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Drivers' needs and acceptability of a mobile road alert service based upon social networking

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Abstract

Social networking in transport could be a powerful tool to contribute to drivers' safety and comfort, by allowing quick widespread of critical road information through "driver-generated content". This communication process, based upon application downloaded by smartphone, is easily accessible with a low cost. Nevertheless, several issues such as reliability of the transmitted information with resulting level of drivers' trust, and level of members' participation, might be critical. A survey has been conducted in order to evaluate drivers' needs and acceptability of this type of service. Results showed that the very high level of participation is not motivated by stars rewarding, but rather by pragmatic willingness to make the system working in addition to a more social aspect such as solidarity to the community. Senior drivers are also motivated to use the service, with a main concern dealing with road safety, and to generate information even if they have a lower mileage.

Introduction

At the end of 2011, there were about 6 billion mobile subscriptions, estimates "The International Telecommunication Union" [1] which corresponds to 87 percent of the world population that would be concerned.

Within this context, the worldwide smartphone market grew 54.7% year over year in the fourth quarter of 2011 [2]. In relation to this deployment of smartphone, there is a corresponding increase access to sophisticated services such as internet and geo-localisation [3].

Indeed, over 300,000 mobile applications have been developed in the last three years, with 10.9 billion times downloads; and demand for download mobile applications is expected to peak in 2013. Japanese consumers are still more advanced in mobile behavior, using mobile Web, applications and email more than US or Europeans [4].

Among these mobile applications, some of them are aiming at increasing travelers' comfort, ecomobility [5], ridesharing [6] and even safety. Examples of the scope of these applications are information on public transport (time schedule, location of stations, accessibility), road events (traffic and critical zones in real time), and feedback for drivers related to their fuel consumption.

Closely linked to the widespread of the smartphone use, there is a tremendous increase in social networking activities. The mobile media technology allows drivers and travelers to communicate and to collaborate in virtual communities and networks [7]. Among diversified purposes, networking is also used to make real time transport events circulating among members in a process that can be called " *user-generated content* », where each member sends information to the others whenever he feels like doing it. These innovative applications could constitute an efficient and low cost tool to inform drivers and travelers about real time events happenings with positive impact on road safety. Indeed, there is a clear drivers' need to be quickly and accurately informed about critical road events in order to anticipate, or even to

avoid these events. Therefore, smartphone applications displaying services related to real time information about traffic information and critical zones could bring an added value to road safety, in addition to the traditional media such as Variable Message Signs and radio on motorways.

Nevertheless, little is known about actual drivers' use and needs of these applications while driving, and little is known about trust and motivation of the drivers' social community to participate to this activity, neither about its actual efficiency.

Social networking and real time road alert

Real time road alerts via networking can be conducted following two types of principle: using an existing social network connecting drivers to each others without any intermediate, or using dedicated road alert mobile services centrally managed. In the first case, the service is free, the number of members is huge but the process is empirical and the reliability of the circulating information is uncertain. In the second case, a fee can be required for the service, the number of members is usually lower than a general social network, but the information circulation is filtered by the community management system according to several criteria in order to get the highest possible level of reliability.

For the dedicated mobile service, the general principle is the following (Figure 1):

- a driver identifies a specific road event that can be of interest for the rest of the network (traffic congestion, roadwork disturbing traffic, critical zones of any kind)
- he/she decides to inform the community via the management system about this event by touching an easy access button on the tactile screen or by vocal key words
- a set of pictograms representing various potential road events is displayed on the screen, allowing to qualify the event more precisely
- after answering to this request, the information is sent to the community management system
- this information is filtered based upon several criteria such as previous background of this driver in terms of involvement and reliability, similar information coming from other drivers in this area, etc…
- if considered as reliable, this information is widespread to the other community members about to enter in this zone
- then, any driver receiving the alert has the possibility to confirm or to infirm the reality and the actuality of the event by a simple touch, the answer being transmitted right away to the service management, in order to update the data base.

