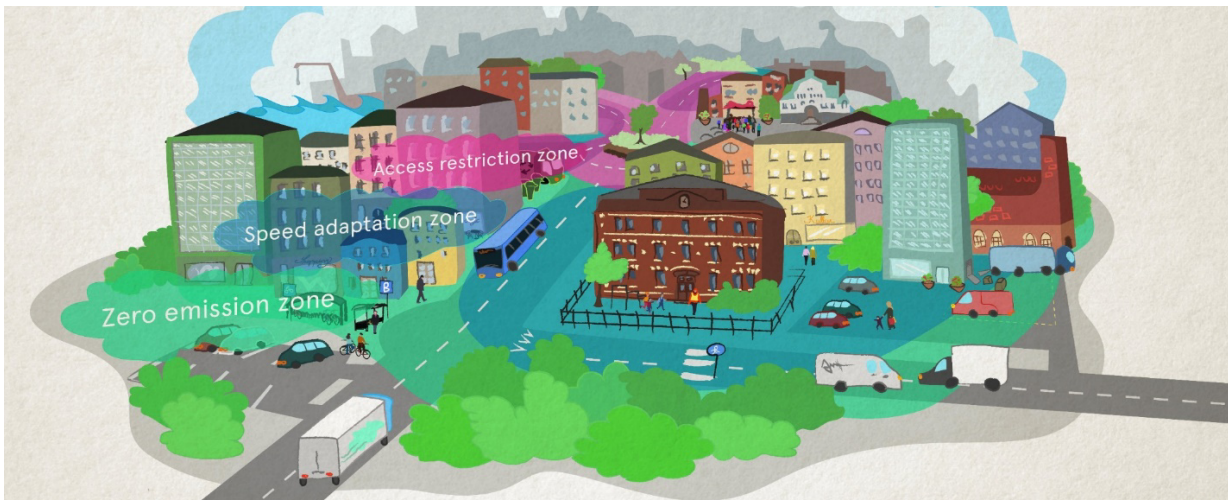


Report on Stakeholder Management and Participatory Processes for developing and implementing Geofencing



GeoSense (2024)

The project GeoSense elaborates on geofencing solutions aiming at improving urban traffic management and planning

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1. Introduction

This report is part of work package 2 of the GeoSense project and explores stakeholder management and participatory processes of testing and implementing various geofencing applications. Most, if not all, geofencing applications in traffic related applications are either developed by, used by or affected by several different stakeholders. Cities wishing to begin testing or implementing any type of geofencing application need to identify, consider and, to various degrees, manage all the stakeholders that will contribute to or be affected by the implementation of geofencing for traffic management. Cities that have worked with geofencing in various pilot or demonstration projects consider coordination and collaboration with external stakeholders to be one of the main barriers to implementing geofencing.

This report will shortly describe the importance of and what to consider regarding managing stakeholders and participatory processes of implementing geofencing application for traffic management. This report is the result of following different processes on testing and implementing geofencing for different traffic management applications. The study is part of the GeoSense project with the overall objective to design, trial and evaluate new geofencing concepts and solutions for specific cases in cities and to propose new ways on how to deploy different geofencing applications. The report is structured as follows: section 1 focuses on the importance of stakeholder management and participatory processes before describing the method of the study resulting in this report in section 2. Section 3 describes the results from the case studies before showcasing conclusions and recommendations in section 4.

1.1 The importance of stakeholder management and participatory processes

For many years it has been clear that collaboration between public and private actors is crucial for developing and implementing various traffic related innovations. There are many benefits to a more collaborative approach, such as increased speed to market, possibility to develop new business models, access to external resources (for example knowledge and data) and risk and cost sharing (Urbinati et al., 2021). Furthermore, it gives a better insight into the different objectives of the involved stakeholders and ultimately a solution that provides value for all included.

