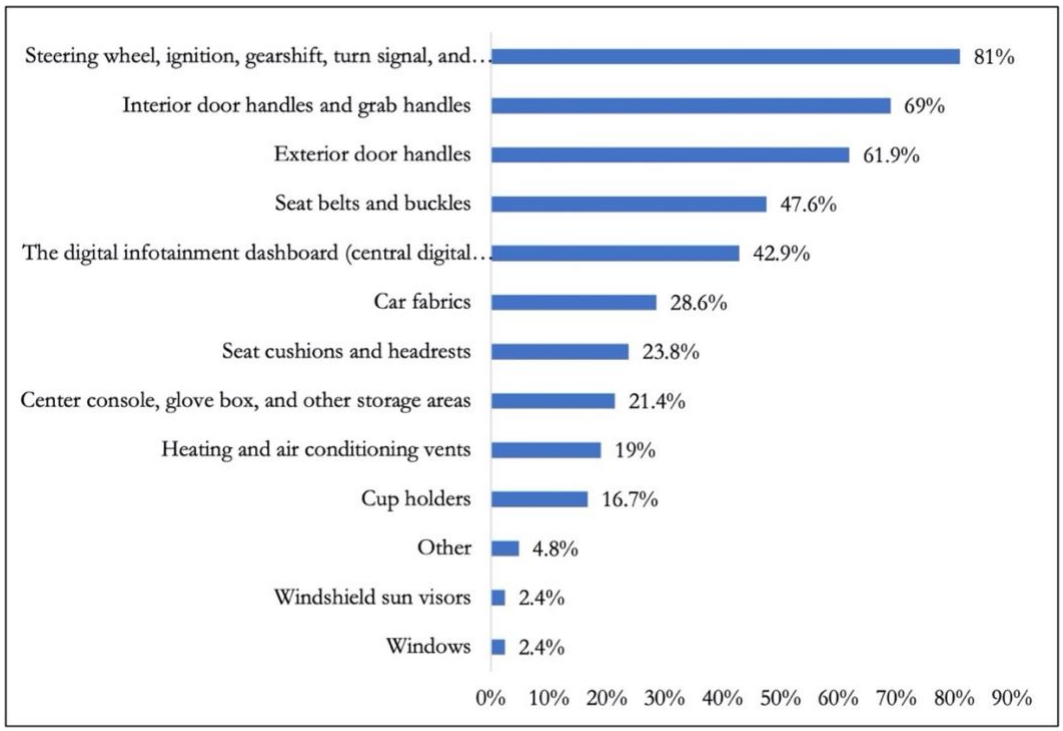

Figure 3. Participant Response to Study Question "Generally, which areas of the car are you most concerned about possibly being contaminated with germs and viruses? Select the five areas you are most concerned about."

The team utilized a working list of features that were being considered for future vehicle designs, and the messaging claims associated with each feature. Our goal was to test these features and messages with participants to understand their interests and preferences for future vehicle features. We found that the most preferred features were those related to surface cleanliness at the beginning of the study, and those largely maintained their popularity. Features related to physical storage of items like hand sanitizer and masks were initially popular but fell as the study progressed. We often found that participant preference for future features evolved in response to the information currently available about the virus itself. As our nation got smarter about COVID-19, the tools and techniques desired to keep us safe evolved with that understanding, decreasing interest in mask hangers and increasing interest in air filtration.

But before testing specific claims or features, we asked participants to show us their ideas of what a clean car of the future would look like. The handmade drawings we received revealed a widespread desire for visual indicators of cleanliness.