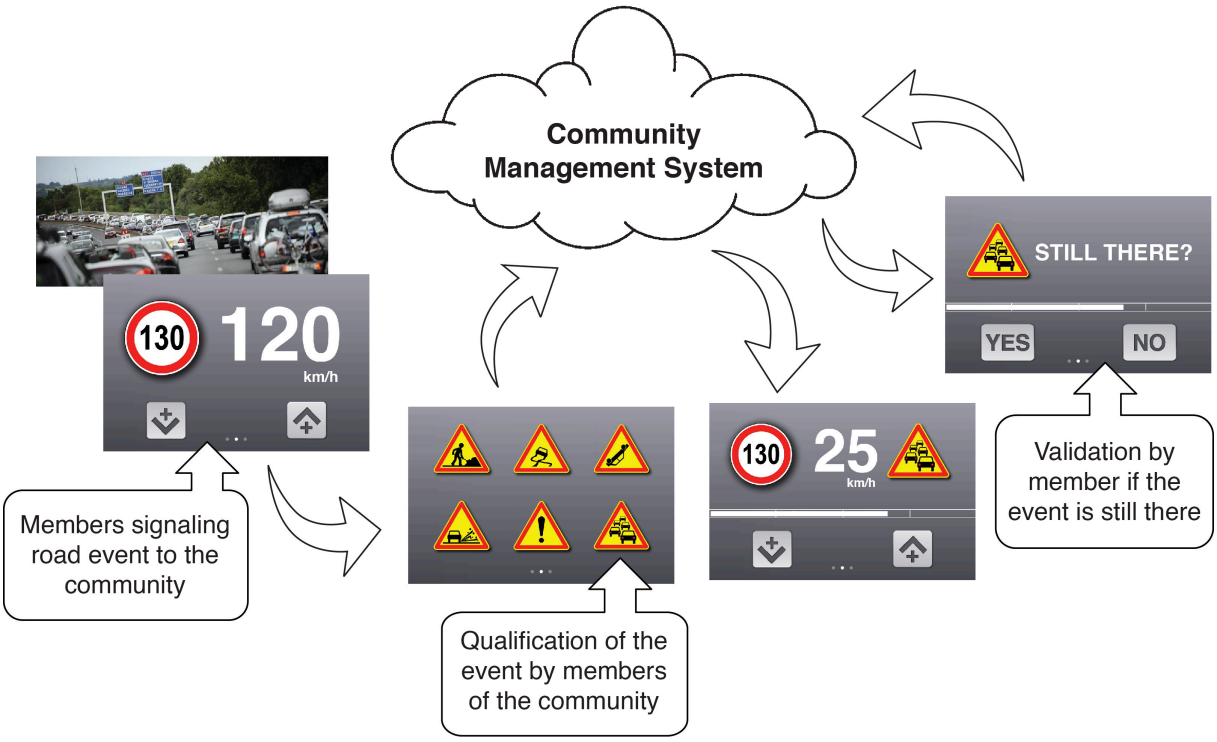

Figure 1: General principle of "driver-generated content" for road alert information

An investigation has been conducted among users of a dedicated mobile service centrally managed based upon this principle, in order to understand needs and motivation of drivers involved in this type of network. As previously described, this service allows drivers to inform the members of the community about location and type (accidents, roadwork, obstacle, etc…) of critical road events.
Community participation is on a voluntary basis principle for the driver. There is an easy access to the buttons allowing communicating information to the network via the service management system, with touches on tactile screen available anytime on the main screen of the system.
The reliability rating of members is represented by a set of stars, with a maximum number of 3, symbolizing the reliability of the member for the community based upon their past inputs in terms of validity, frequency and significance for the community.
The main information displayed to the driver by the smartphone service during the regular route is current speed, number of members ahead with their average rating in stars and distance of their location.

The various risky zones (temporal ones) or dangerous zones (permanent ones) are displayed to the driver when entering the critical zone using an alert visual display with red background, symbolising criticity of the situation, completed with vocal messages (Figure 2), or with cartographic background, option available to have an overview of the set of critical zones in a specified area (Figure 3).

