Collaborative driving tools for traffic problems: a design anthropological approach to car commuting

Ferramentas de condução colaborativa para problemas de trânsito: uma abordagem antropológica do design para o deslocamento de carro

Herramientas de conducción colaborativa para problemas de tráfico: un enfoque antropológico de diseño para los desplazamientos en automóvil

Angelica Porto Cavalcanti de Souza
ORCID: https://orcid.org/0000-0003-4153-5514
Universidade Federal de Pernambuco, Brazil
E-mail: aportocs@gmail.com
Camille Nascimento Santiago Caminha
ORCID: https://orcid.org/0000-0001-6361-055X
Universidade Federal de Pernambuco, Brazil
E-mail: cnsc@cin.ufpe.br
Ademir Macedo Nascimento
ORCID: https://orcid.org/0000-0001-5678-2740
Universidade de Pernambuco, Brazil
E-mail: ademir.nascimento@upe.br
Alex Sandro Gomes
ORCID: https://orcid.org/0000-0003-1499-8011
Universidade Federal de Pernambuco, Brazil
E-mail: asg@cin.ufpe.br
Renata Zilse P Borges
ORCID: https://orcid.org/0000-0002-5869-5795
Samsung Campinas, Brazil
E-mail: renata.borges@samsung.com

Abstract
People use applications daily to meet some of their needs. Geo location, memory, communication, entertainment and learning are some examples, but it is well known that not every moment is suitable for the use of certain technologies, and sometimes its use is even illegal. While driving a car, a person tends to keep using their phones, even though it is distracting and dangerous, but the reasons behind this use are related to trying to make travel less unproductive and unpredictable. This problem leads this work to investigate the relationship between driving and the driver's continuous interactions with technologies, focusing on a common identified activity: the informational collaboration, made from Geo location apps and instant messaging. For this, the Design Anthropology approach and the Design Ethnography method were used, seeking to understand how improvisations and contingencies can provide a deep understanding of the user's real needs. The results show that, by applying this methodology, it was possible to understand how and why people collaborate on traffic, including which applications they use and how they trust the information while adding their own personal knowledge.
Keywords: Design anthropology; Collaboration; Car commuting; Human computer interaction.

Resumo
As pessoas usam aplicativos diariamente para atender a algumas de suas necessidades. Geolocalização, memória, comunicação, entretenimento e aprendizado são alguns exemplos, mas sabe-se que nem todo momento é adequado para o uso de determinadas tecnologias, e às vezes seu uso é até ilegal. Ao dirigir um carro, uma pessoa tende a continuar usando seus telefones, mesmo que isso distraia e seja perigoso, mas as razões por trás desse uso estão relacionadas à tentativa de tornar as viagens menos improdutivas e imprevisíveis. Esse problema leva este trabalho a investigar a relação entre a condução e as interações contínuas do motorista com as tecnologias, focando em uma atividade comum identificada: a colaboração informacional, feita a partir de aplicativos de geolocalização e mensagens instantâneas. Para isso, utilizou-se a abordagem da Antropologia do Design e o método da Etnografia do Design, buscando entender como improvisações e contingências podem proporcionar um entendimento profundo das reais necessidades do usuário. Os resultados mostram que, com a aplicação dessa metodologia, foi possível entender como e porque as pessoas colaboram no trânsito, incluindo quais aplicativos utilizam e como confiam nas informações ao mesmo tempo em que agregam seus próprios conhecimentos pessoais.

Palavras-chave: Design antropológico; Colaboração; Carro pendulares; Interação humano computador.

Resumen

Las personas usan aplicaciones a diario para satisfacer algunas de sus necesidades. La geolocalización, la memoria, la comunicación, el entretenimiento y el aprendizaje son algunos ejemplos, pero es bien sabido que no todos los momentos son adecuados para el uso de determinadas tecnologías, y en ocasiones su uso es incluso ilegal. Mientras conduce un automóvil, una persona tiende a seguir usando sus teléfonos, aunque distrae y es peligroso, pero las razones detrás de este uso están relacionadas con tratar de hacer que los viajes sean menos improductivos e impredecibles. Este problema lleva este trabajo a investigar la relación entre la conducción y las interacciones continuas del conductor con las tecnologías, centrándose en una actividad común identificada: la colaboración informativa, realizada a partir de aplicaciones de geolocalización y mensajería instantánea. Para ello, se utilizó el enfoque de la Antropología del Diseño y el método de la Etnografía del Diseño, buscando comprender cómo las improvisaciones y contingencias pueden proporcionar una comprensión profunda de las necesidades reales del usuario. Los resultados muestran que, al aplicar esta metodología, fue posible comprender cómo y por qué las personas colaboran en el tráfico, incluidas qué aplicaciones usan y cómo confían en la información mientras agregan su propio conocimiento personal.