Stakeholder management can be defined as the organizational-level mechanisms that design the participatory rights and responsibilities assigned to the multiple stakeholders of a process and guide the stakeholders' interactions during the process (Bacq & Aguilera, 2022). It sees to establishing value creation goals for the process and the individual stakeholders participating. Simplified the stakeholder management and participatory processes in multiple stakeholder processes consist of (1) identifying stakeholders, (2) coordinate stakeholders and (3) monitor stakeholder engagement. *Identifying stakeholders* means to identify what organizations and people that should be involved in the process at what stages and to what degree. It is possible that different stakeholders are included in different parts

of the process and that they can take different roles during the process. It also includes identifying the stakeholders that are affected by a specific project or have an interest in in the project. *Coordinate stakeholders* include the practices of sustaining relationships and interacting in usually complex networks of stakeholders. Lastly *monitoring stakeholder engagement* is the task of sustaining active involvement to maintain efficient progress. All three parts are time-consuming but crucial for successful outcome of a project or a process.

In relation to geofencing there are many different applications with the technology that enquire different sets of stakeholders, different roles of stakeholders, different business models and different operational processes. Different geofencing applications will therefore require different stakeholder management processes and different participatory processes. However, the benefits of understanding the importance of managing stakeholders and different approaches can reduce both organizational barriers and costs for implementation. For instance, a well-structured process of managing stakeholders can lead to:

Better understanding of the geofencing application and its potential

Stakeholder management and participatory processes will increase the understanding of how a geofencing applications best can be used and for what purpose. Depending on geofencing application it is not always clear what roles different stakeholders have in the deployment of the service, the structure of value streams and effects of the applications on the traffic related problem it intends to solve. Involving relevant stakeholders in dialogues and pilot projects about the technology or, more importantly, the problem that the geofencing application is intended to solve, reduces uncertainty about roles, values created and potential impacts. Furthermore, including stakeholders in the process give further insight into how geofencing application is organized and daily operated.

Increased acceptance

Various stakeholders have valuable input on what works good or bad and why that is the case. Why something brings value and what kinds of values needs to be considered from different perspectives. There is often a lack of knowledge from city planners of the “real world” who plan for one thing to happen while the reality makes that plan irrelevant and sometimes ignored by the end-users. This is both time-consuming and costly. Considering different stakeholders perspectives increases the possibility to design a geofencing application that is more considerate to different stakeholders needs.

Increase speed to market

Geofencing applications for traffic management depend on commercial actors to provide services that have the desired effect. Both suppliers of hardware and/or services that enable geofencing and transport service providers that use geofencing for their transport services are interested in the economic potential of the technology or geofencing application. Even if a geofencing application has great social, environmental and economic value for a community, it will not be widely implemented if there is no economic value for the commercial actors that enable the technology. To manage the stakeholders involved in the process of developing and implementing geofencing will increase both understanding of the technology and the values of it, making it faster to reach a wider market.

Access to external resources

Engaging stakeholders also gives a better access to external resources, this includes tangible resources such as test sites, vehicles, hardware and personnel. It also includes intangible resources, such as knowledge, experience and data. Access to data has shown to be of big value for city authorities when developing geofencing applications with external stakeholders.

Risk and costs sharing

New technologies, or as the case for geofencing, an old technology in a new setting, is often costly to develop and implement. This is mainly due to many uncertainties. This can include uncertainties in what hardware to use, how daily operation will look like, how users will react on the technology and what effects there will be. And one thing is sure, there will always turn up issues that has not been thought about before starting testing or implement a technology in a specific setting. Just because it works well in one setting does not mean it will work well in another. Involving stakeholders means that both the risks and the costs of development and implementation are more widely shared.

2. Method

The data collection in this study mainly consists of interviews with participating stakeholders in the geofencing pilots that are part of the GeoSense project. During the project a couple of pilots were made which upon this study is based upon. The pilots are based in the cities of Gothenburg, Stockholm and Munich. The objective of each pilot and the main stakeholders are described in table 1. In total 12 in-depth interviews have been conducted with people within the organizations involved in the pilots. Initially the plan was to conduct workshops with each pilot to describe the processes of the participatory processes. But after consultation with project partners it was concluded that interviews with the involved stakeholders would give better insight to the participatory processes from different perspectives.

As this study main object is to analyze and come up with recommendations for stakeholder management and participatory processes regarding developing and implementing geofencing for urban mobility, the interviews has mainly been conducted during and after the pilots of the GeoSense project. The interviews have all been conducted during 2022-2023 and digitally with the opportunity to record each interview. Unfortunately, a couple of key stakeholders have not been able to participate in the study. This mainly concern the Gothenburg case where it was not possible to get hold of respondents from the transport operator nor the third-party service provider of hardware for enabling geofencing in the vehicles used in the pilot. These are main stakeholders to enable the pilot, and their view on how they were involved and how the managerial process unfolded during the process would have been useful. Although unfortunate, and detrimental to the study, there was instead interviews with two involved respondents from the city of Gothenburg who independently gave similar response of the process of managing stakeholders during the pilot.