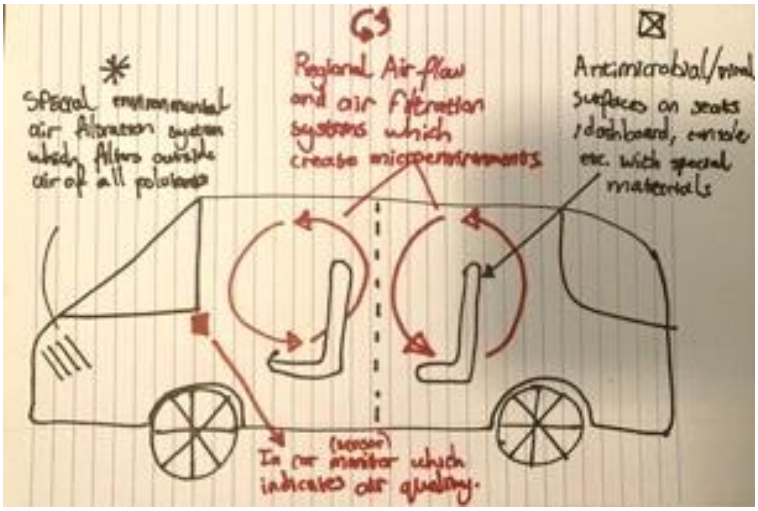

Figure 4. A drawing by a study participant describing their ideal clean vehicle, including "Regional airflow and air filtration systems which create microenvironments."

What we frequently saw reflected in these drawings (and in other data points from the study) was a desire to see the effectiveness or status of cleanliness features, along with the ability to enable notifications or communications regarding the status. Participants were eager to protect themselves from in-car threats through tactile cleaning routines during the worst of the pandemic, but also envisioned a more proactive in-car experience in the future. Many told us that they'd want some visual indication of status or operating state of cleanliness features to build trust that the feature was working as desired, underscoring the adage – to see is to believe.

CHANGE WILL ENDURE – BUT NOT FOR THE REASONS WE THOUGHT.

By October 2020, our participants were more aware of and interested in vehicle features related to intangible, invisible aspects of cleanliness: air quality and filtration. Designed to improve air quality through advanced anti-allergen or anti-microbial filters and enhanced climate control functionality, these features were some of the least desirable with participants initially, but they steadily increased in consideration and popularity throughout the study.

Why the increase in interest? As mentioned, the narrative of COVID-19 transmission had shifted from surface to airborne over the summer and fall months of 2020. The CDC's confirmation of airborne transmission was another exclamation point on the risk associated with sharing enclosed spaces without sufficient air filtration or ventilation. We believe shifting knowledge of how transmission occurs contributed to increased interest in air filtration features. It was also a reminder of the difficulty in drawing definite conclusions about shifts in consumer behavior in 2020. Were we observing a so-called static new normal, or were we observing yet another peak in the behavioral rollercoaster of the pandemic?

But, as participants told us, airborne transmission was not the entire story behind their newfound interest in air quality and filtration. A second narrative was playing out across the United States during this exact timeframe: the worst fire season on record for many states in

the western half of the country. The season was a continuation of a "long-term trend towards more frequent, more devastating fires in the West that shows no sign of slowing down (Record Wildfires on the West Coast, 2020)." Participants from Oregon, California, and Washington reported adopting new routines and behaviors in response. As one Californian participant said, "The recent fires have further put a spotlight on the importance of air quality. I now monitor AQI on a daily basis, whereas three weeks ago I barely knew what it was. Within my home, I've purchased an air purifier and replaced my air conditioning filter to further fortify my defenses in light of these new (horrible) developments. If I could do the same in terms of fortifying my car, I would definitely be interested."

The combined sum of COVID-19 and the 2020 fire season opened consumers' eyes to safety and cleanliness threats surrounding the driving experience. This finding has significant bearing upon one of our key research questions: how long can we expect these new in-car cleanliness behaviors to endure? Participants felt that while they may become laxer in cleaning surfaces and sharing vehicle spaces after the pandemic, many added a caveat: pandemic or no, we are entering into an era where air quality, disease transmission, and other public health concerns will be topics that pervade many aspects of their lives, including their experiences as drivers or passengers.