Palabras clave: Antropología del diseño; Colaboración; Desplazamientos en coche; La interacción persona-ordenador.

1. Introduction

Innovative digital technologies have been continuously developed over the past years, and nowadays are tangled with routine activities. Applications and tools linked to daily needs create a scenario of dependency, since they outsource information that people got used to constantly use such as location, memory, communication, entertainment and learning, all features that can make life easier, efficient, safer and more pleasant.

This reality can be seen in one of the largest countries in the world, Brazil. There, 80% of the drivers use the smartphone while commuting and 42% send text messages at the steering wheel (G1, 2016), although illegal in the country. Furthermore, the eagerness to access navigation data is also present in Brazilians daily commutes, helping to identify slow traffic points, as well as offering the option to users actively report problems, providing collaborative data for social support.

However, although these uses often meets drivers' immediate needs, they contravene national traffic legislation and can generate unsafe surroundings as the driver creates risks to himself and others (Li *et al.*, 2020, Vlakveld *et al.* 2021).

Although the driving activity demands caution and cognitive effort, it competes with technologies that also demands attention. Therefore, there is an evident and urgent need to design new possibilities for a near future that can provide fluid, interconnected and secure use of the digital devices and services, especially in the context of driving.

In this context, Bitencourt and Lerípio (2017) point out that Recife citizens (in Brazil) spend, on average, an additional 38 minutes a day on car commuting (that is 37% extra time). This extra time results in a total of 145 hours lost per year in addition to the regular travel time.

To make journeys less unproductive and more enjoyable, as well as the constant need to avoid intense traffic, people tend to use improvisations. The smartphone is the main technology used for assisting these improvisations, allowing the driver to know what is happening and communicate with others, while accessing navigation, music, and instant messaging applications.

This problem leads us to investigate the relationship between the driving activity and the people continuous interaction with technology in car commuting. We focused on the need to access valuable information about the routes and the collaborative activity in which people generate traffic information. For this, we addressed three questions: (i) how people actively collaborate with navigation data, (ii) what applications are more commonly used for this kind of traffic collaboration, and (iii) how they manage the information received on the applications.

2. The Design Anthropology Approach and HCI

This work used the Design Anthropology approach to comprehend how improvisations and contingencies can provide an understanding about the role, meaning and user's real needs in car commuting. This methodology was already used in researches involving car scenario (Pink *et al.*, 2018) and offer opportunities that allow an engaged view, where participants collaborate with researchers, amplifying the potential to comprehend people's behaviors and the connection between technology and environment.

The relationship between Design and Anthropology is already consolidated, both in academia and industry (Agar, 2014, Pink, 2014, Segelstrom & Holmlid, 2015). Anthropology is defined as a social science field which contemplates qualitative methods for community behavior studies. It can be described as a comparative study of societies and cultures based on detailed empirical research in concrete social contexts (Gunn *et al.*, 2013).

Within Anthropology, the ethnographic method allows an in-depth and detailed understanding of people's behavior and daily life. The ethnographic techniques have a role in many stages of product design being recognized as a suitable approach, building the comprehension of people's real social practices (Yliris & Buur, 2007), since it allows a deep, complex and holistic user understanding.

In this research, we present the contingent circumstances of how people behave while driving and how they improvise to fulfill their needs, focusing on how collaboration makes the driving experience less unproductive and unproblematic.