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Figure 2: Display of a risky zone by alert visual display with red background

- Speed limit and actual speed are displayed, in addition to length of the risky zone
- This display allows also knowing that 4 members confirmed this risky zone 49 minutes ago (display on the left) or 1 member confirmed this risky zone 1 minute ago (display in the middle).
- Information on member and time confirmation is not required for dangerous zone where the zone is permanent (display on the right).

Figure 3:Cartographic display informing about risky and dangerous zones

- Several dangerous and risky zones have been identified by the community and displayed on a map
  for the benefit of any members, allowing to identify location and type of dangerous and risky zones in a specified area
- This display allows also knowing that 10 members with an average of 2 stars (on the left and in the middle) or 14 members with an average of 3 stars meaning highly reliable in their contribution to the community database (on the right), are located in a close surrounding.
- For the risky zone, information is given about the fact that 89 members confirmed the temporary event 4 minutes ago.

Methodology

A survey using internet media has been launch in cooperation with the service provider. This survey was composed by a set of 141 questions, covering various issues such as users' profile, frequency and context of use of the service, understanding of functionalities and interfaces design, evaluation of the type of buttons the driver would use to inform about road events such as obstacle on the road, accident, icy road illustrated by photos, trust in the information displayed by the service. Several questions were dedicated to the social network level of participation to the community, motivation regarding this participation, potential interference and annoyance while driving when informing or validating information for the community, current number of stars symbolizing driver's reliability, trust in the other network members.
Most of the questions were closed-ended, some of them were open in order to better understand reasons and motivations regarding answers. Filling the survey required about 20 minutes.
The announcement of the survey has been sent by mail to about 20 000 drivers using the smartphone service and selected according to two criteria: an annual subscription to this service and more than 6 months of experience. A total of 988 of these drivers filled in completely the survey.

Results

Drivers are using the mobile service very often, mostly several times per week or every day, with 42,3% on motorway, 38% on national/departmental roads and 19,65% in urban area. The service is considered as being the more comfortable to use in motorway context for 85% of respondents and in urban area for only 1%.
The main essential reason for using this application was "to keep points of the driving license" (87%), knowing that, in France, each violation to road code leads to demerit points withdrawn from the 12 original driving license points, and over speeding in a dangerous zone can result to points loss, with 1 demerit point for over speeding under 20 km/h of the speed limit and 2 demerit points for over speeding between 20 to 30 km/h over the speed limit. Being informed in advance about these zones allowed drivers to adopt the right speed.
The other reasons to use the service, far less priority, were "reliability of the information coming from the community" (45%), "size of the community" (44%) and "road safety issue" (44%), in comparison with other issues such as "system easy to use" (28%), "friends recommended the service "(18%), "innovative technology" (15%) and "to belong to the community" (13%).

Generally speaking, efficiency of the social network and reliability of the alert information is closely linked to the size of the community, with the requirement that at least one member has the opportunity to identify a critical road event and the willingness to inform the network about it, for a given area at a given time. In this framework, it is understandable that the choice of this type of service is based upon the item "size of the community". What is interesting is that an analysis of responses according to 3 main age groups (18 to 30 years old, 31 to 60 years old and more than 61 years old, splitting made with a clear objective to contrast generational culture typical of each group), revealed that the senior group is not that much aware about the importance of the "size of the community" and that their main objective in using this service is rather linked to "road safety" (Figure 4).