OUTCOMES AND IMPLICATIONS

At the conclusion of the study, Rightpoint summarized key learnings and takeaways for GM stakeholders. The final report included information relevant to marketing, design, and product development initiatives, and was attended by a diverse group of researchers, engineers, and decision-makers. The inclusion of videos from participants was particularly effective in communicating potential outcomes to the group. The team responsible for interior surfaces, for example, expressed surprise (and a little bit of horror) while watching one participant apply hand sanitizer liberally to the highly engineered fabrics of their car's interior.

With a long legacy of innovation and product development, GM devotes significant investment in understanding and anticipating the needs of its customers and developing products in response. While this 7-week study was a small drop in the ocean of research conducted each year, it is possible to connect these findings to some longer-term implications for the business. First is related to the usage of mobile applications while in the vehicle. There is a broader desire from both drivers and passengers for information that will help them regain a sense of control and comfort within the car. This includes in-car notifications that contain cleanliness information that is specific, easily understood, provides a clear next step, and comes from reputable sources. This suggests that a mobile app or rear-seat digital display screen could be a solution to a core pain point of passengers today – a lack of control and information about the cleanliness of the vehicle in which they're traveling. For example, those who view their car as a controllable space could benefit from a mobile app that provides updates on a vehicle's surface sterilization status while the driver is away, providing a sense of security once they return to their vehicle. A rear-seat display could benefit those who view their vehicle as a risk (like shared ride platforms passengers), providing the ability to view air quality and surface cleanliness indicators and control advanced HVAC functions from their position in the back seat.

The second implication was related to technology insertion. Consumers were most compelled by product claims that were relevant to a range of environmental or health issues beyond just viruses. This finding indicated to us that sensitivity to and awareness of germs, bacteria, pollutants, and allergens had grown, and that consumers will have heightened interest in surfaces and features that eradicate a wide spectrum of risks, not just viruses. And as our participants demonstrated, cleaning is a visual experience – indicating that future features like vanishing fingerprint surfaces may play well with customers who want a visual indicator of cleanliness.

Finally, our participants also showed us that regardless of the pandemic's timeline, the effects of climate change and climate disasters will have a permanent impact on the experience of traveling by car. As temperatures rise, wildfires generate clouds of smoke that cross state lines, and pollution plagues high-traffic areas, the importance of creating a safe, clean space inside the vehicle also increases. Tracking AQI, switching air filters regularly, and enhanced HVAC and climate controls are all features that will gain relevance with customers in the coming years. This is a reality that we have long anticipated and prepared for, as discourse about the environmental impact of climate change and mobility technology continues to rapidly evolve. In 2021, GM announced that it would substantially increase its investment in new mobility technologies to $35 billion through 2025. This represents a 75% increase from its investment levels announced before the pandemic. GM sees this investment as a critical shift in response to new consumer, environmental, and policy demand. As GM Chair and CEO Mary Barra said, "There is a strong and growing conviction among our employees, customers, dealers, suppliers, unions and investors, as well as policymakers, that electric vehicles and self-driving technology are the keys to a cleaner, safer world for all. (GM will boost EV and AV investments, 2021)."

This study helped us understand the evolving mindsets and needs of consumers in the United States at a moment when in-person research was not possible, providing feedback from consumer to influence feature priorities and user interface designs. It also shed light on the longer-term implications of COVID-19 on how we work, socialize, and travel. This study is a reminder of how powerful ethnography can be in tracking and anticipating the future as it unfolds – especially when we're not certain when (and why) the future might arrive. As we learned, the macro drivers of consumer interest and attention can shift quickly and in ways we may not expect.