3. Methodology

This work methodology involved two different cycles:

- The first cycle intended to understand the car commuting activity in the city of Recife, Brazil. In this cycle, it were applied re-enactment interviews (Pink *et al.*, 2018) and observations, chosen in order to discover gaps in people's everyday life related to this scenario;
- The second cycle used two ethnographic interviews techniques: situated and narrative, applied according to the circumstances that participants allowed. In this way, is important to highlight this work does not seek to gather objective data but to seek a deep and collaborative understanding of the broader context on everyday experience (Pink *et al.*, 2013).

The next topics details the participant recruitment approach, some of the most used data collection techniques, and the ethnographic analysis.

Research Scenario

The immersive data collected occurred in the city of Recife (in Brazil) where the long-time consumption on the daily traffic is the result of problems along the journey. To justify the choice of this city, we used the "Tomtom Traffic Index", an indicator that measures travel time spent inside a car in 403 cities from 54 countries. In South America, Recife stands out as the third with the most time wasted in traffic (Tomtom Traffic Index, 2019).

Participants

This process was done with different participant sampling in both cycles. The participants were invited based on previous researcher's contacts in order to facilitate the empathy and comfort when collecting data, in a way the researcher presence influence would be minimized.

In the first cycle it was used a sampling of 19 Brazilian participants from 23 to 50 years old. In the second cycle it was

used a sampling of 10 Brazilian participants from 28 to 36 years old.

Data Collection Techniques

Situated Interviews

The situated interview technique consists in focusing on study the people in their real settings combined with self-documentation (Yliris & Buur, 2007). For the authors, "being situated" means having direct access to the details of people's practices at the moment of the interview. This technique was used in order to deepen the data collected in the first work cycle. The interview happened inside the participant's car while parked for security reasons and the data was collected by audio record.

Those interviews were conducted based on semi-structured questions, aiming to know which applications are usually used while driving in everyday routine. By using this technique, we were able to discover pain points and explore about "what people know" and how they get information about traffic in everyday drive routines.

Narrative Interviews

The narrative interview, together with an episodic technique, was used to collect the data when it was not possible to use the situated interview technique. The narrative interviews were also applied using semi-structured questions intending to know which apps are normally used while driving in everyday life.

4. Findings: How People Collaborate to Deal with Traffic Problems in Brazil

Our research findings showed that citizens in Recife (Brazil) constantly deals with traffic jams and tend to use digital tools to avoid or get out of traffic. Those findings endorse that mobile maps applications are commonly used to aid in route decisions by providing information in real time. The next topics will detail those findings.

4.1 Collaboration through geolocalization applications

The data showed two geolocation applications unanimously cited by the participants to provide traffic information and optimize time: Waze© and Google Maps©. Both can offer less problematic routes suggestions based on the information collected by tracking the position and speed of other registered users on the platforms.

Those applications interfaces offer similar information. For example is the presentation of the chosen route, highlighted while the path to be followed is confirmed by the indication of arrows for guidance.

These applications also display the distance to be travelled for each turning points in the route suggested (e.g. 300 meters, turn right), the remaining time to arrive in the destination (in hours and minutes), updated in real time.

Visual information is also complemented by audio assistance. A voice (male or female) dictate the information displayed, reducing the driver's need to divert his attention by looking at the cell phone screen.

Although those applications offer similar features, users have different preferences and diverge when deciding which one is the most efficient according to their use, past experiences and needs. In this research, was identified two types of divergence: extra functions and security.

Google Maps©

One of the Google Maps©'s extra functions in comparison to Waze© is to inform other means of transportation besides the commuting by car. Train, bus, bicycle or even on foot, are the possibilities offered by the application as alternatives for commuting, expanding the user profile that covers different needs.

Regarding the safety feature in the driver scenario, participants explained that Google Maps© usually maintains the

suggested routes on the "main" streets, avoiding paths that can lead the driver to dangerous situations. In the interviews, there was constantly the testimony of drivers who lost trust in Waze© after being led to dangerous areas.

One counterpoint, in Google Maps©, by the time the data was being collected in 2017/2018, the application didn't offer options in which users could actively contribute by feeding the system with specific and detailed information about possible eventualities. The only way in which users could collaborate was the possibility to allow sharing a location track with private contacts by integrating the application with Gmail©, WhatsApp©, and other messaging applications.

In the early months of 2019, Google Maps© incorporate the same feature that made Waze© popular: the active collaboration of valuable traffic information, although it is still limited to report only crashes, speed traps, and slowdown commute flow.