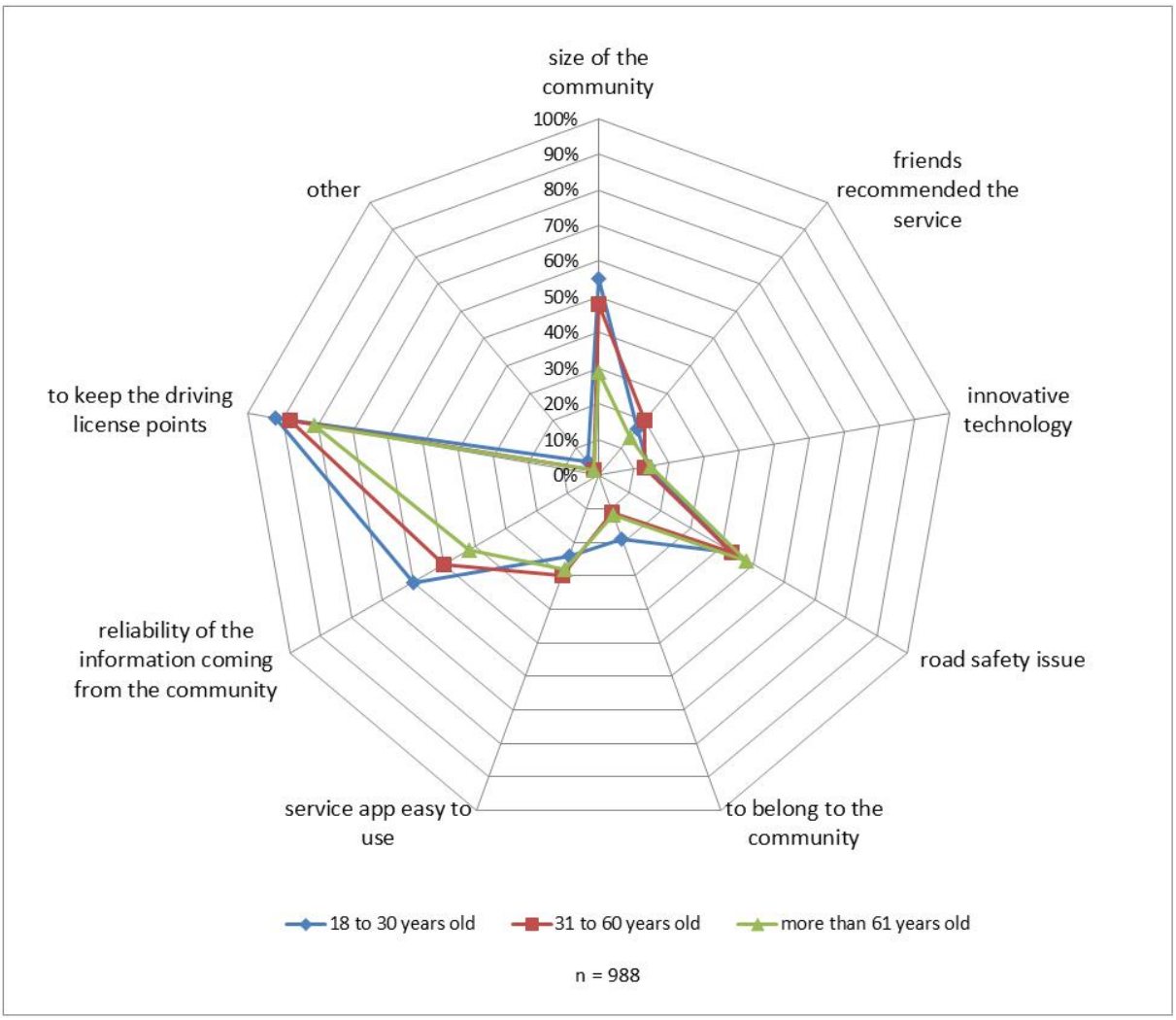

Figure 4: Reasons for using the mobile service by age groups

Furthermore, "belonging to the community" per se is not a major motivation for the sample of drivers, obviously less important than "road safety" and "system easy to use"; the younger group is the more concerned by the item linked to community belonging.

The impact of the community activity allowing road alert reliability would not be clearly perceived by the seniors. Then, not surprisingly, the level of participation to the community decreases as the drivers' age increases, with a "systematic participation" of about 83% for the young drivers and 52% for the drivers over 61 years old (Figure 5). It can be noted that seniors 'participation is still quite high.