APPLICABLE LEARNINGS FOR THE EPIC COMMUNITY

What lessons can we offer other teams conducting remote research on an evolving topic? An attempt to study the potential for long-term preferences in a short-term period presents challenges for any researcher. In our case, the fast-moving dynamic of COVID-19 was at odds with the long lead times necessitated by the automotive industry. For an automotive company, technology and design decisions must often be made years before a given feature becomes available in the market, due to manufacturing, production, and safety requirements. We were constrained on both ends by a crisis with no end in sight and a narrow window in which we could meaningfully affect change in the product. Should this research be conducted? If so, when would we need results? How could we make this work as relevant to the business as possible?

Design for Flexibility and Iteration

The clear benefit of a diary study was the ability to evolve each of our five touchpoints with participants as conditions changed over time. A combination of fixed qualitative and quantitative questions were asked across all parts to measure reactions and sentiment across the study consistently, but we also planned for a series of variable research questions that would evolve as we concluded each study part. For example, we first heard emerging air quality concerns in touchpoint #3 and were able to adjust the following touchpoints to focus on this specific topic. We used this pattern throughout the study to ensure we were getting relevant and contextual answers from our participants as the COVID-19 situation evolved.

Make it a Party

The involvement of multiple stakeholders and teams helped to address these challenges. The research had potential applicability to the Vehicle Systems Research Lab, User Interface Design, Global Interiors and Cabin Comfort as well as Marketing teams. Stakeholders from these teams were involved in shaping the learning agenda and research approach at the beginning of the project. Giving stakeholders the opportunity to provide input helped us to design the study to align with their unique goals and questions, and increased the likelihood that the end output would have relevance to teams operating on longer time horizons (such as Research & Development or Feature Insertion), as well as teams searching for more immediate implications (such as Marketing and Communications).

Look for Opportunities to Pair Qual with Quant (where Possible)

Our approach generated a significant amount of video content that required close analysis of both the language used by participants, as well as the cleaning behaviors they demonstrated in the vehicle. We created a quantitative tagging framework to structure the coding and analysis of qualitative data (including video, open text, and photo responses). This tagging framework ensured that the data was being coded against a consistent set of values, regardless of the researcher doing the tagging. It also allowed us to quantify behaviors and mindsets of participants.

Quantifiable results are an expected outcome of most research for automotive manufacturers, who (as mentioned) are voracious and sophisticated generators and consumers of big data. Our study focused on a small sample compared to the sample sizes that General Motors typically relies upon to make major decisions. Taking an ethnographic approach with a relatively small group of participants allowed us to go deep on emerging emotions, needs, and experiences in the vehicle, but our findings would need to be validated through large-scale market and engineering research efforts in order to validate at the scale required by the organization. In an effort to mine the study's dataset for additional quantitative insights, we partnered with the General Motors Research & Development Lab Group during the synthesis phase of the project. The team conducted an exploratory statistical analysis of the data generated by the study. While a number of interesting preliminary trends were observed, few were considered statistically significant by the Research & Development Lab Group, who typically work with much larger sample sizes. In the future, we would recommend adding a quantitative component as a fast follow to validate qualitative themes and patterns at scale.

Additional partnership with a client's market, media, or voice of customer research teams may also hold potential for contextualizing ethnographic findings at scale. For example, do findings from the client's ongoing brand tracking studies align (or conflict) with what participants are saying? Identifying those opportunities to cross-pollinate isn't always easy, but it holds real potential to increase buy-in from stakeholders on ethnographic insights.

Controlling for Bias in Remote Studies

Qualitative data was a vital part of this study, particularly in the form of participant-made videos (PMV). As Susan Faulker and Alexandra Zafiroglu have eloquently observed, PMVs create unique opportunities to observe intimate moments in our participants' lives, but "the heightened intimacy and engagement our stakeholders' experience with these videos poses new challenges for how we, as ethnographers, consistently and assertively guard the integrity of these research materials and our relationships with our research participants (Faulker and Zafiroglu 2010)."