Waze©

An aspect emphasized by participants was the active collaboration feature provided by Waze©. The possibility of communication and access to specific detailed traffic information makes Waze© the most used applications within the research sample. That feature were widely appreciated by many of the participants.

On Waze© users can actively collaborate with traffic information by marking problems on their location. These indications include:

- The information about traffic intensity (moderate, heavy or standstill);
- Police surveillance (visible, hidden or other side);
- Accidents (minor and major);
- Hazards on the road, on the side of the road or concerning the weather
- Price indications at gas stations;
- Open a chat channel (enabling platform users to be in direct contact to share more detailed information about a reported issue)
- Sharing photographs of facades or hazards found on roads;
- Requests for roadside help (SOS- concerning the car or someone's health in the vehicle),
- Location of speed cameras; and
- Blocked streets.

But, to contrast the benefits, an aspect widely criticized by participants were the dangerous routes occasionally suggested by Waze©. Some interviewees reported that, based on their previous knowledge of the city, were able to avoid dangers, refusing to follow the suggested routes; however, others decided to abandon the platform and exchange it for the direct competitor: Google Maps©.

In a widely reported fatal incident in Rio de Janeiro in 2015, an elderly couple relying on information from Waze©, was, unfortunately, led to transit through a highly insecure neighborhood.

According to the CNN (2015) that interviewed the late Regina Murmura's husband, Francisco Murmura blamed the app for the tragedy: "The app was responsible for everything. It was the Waze app who led us there. I have no doubt that they are responsible for it.".

This problem can be related to the lack of access to this kind of crucial information. Without that, Waze©'s system is unable to discern between safe and risk locations, leading its users along paths not only insecure but eminently dangerous.

4.2 How people interact through technology to outsmart traffic

In this section we outline, through narratives, the key findings of our research answering the question on this section title. The goal for using narratives is to describe the understanding about people's choices, attitudes and uses of different tools. Each one of the narratives is presented through different themes and each theme indicates a collaboration mode.

It will be presented specific journey circumstances of three participants, including: improvisations, contingent moments, and how this collaboration is directly and indirectly related to the trust on the APPs information.

Other findings discussed are: the understanding of how the driver experience is embedded with the use of smartphone APPs; how the use of mobile navigation apps can optimize the time spent on driver's daily commutes; and how collaboration can help with unexpected driver's problems . Comprehending how it happens in the present, we intend to understand the user's needs and key points to move beyond and think future possibilities.

Information dependency

This topic presents the intense relationship between the user and geolocation APPs identified within the researched sample. During the analysis, it is understood that the daily use of these applications is not necessarily related to routes indication, since knowing the daily routes is already part of each driver's common knowledge. Therefore, the issue is to understand not only which applications the participants use, but also the goals, real needs and what types of information has value in their daily commuting.

Considering the recurrent problems in Brazilian commuting, the route information has been verified as resources widely used in both geolocation apps. However, Waze©'s collaboration feature has created in some users a dependency relationship, once it provides detailed traffic information.

Thus, the collaborative application system is a "two-way street". As users tend to collaborate with new information, they also expect others to do the same, believing that this information helps the app to constantly offer the fastest route available. Next, will be presented a narrative that exemplify the category.

Ana is a 30-year-old dancer, dance teacher, social media analyst, designer and student who has a very active routine and needs to move to different locations on a daily basis. Her presence is requested in different dance studios and even at the weekends whenshe has a postgraduate course to go to. She believes that, thanks to Waze©, it is possible to avoid wasting unnecessary hours stuck in unexpected traffics.

Like many others participants, Ana reports in a comical but still intense way that her relationship with Waze© is similar to one with a real person, whom she relies and can depend on its suggestions, since, as she says: "Waze© knows more than I do." Ana says that she is 100% dependent of the information provided by the application and, although she feels that doing the collaborations while driving is difficult, she always does it.

With a very busy schedule, and because of the distance between the places she needs to be, Ana reports a "dependence" on "Waze© knowledge". Her intense relationship with the app is expressed in the phrase "without Waze© I'm 40% blind".