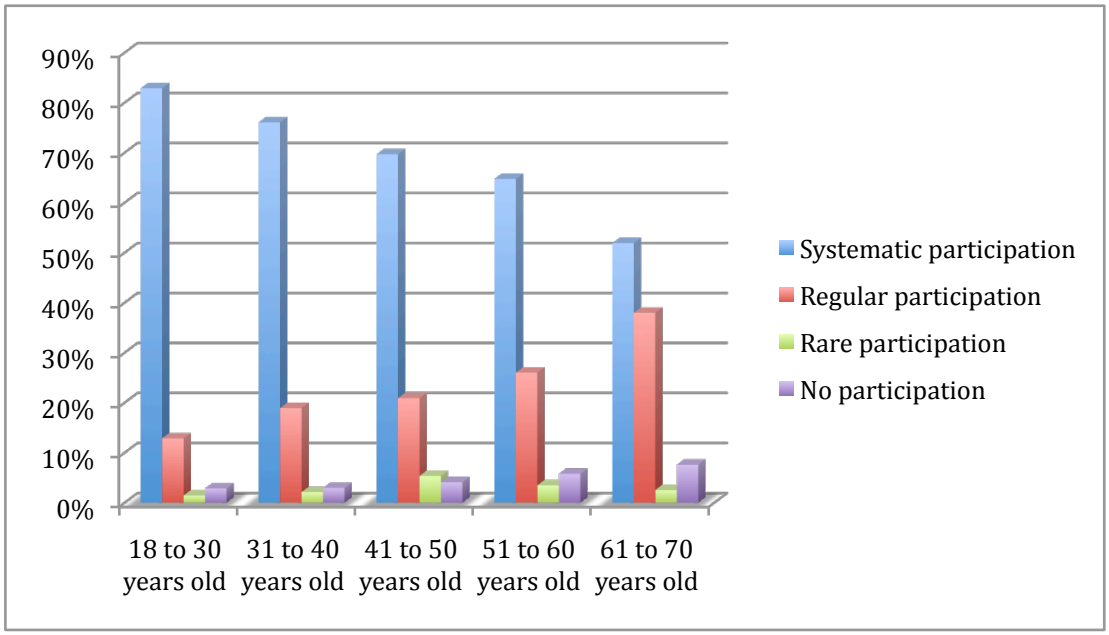

Figure 5: Participation to the community by drivers' age

The main reasons to participate to the community is the willingness to have a good functioning of the system for 68%, and, to a lower extent, by solidarity with the community for 29%. "Gaining stars" or "playing with the service" are very marginal reasons.

Negative impact of this participation to the driving activity is rated "weakly disturbing" for about 50% of the drivers, "a little disturbing" for 44%, "disturbing" for 6% and nobody found it "very disturbing", with similar findings whatever the drivers' age. This result is very important taking into account road safety concern. It is clear that drivers chose if they want to inform the community about an event and when, being then in full control of the interaction with the device, and able to manage any interference with the driving task. Nevertheless, these results are based upon subjective comments and impact of using the system on the driving task would deserve to be evaluated in real road context by recording drivers' behavior, in order to confirm this low level of interference.

Concerning drivers' ranking, half of them did not know their own number of stars, commenting that they were not too much interested to participate to a "competition with award", but nevertheless, they considered it is important to be informed about stars of drivers ahead in order to evaluate the reliability of the information ("very important" for 47%, and "important" for 42%).
Regarding drivers' interest to be ranked, 43% are willing to gain stars while 43% did not understand what is the purpose of stars or did not know the exact process to get them. In this last case, surprisingly, an important amount of drivers did not manage to make a clear link between having stars and being considered as reliable in the community.
For the group of drivers aware about the stars meaning and purpose, most of them are really motivated to participate and to be well ranked to guarantee the good functioning of the system, "more stars, more reliable information, more confidence of the community".
Indeed, confidence in the social network is a crucial issue for a driver community generating content. Taking into account the important ratio of drivers unaware about the logic and the issue linked to get stars, it seems that this process would deserve more pedagogy toward the

drivers to increase motivation of participation.