For full background and case description, please see appendices to the implementation guide for the GeoSense project.

Table 1. Descriptions of the pilots and main involved stakeholders.

Pilot	Objective	Main stakeholders
Gothenburg	Addresses geofencing in public procurement to ensure that speed limits are being respected by transports procured by the city.	<ul style="list-style-type: none"> • City of Gothenburg (3 departments). • Procured Special Transport Service provider and their drivers. • Third party service provider of hardware and software to vehicles. • Research partner. • Lawyer.
Stockholm	Investigate a new way of working to deploy geofencing, e.g. issuance, updates of local traffic rules, network editing, and creating new routines/processes regarding data management.	Several departments and areas of expertise within City of Stockholm (transport, innovation, digitization and data management).
Munich	A pilot using geofencing to define parking and no-go zones for e-scooters.	<ul style="list-style-type: none"> • City of Munich (Department of Mobility). • Mobility service providers and their users. • Third party software providers. • Residents and business owners.

2.1 The Gothenburg case

The Gothenburg pilot included 16 vehicles which were retrofitted by a third-party service provider who installed hardware and software in the vehicles to either function as an informative (advisory) Intelligent Speed Assistance (ISA) or a mandatory ISA. When the vehicles entered the selected locations the driver either got a notification of the speed in the area or the vehicle itself reduced the speed to the legislated speed limit or lower, e.g. 30km/h or 40km/h. This was mainly done at locations where it was considered to be higher traffic risks, such as residential areas or close to schools. The geofences were set up in a fleet management system that impacted the vehicles. The main objective of the pilot was to compare and evaluate user behavior, and acceptance during test with geofencing and to learn more about pros and cons with retrofitted equipment and geofencing.

The Gothenburg case is more project based, meaning that a pilot is made during a set timeframe and the stakeholders are managed to fulfill the set targets of the projects. The pilot period was during August - December 2022, but planning and preparations started already early 2021. Planning, preparations, executions and follow-ups were made in coherence with other stakeholders involved in the pilot. The vehicles retrofitted were part of the city's Special Transport Service (STS) department which offers public transport services to passenger groups with special needs. Three private traffic operators are contracted by the city authorities to carry out these trips.

2.2 The Stockholm case

The Stockholm case focused on investigating new ways of working to be able to deploy geofencing and other connected solutions in its daily traffic planning and management operations. The focus has

been on mapping the current situation and existing processes, as well as new needed routines and processes for data management that can enable geofencing for all transport mode. The ambition of the Stockholm case has been to map changes that are needed in data management to scale up and implement geofencing in traffic management.

The Stockholm case was of internal city matter, meaning that the focus is on how processes within the organization can unlock the potential in datasets to enable various geofencing applications. It can for instance mean that the city makes sure that the data they publish and make public is correct and correlates with how the physical infrastructure is structured. Some geofencing applications depend on data, such as digital traffic rules, to function. If this data is not correct it hinders the implementation. To make data correlate and that the processes of publishing and enabling traffic data digitally it requires collaboration among several departments, e.g. mobility department, environmental department and IT department. Management of stakeholders in this case entail more long-term based processes. It includes getting right people to engage in the process and establish an internal acceptance among employees within the organization to reach a way of working that enable geofencing applications built on data provided by the city.

2.3 The Munich case

The Munich case focused mainly on the geofencing of e-scooters to ensure that they are parked in designated parking zones. Interviews were conducted with a representative of the city administration and several mobility service providers, all of which are involved in the e-scooter business. The mobility service providers have all been involved since 2019, when the scooters first appeared on German streets. Shortly after the arrival of the first scooters, the city of Munich set up a forum where shared mobility service providers were invited to exchange information and knowledge, and the city set up a voluntary commitment for co-operation and regulation with and of mobility service providers. In 2022, the Munich City Council decided to develop an overall strategy for shared mobility as part of the overall mobility strategy for 2035, which also includes Vision Zero and the decarbonisation of transport in the city. With this in mind, the city wanted to better structure how and where e-scooters are used and parked in the city, and wanted to establish parking and no-go zones for e-scooters. To achieve this, the use of geofencing was discussed to ensure that e-scooter users adhered to the set parking rules. Stakeholder management has been a long-term process and will continue after the GeoSense project, as the forum where the city and service providers meet involves more than just geofencing.