However, despite this relationship, Ana identifies problems about the use of the APP. Inputting new information requires to be done at the exact moment on the location.

This goes against any understanding of safety and legislation in the country, since the driver must manipulate and touch on the cell phone screen to collaborate.

Another problem reported is about the interface: it is not driver friendly, once it does not consider the driver momentary limitations. Although Ana says that she does the proper collaboration whenever she can, she also complains about the application's interface, saying that it is difficult to do the required "marks" along the way:

"Waze is not good for that. It's complicated even if you want to do it willingly. If you were in the sidewalk standing at the bus stop, looked and thought "oh, I'll mark this on Waze ", even like this it would be difficult to do because it is difficult to find where the markings points are. It doesn't have a very interactive interface."

In order to validate this information, when the research team analyzed the steps involving this task (at the beginning of 2018), it was discovered that, to define the specific markings, a sequence of screen touches is necessary, demanding the driver's attention, even for a few seconds.

Anyway, despite all the problems identified, the collaborative feature brings value to the application in which users collaborate helping each other "outsmarting traffic, together", as it is presented on the application's slogan.

Private, monitored and safe information share

Another participant, João brings a subtle type of collaboration in a controlled and private way, which involves a limited number and specific kind of localization sharing. By using this kind of collaboration, João can choose who will specifically receive his tracking information. The subtlety around collaboration is characterized by the administration and sharing of commuting information (arrival time, problems, real-time tracking), resulting in the reduction of negative feelings due to lack of information.

João, a 36-year-old physiotherapist, has three jobs at different hospitals and reports that he often improvises sharing the track of his route even before he gets into the car. He identifies the moments that he believes the use of this resource is useful: when there are people waiting for his arrival. Thus, he has control over who will have access to this real-time localization, once he does not like to share his personal data as public information.

João talks about the possible benefits of this kind of sharing, by reporting its use between him and his wife:

"It brings a small sense of security, both to my wife and me. Because suddenly, if something happened that makes me stop, she will know that some kind of trouble must have happened. In a way, for my wife who is waiting for me, she does not feel anxious. She knows where I am and when I will arrive. That's also an interesting feature for meetings, or other appointments. You can send a message that you are on your way and others can confirm that you are close by. It even reduces the anxiety feeling since they know the exact time I will arrive. "

This improvisation, although looks like a simple one, it might solve some of the daily problems related to information for sharing and make travel safer. By preventing direct interaction with the cell phone, even while sharing important information, it avoids the "competing activities", keeping the driver focused on the road and, at the same time, decreasing the anxiety feeling that can appear when people are waiting for someone.

Empathic, direct and detailed information

Unlike the specific application uses for accessing route information described above, one of the improvisations identified for collaboration happens by instant messaging applications. This direct contact presents itself as a more direct, specific, empathic and detail-rich form that occurs among people who have previously met. In the researched sample, the use of the WhatsApp© was congruent to all participants. It was unanimously cited as the App most used for instant messaging via internet.

This type of collaboration was characterized as a "facilitated" way of requesting directly relevant information, but it depends on some specific prior knowledge about the people involved (such as the access to people's private contact and knowledge of the daily route of third parties). This exchange and request for information can happen both through private and group messages.

As an example, the participant Antonio, a 29 years old university professor, usually leaves early in the morning for his job. His journey takes about 40 minutes until he arrives at the university and his search for information starts even before he

gets in the car. Changes in his agenda it's common and the need for confirmation between his appointments makes Antonio looks for constant possible changes in his plans influencing directly which place he must go to and which route he must take.

Antonio says that he feels uncomfortable using the cell phone while driving, because he understands that its use can be distracting and dangerous both for his safety and others. So, he avoids the contact with the device, using it only when he deems it strictly necessary, essential or on an emergency. The use is also restricted to what he considers safe moments (such as when the car is stopped on the red light or stuck in standing-still traffic).

By avoiding the cell phone use in his daily commuting, Antonio often uses his own knowledge to decide the better route to take. He also knows the estimated time to arrive at work, and because of this, when facing unusual events that delays his arrival, he feels the need to get specific information in order to make decisions and get out of intense unexpected traffic jams.