Road alerts displayed by the service are considered as reliable “most of the time” by 86% for “danger zones” corresponding to critical constant zones, and by 73% for “disruption zones” corresponding to temporary critical zones.

Information coming from the community is considered more reliable than the one coming from the variable message sign and from the radio (figure 6). In the same vein, a recent research demonstrated how information on weather warnings coming from social network was efficient to make drivers changing behaviour [8].

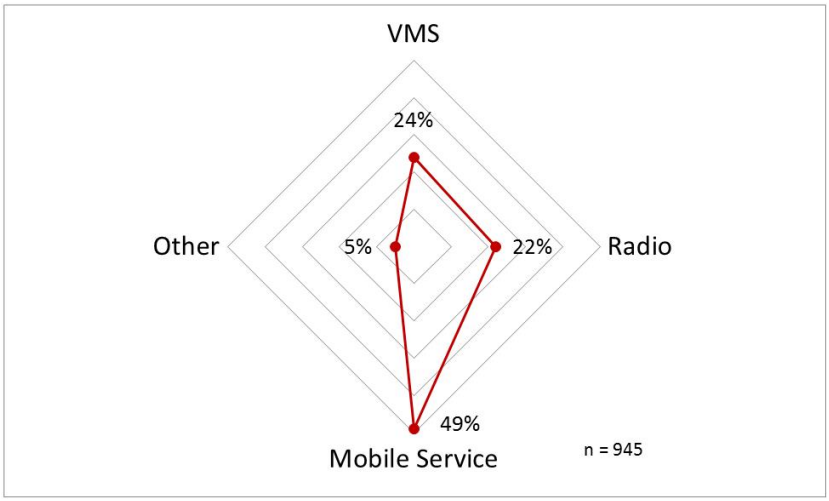

Figure 6: Drivers’ evaluation of reliability for the road alert information by sources of information

In this study, weather warnings information disseminated through network was a powerful tool to convince driver to change decisions such as route planning and trip cancellation. The overall opinion of the service was very positive, especially when compared to other sources of traffic weather information and alerts. Generally speaking, mobile devices are primarily used for personal communication, while traditional road information channels such as VMS, and including radio, are more impersonal and research shows that people remember better information that affects them personally [9].

Conclusion

Social networking in transport could be a powerful tool to contribute to drivers’ safety and comfort by allowing quick widespread of critical road information through “driver-generated content”. This communication process, based upon application downloaded by smartphone, is easily accessible with usually low cost. Nevertheless, several issues such as reliability of the transmitted information with resulting level of drivers’ trust might be critical.
The investigation conducted to gather data on a service aiming at informing drivers about dangerous and critical zones in real time showed several main results:

- except a high and general priority in terms of willingness to keep driving license

points, reasons to choose this service are different according to driver's age, with a focus on community size and reliability of the information coming from the community for young drivers and a little preference linked to road safety for senior drivers
- drivers are motivated to participate actively to the community by informing systematically road events to the other members for young drivers or at least on a regular basis for seniors
- motivation to participate to the social network information is first of all pragmatic with an awareness that inputs are required for a good functioning of the system, and is also social with a willingness to be solidary with the community
- drivers can be split into two categories: an important amount of drivers did not understand or did not care about the stars ranking principle, meaning that the level of participation for them to the community is not linked to the reward process itself. The other group relied on this information to evaluate reliability of the road information and gaining stars is part of their motivation
- road information coming from the social network are more trusted by drivers than any other sources of information

Based upon these results, mobile services can be considered as good candidate to display critical road information to drivers, with a positive context in terms of acceptability and motivation of use, even by seniors drivers who did not have the same generational culture than young ones regarding social networking but can be still active and motivated to participate as other researches already showed [10].

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