3. Learnings from the use cases

3.1 The Gothenburg case

Although successfully carrying out the pilot with geofenced vehicles during the fall of 2022, the Gothenburg case had several challenging periods during planning and execution. Several challenges can be directed toward the interaction between stakeholders during the process.

One of the main issues in the Gothenburg case was that the organizational structure made it difficult to get information across effectively. The city authorities contracted both transport operators and third-party service providers of the technical components to enable the geofencing applications in the vehicles. The city authorities hence became a central figure, acting both as a customer (of transport services and technical services for enabling geofencing) and a project manager for the geofencing pilot. Furthermore, the transport operator initially during the planning and execution of the pilot made sure that all contact to a driver of a geofenced vehicle went through traffic managers, who were employees of the transport operator company. This was necessary to ensure anonymity and privacy of drivers involved and which was formulated in advance as a basic requirement for their consent to participate. This means that if a city representative wanted feedback from a driver on the technical functionality of the geofencing application, they had to first contact the traffic manager, who in turn talked to the driver. Worst case scenario was if the third-party service provider, who had installed hardware in the vehicles, wanted feedback from the drivers, as the service provider had to contact a city representative, who contacted the traffic manager, who talked with the driver. The information then went back the same way. This process has many risks as there are several middlemen, which affect both time and risk of misinterpretation along the chain of communication.

The results indicate that the traffic managers, who functioned as middlemen between city authorities and the drivers, had lower commitment and interest in the pilot as they were less affected by the geofencing applications and the geofencing pilot was not part of their core working load. The drivers on the other hand were directly affected by the geofencing applications and had useful information which could be conveyed to the city authorities and the third-party service providers to improve the functionality of the geofencing application. But as the communication occasionally was not effective, the information from the drivers could not be utilized in the best way possible. There were some technical difficulties during the pilot which could have been fixed quicker with more effective communication between the drivers and the third-party service provider. Furthermore, as the drivers did not get quick response on their feedback on the geofencing application, they became less keen on committing to the pilot. As one of the main objectives of the pilot was to evaluate user behavior and acceptance during test with geofencing, the deficient contact with the drivers affected the results of the pilot and risked diminish the goals of the project.

However, later during the project, the city authorities increased pressure on the transport operators and ultimately got direct contact with drivers and could then better understand various problems with the geofencing application. The project managers then got direct feedback from the drivers and the third-

party service provider could directly make adjustments to improve functionality and user experience. It took a lot of effort and resources from the city authorities to get to that point.

For the city representatives the whole pilot was a demanding and challenging process. It involved managing several roles and multiple stakeholders with different objectives, as well as ensuring that the project delivered results for evaluation as was originally planned by the research team.

Main learnings from Gothenburg

- Early identification of the main stakeholders and a continuous process of evaluating that the right stakeholders were involved helped achieving set goals. During the project more stakeholders were identified and involved, such as legal expertise, police and union representing the drivers.
- Clear goals and objectives for the pilot, and most important, the problem statement on why the geofencing application was to be tested, were formulated early and established among the main involved stakeholders. It made it easier to refer back to the “why” of the geofencing pilot during the whole process.
- In the process of applying geofencing for transports service for the municipality, the city representatives needed to manage several roles. Resources and competences to manage these roles needed to be addressed. Project manager skills, procurement skills as well as technical skills were needed.
- Good coordination and organized responsibilities and assignments among involved employees within the city authority was crucial. Coordination of external actors depend on good internal coordination.
- It was difficult to “own” the pilot process as there were several different actor specific objectives to consider, which becomes more complicated when private actors are involved. The value for all stakeholders needs to be addressed.
- Direct contact with the end users, in this case the drivers of the geofenced vehicles, was crucial. Some moments there were low or no feedback on why something was not working with the geofencing application which reduced both the functionality and acceptance of the technology.
- A major breakthrough occurred when the municipality took control of the process and reduced the influence of middlemen who had little interest in the geofencing pilot.
- Personal enthusiasm among employees in the city authority to test and evaluate the geofencing application was a main driver for success.