When questioned about his use of geolocation applications, Antonio reported that he only uses these kinds of apps when he does not know the city or routes he should take. And when necessary, he prefers to use Google Maps© instead of Waze©, thanks to past insecure experiences on route indications.

Thus, when he deals with contingencies that can cause inconvenience or delays, the participant improvises through WhatsApp© a way to acquire useful information. His improvisation depends of personal contacts and sometimes even specific prior knowledge. To access valuable information, Antonio has two different ways, using the same instant messaging tool. The first way involves trying to speak directly to specific people he knows that are on the same route as him, and the second involves the use of a WhatsApp© group created by his friends' which use is exclusively for sharing specific and detailed traffic information. Antonio explained:

> "Once, I was coming back from work and it was happening a protest at Domingos Ferreira Street. Then I checked the group. I am not used to check it, I did it because the traffic was really stuck, and this group had the goal of helping to get people out of traffic jams. So, my friends answered what was happening and told me to take another route. Since I had this specific group and WhatsApp© is an easy thing that I use every day, it seemed to me like the faster way to have an answer. There was someone in the group talking, detailing, sometimes knowing the reason, rather than just something on the map that I did not have much of an understanding about what was really happening. Like, if it was happening a "protest", but for what? How long it will last? What other street has a good traffic flow? Then they sent the audio with the information, I turned around and went through Imbiribeira Street. "

5. Discussions: Cognitive Effort, Interconnectivity, Empathy and Privacy to Think Possibilities for Collaboration in Brazil

In the previous section we presented, through the three narratives, the findings related to interaction and collaboration in Brazilian commuting, including uses, contingencies and improvisations, as well as people's needs and goals. The anthropological approach leads to detailed behaviors about collaboration through geolocation and messages apps, revealing how participants improvise in different ways according to their preferences and intentions.

In this section, we highlight the main pain points, needs, and implications related to shared information .

Then, in order to understand how people, face their problems and fulfil their needs, while dealing with the commuting unpredictability, the five following themes will be discussed:

- "Cognitive effort and technological interconnectivity";
- "Collectivity and Social Support", helping with the sharing of meaningful information;
- "Empathy" as an incentive for collaboration;
- "Privacy control" and;
- "Security and Social Context".

Cognitive effort and technological interconnectivity

In terms of pain points and needs, as people uses the smartphone in a distracting way, the present analysis comprehends the cognitive effort generated by the excess of competitive activities to the complex act of driving. In order to use connectivity and lessen the negative feelings generated by uncertain commuting, drivers deal with demanding clicks and the need to focus their sight on their smartphone screen. The use of different tools needs to be coordinated by the driver through unsafe ways.

In the narratives, two of the three participants accessed the information and collaborated interacting by touching the screen without any fluidity between the simultaneous activities. However, the improvisation made by João when he accessed Google Maps© through Google Launcher© diminished the touch interaction on the phone.

Collectivity and Social Support

This theme is related to understand the collective events between those involved in the same contingencies. Using the available connectivity, the community improvises to communicate, collaborating among each other to optimize time and decision making. Through this social support, people use digital communities mediated by Google Maps©, Waze©, and instant messaging applications.

According to Su (2016), a virtual public sphere has the following characteristics: being intangible, a virtual community bounded by common interest and concerns, and being a site for netizens to assume the identity of activists. Therefore, the present work considers these digital public communities as networks in which the information is exposed for community benefits, directly assisting the decision-making process of its participants.

This conclusion arose from the observation of the collaborative processes in the virtual community, in which, users jointly contribute with relevant information to the system and also help directly other users, who tend to appreciate and trust in the content received. The example in which this collaboration became clear was related to the habit of some of the participants about the use of the collaborative tagging features on Waze©.

Empathy

Collaboration was an event identified in two narratives presenting an important congruence: collaboration between known people. This issue revolves around empathy as a trigger for collaboration. This empathic relationship is classified by Kotler (1998) as a "primary" affinity groups, consisting of family, friends, neighbors and co-workers with whom people interact most continuously.

However, in Waze©, the influence of "empathy" is lost. The sharing collaboration is made through and for an entire community with digital profiles that, quite possibly, do not know each other. For that matter, one of the hypotheses that can be raised concerns the driver's perception of "value" on posting collaborative information for unknown people, especially considering that it is a risky activity that demands cognitive effort while driving.