Working with the same core group of participants over the study timeframe gave us the ability to understand personality traits, beliefs, and lifestyle factors that might influence their opinions and approaches to cleanliness. The repeated use of PMVs and other user-generated content allowed us to build relationships with our participants over time. A drawback of this approach is the potential for participants to become overly familiar with the subject matter, potentially leading to responses that participants may suspect we, as researchers, want to hear (Paulhus 1991). As an example, the stimuli used to communicate with participants did not mention GM at any point. Participants would often guess who was behind the research, and many believed that we (the researchers) were working for Uber. We noticed that this led to some social desirability bias, as a few participants began to lean more heavily into pro-cleanliness and enthusiasm for features that seemed slightly out of character over time. To better understand these deviations, we spoke to many of these participants in 1:1 interview settings to delve deeper into their responses and understand how much social desirability bias (or a response to increase knowledge of the subject matter as a result of the study) might be at play. Having developed a relationship throughout the study, we felt we were able to at least acknowledge what seemed out of character for our participants.

From Participant to Partner through Co-Creation

Another way to control for bias was to frequently change up the focus and stimuli used in each study touchpoint. The initial phases of the study relied heavily on quantitative, open text, and video responses, which created a detailed view of current in-car behaviors and attitudes without the risk of a change in behavior or routine due to the presence of a moderator. In later parts, we began to engage directly in co-creation and discussion with participants, asking them to draw their clean car of the future for us, and even sharing initial concept designs through in-depth interviews with a subset of participants. The concept of co-creation originated from Scandinavian trade unions during the 1970s cooperative design movement which aimed to empower employees by encouraging collective decision-making around workplace technologies, working conditions, and policies (Lee et al. 2018). The practice has permeated corporate America over the past decade. Co-creation methods are now frequently used to bring customers along to help inform UX design and product

innovation (Gioia 2015). As we found, these techniques are still valuable when executed in remote settings. Breaking down the barrier between the researcher and the participant created open dialogue about the participant's perception of the future in a more natural context than a participant-made video. Most participants had nuanced, thoughtful feedback for us on the conceptual designs, as well – perhaps because they had already "designed" their own clean car of the future earlier in the study. This approach created an educated, highly engaged group of participants who were just as interested in anticipating the future as we were. That may be one of the most interesting aspects of studying major cultural or behavioral shifts as they happen: participants and researchers are united in their curiosity about the future in a way they may not have been during more certain times.

Conclusion

In the summer of 2020, Rightpoint and General Motors set out to study the experiences of drivers and passengers during a time of sustained societal change and intense anticipation of the future. The evolving nature of the COVID-19 pandemic presented both a research opportunity and challenge. An ethnographic approach would be the perfect methodology for surfacing new behaviors and attitudes as they emerge, but getting into the proverbial car with participants wasn't an option for us.

The team designed a remote, longitudinal diary study to identify, understand, and track the evolution of cleanliness behaviors and attitudes amongst drivers from August to October of 2020. Five touchpoints were fielded to a diverse group of participants, including a mix of quantitative questions and qualitative media responses.

As we learned, COVID-19 has changed sensitivity to in-vehicle cleanliness, perhaps permanently. The experience of sharing a vehicle with others was often stressful for both drivers and passengers. Many expressed a desire for more control of their experience, and those specific needs and preferences informed the prioritization of certain technology and design features by General Motors in future vehicles.

The use of an ethnographic approach uncovered connection points that other methodologies may have missed by creating the space to ask our participants open-ended questions and to record detailed responses. An example of this was the increase in interest in air filtration-related features during the study. Depending on study design, a survey or other quantitative methodology may have attributed that rise in interest to concern over disease transmission during the pandemic. But in video or text response, participants can explain their needs in a much deeper or more revealing way. While COVID-19 had raised participants' awareness of in-car air filtration, they anticipated that climate change would be the longer-term driver of their interest in enhanced climate control features for their vehicle. We hope that this case study can provide a reference guide for teams looking to study similar topics remotely, and as an example of using ethnography to continually anticipate and envision the future in collaboration with participants – even under the most unique circumstances.

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