Privacy control

Data sharing can often be motivated by the relationship of intimacy between those involved, and for this, people need to have control over what information is public or private. This data is observable in João's interview when he releases his location track to private contacts in order to decrease the anxiety feeling.

Consequently, knowing exactly who has access to their location can also provide to drivers a security feeling. This happens because of the city's social issues, where people can have their physical and material integrity at risk.

Security and social context

When comparing the geolocation Waze© and Google Maps©, the security issue was highlighted as a critical point for the decision to adopt or abandon a platform. That is noted when participants reported that Google Maps© maintains suggestions on main streets, unlike Waze© which, do not consider this aspect. That can lead people to lose confidence in the application itself, once they are exposed to insecurity situation caused by the app's system.

The urban violence is present in Brazilians daily life and needs to be considered when thinking about technologies for Latin America. The social scenario that sometimes isn't considered by geolocation applications has already victimized users in situations that vary from simple insecurity feelings to real death risks.

Finally, we argue that this discussion reinforces the need to design future possibilities by thinking about the contingent circumstances and including technologies in different scenarios.

6. Final Considerations

Focused on contingent and improvised daily activities, the Design Anthropology approach and the Design Ethnography method used in this research lead to a number of considerations about how and why people collaborate in traffic, such as the applications they use and how they trust the information presented, while still aggregating their own personal knowledge. The ethnographic narratives and the themes created made it possible to understand the people's needs, feelings and purposes but also think about future technologies related not only to the types of interactions but the complete experience around the commuting daily activity. And, for last, it also provides insights for future research both in Design Anthropology and HCI field.

On an overview, we discussed five main themes: (i) cognitive effort and interconnectedness, (ii) collectivity and social support, (iii) empathy, (iv) privacy control and (v) security and social context. Those themes revealed different ways that people perform to satisfy their needs, due to the contingencies and improvisations related to the unpredictable car commuting context.

"Privacy control" and "social support" refer to the two types of digital interaction found in this research: with private communities, and public communities. The analysis and themes identified offer ways in which the technology to be used inside the car should be thought and designed considering the individual and collective networks, social spaces and the ubiquitous nature of social applications.

To future researchers, a key suggestion that raises in this discussion is to go even deeper about the concomitant informational collaboration along commuting, as well as to understand the potential of the Brazilian context for collaboration, comprehend the relationship between the touch on the screen and the distractions generated. Those types of studies can improve the experience by providing safety and security to the driver and the community.

Finally, we must also consider collaboration through technologies as a Design principle to be studied in the context of Brazil. The goal is to expand the car commuting scenario to other situations that involve the interaction between people and technology, treating empathy as an incentive, considering the degree of intimacy between people, privacy control, and the security issues.

Acknowledgments

References

Agar, M. (2014) An outsider's ethnographic thoughts about design. Arts and Humanities in Higher Education, 13(4), 404–411. <http://ahh.sagepub.com/content/early/2014/04/16/1474022214531478.abstract%5Cnhttp://ahh.sagepub.com/content/early/2014/04/16/1474022214531478.full.pdf>.

Bittencourt, V. S. & Lerípio, J. R. (2018) O impacto do tempo perdido no trânsito no Bem-Estar do brasileiro | Blog do IBRE. <http://blogdoibre.fgv.br/posts/o-impacto-do-tempo-perdido-no-transito-no-bem-estar-do-brasileiro>.

Bødker, S. & Susanne. (2015) Third wave HCI, 10 years later-participation and sharing. Interactions, 22(5), 24–31. <http://dl.acm.org/citation.cfm?doid=2818696.2804405>.

Crabtree, A. (1998) Ethnography in Participatory Design. Proceedings of the 1998 Participatory Design conference, 93–105. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.96.1129&rep=rep1&type=pdf>.

Garbin, D. (2018) 80% Dos Motoristas Dirigem E Usam Celular Ao Mesmo Tempo, Diz Pesquisa. <http://g1.globo.com/jornal-da-globo/noticia/2016/01/80-dos-motoristas-dirigem-e-usam-celular-ao-mesmo-tempo-diz-pesquisa.html>.

Darlington, S. (2015) Waze app directions take woman to wrong Brazil address, where she is killed. <https://edition.cnn.com/2015/10/05/americas/brazil-wrong-directions-death/index.html>.

Gunn, W., Otto, T. & Smith, R. C. (2013) Design Anthropology: Theory and Practice. Bloomsbury Academic, 2013.

Harrison, S., Sengers, P. & TATAR, D. (2011) Making epistemological trouble: Third paradigm HCI as successor science. Interacting with Computers, 23, (5), 385–392. <http://dx.doi.org/10.1016/j.intcom.2011.03.005>.

Kotler, P. (1998) Administração de Marketing. Análise, Planejamento, Implementação e Controle. Atlas.

Li, J., Dou, Y, Wu J., Su, W. & Wu, C. (2021) Distracted driving caused by voice message apps: A series of experimental studies. Transportation Research Part F, 76.

Mirnig, A. G., Gärtner, M., Laminger, A., Meschtscherjakov, A., Trösterer, S., Tscheligi, M., Mccall, R. & Mcgee, F. (2017) Control Transition Interfaces in Semiautonomous Vehicles. Proceedings of the 9th International Conference on Automotive User Interfaces and Interactive Vehicular Applications – Automotive UI '17, p. 209–220. <http://dl.acm.org/citation.cfm?doid=3122986.3123014>.

Pink, S. (2014) Digital visual sensory design anthropology: Ethnography, imagination and intervention. Arts and Humanities in Higher Education, 13(4), 412–427. <http://journals.sagepub.com/doi/10.1177/1474022214542353>.

Pink, S., Gomes A., Zilse R., Lucena R., Pinto J., Souza A., Caminha C., Siqueira G. M. & Oliveira M. D. (2018) Automated and connected? Smartphones and automobility through the global south. Applied Mobilities. < https://doi.org/10.1080/23800127.2018.1505263>.

Pink, S. & Leder Mackley, K. (2013) Saturated and situated: expanding the meaning of media in the routines of everyday life. Media, Culture & Society, 35(6), 677–691. <http://mcs.sagepub.com/content/35/6/677.abstract>.

Pink, S., Sumartojo, S., Lupton, D. & Heyes La Bond, C. (2017) Mundane data: The routines, contingencies and accomplishments of digital living. Big Data & Society, 4(1), 2053395171770092. <http://journals.sagepub.com/doi/10.1177/2053951717700924>.

Pink S., Fors, V. & Glöss, M. (2017) Automated futures and the mobile present: In-car video ethnographies. Ethnography, 146613811773562. <http://journals.sagepub.com/doi/10.1177/1466138117735621>.

Politis, I., Langdon, P., Bradley, M., Skrypchuk, L., Mouzakitis, A. & Clarkson, P. J. (2018) Advances in Design for Inclusion. Springer International Publishing AG, 587. <http://link.springer.com/10.1007/978-3-319-60597-5>.

Roider, F., Rümelin, S., Pfleging, B. & Gross, T. (2017) The Effects of Situational Demands on Gaze, Speech and Gesture Input in the Vehicle. Proceedings of the 9th International Conference on Automotive User Interfaces and Interactive Vehicular Applications - Automotive UI '17, 94–102. <http://dl.acm.org/citation.cfm?doid=3122986.3122999>.

Segelström, F. & Holmlid, S. (2015) Ethnography by design: On goals and mediating artefacts. Arts and Humanities in Higher Education, 14(2), 134–149. <http://ahh.sagepub.com/content/14/2/134?etoc>.

Sharp, H., Desouza, C. & Dittrich, Y. (2010) Using ethnographic methods in software engineering research. Proceedings of the 32nd ACM/IEEE International Conference on Software Engineering - ICSE '10, 2, 491. <http://portal.acm.org/citation.cfm?doid=1810295.1810445>.

TomTom Traffic Index (2018) <https://www.tomtom.com/en_gb/trafficindex/>

Vlakveld, W., Doumen, M. & Kint, S. (2021) Driving and gaze behavior while texting when the smartphoneis placed in a mount: A simulator study. Transportation Research Part F, 76.

Yliris, S. & Buur, J. (2007) Designing with video: Focusing the user-centered design process. 2007. ed. London: Springer.