3.2 The Stockholm case

The main focus of the Stockholm case was to investigate a new way of working for ensuring data management that can enable geofencing. Although Stockholm has in various forms been working with geofencing since 2018, and had several small-scale pilots, there has yet not been any large-scale implementation of geofencing in relation to traffic management. It has also been a long process of getting employees in different departments within the city authority to understand why geofencing is worth investing resources in. There was, to some degree, a skepticism towards the actual effects of introducing geofencing in contrast to other measures to mitigate specific traffic related problems.

Because of this, the city of Stockholm engaged in a process of rethinking the underlying purpose of geofencing and its applications. The project manager, with main responsibility for geofencing development within the city, started the position as project manager after the city had been engaged in, implemented and evaluated various geofencing pilots for several years. For example, there had been a long-term pilot that used geofencing to ensure that a plug-in hybrid truck used electric power within specified zones, which enabled off-peak deliveries. The new project manager engaged in a new mindset where focus would be more on the underlying data sets that can enable geofencing. This opened up more opportunities and more interest among other people within the city, as data can be more multifaceted in how it is used and for different purposes. There is a more common understanding among city employees of why high-quality data is needed and why they should engage in activities to enable high-quality data rather than to engage in enabling some specific geofencing application.

The project manager, with the help of a research institute, initiated a workshop series that focused on what data can enable and what data that are needed and what data quality is required. Furthermore, the workshops focused on the processes and the way of working to enable high quality data and how to distribute the data. This in turn can enable various geofencing applications, but also other digital solutions for traffic management. Data was to be seen as a valuable strategic resource, both on individual, organizational and ecosystem level. The workshops aimed to enhance representatives' understanding of the different areas of responsibility in the Transport Department to enable data and data provision in daily operations. The workshops were held for 3 hours, but feedback indicated that more time would have been needed to sufficiently go through the processes of retrieving and distributing data.

By not pushing geofencing as the main focus and solution to various traffic related problem, more people within the organization were interested in joining. A crucial aspect was that a person with right competence, asking the right questions and understanding different data processes, was in the lead of the Stockholm case. The person could better understand the core issue, and hence increase the commitment among participants.

Main learnings from Stockholm

- Acceptance for working with, developing and implementing geofencing was considered not only important among external stakeholders and the end-users who will be affected by the geofencing application. Internal acceptance among employees within the city authority was important to get a better outcome. People within the organization needed to have a coherent understanding of the reason for working with geofencing.
- To increase engagement it was important to not push geofencing as **the** solution to some specific traffic related problems. Focusing on the underlying mechanisms to enable different digital solutions for identified traffic related problems enhanced engagement.
- Focusing on data for traffic management was a key factor. Data is more multifaceted than geofencing, as why it created a higher commitment among other departments and employees within the city authority that might see other possibilities with the data.
- It was important that people with right competence were responsible for driving the process of development. Someone with a wider perspective regarding how data can be used for traffic management led to increased engagement of other stakeholders.
- Too little time were planned for some activities, such as workshop. For higher validity of the outcomes from the activities, more time would have been needed for both input and for participants to revisit their input afterwards.

3.3 The Munich case

The Munich case spans several years, with close collaboration between the city authorities and the mobility service providers, consisting of e-scooter service providers. This report focuses mainly on Case Study A, which deals with e-scooters in the Old Town district in Munich. There are also case studies B and C, which deal with temporary parking during the Oktoberfest and improved use of existing parking facilities.

In Munich, the city authorities had an early strategy to work with mobility service providers to mitigate potential problems with the increasing number of e-scooters in the city from their launch in 2019. The city invited mobility service providers to a dialogue on plans and objectives for urban development and the role of different transport modes in urban development, which resulted in a voluntary commitment with rules for e-scooters signed by all mobility service providers. The dialogue was characterised by a high level of transparency, which helped the service providers to plan and also to find solutions to potential problems that the city's plans might create for their daily operations. An example of this is when the municipality planned parking and no-ride zones for e-scooters, such as the no-ride zone in the pedestrian area of the old town. The authorities were transparent about their plans for parking zones and where in the city they were planning the zones.

The geofencing plans for the GeoSense project focused primarily on the Old Town, a densely populated area in the centre of Munich with high pedestrian traffic and a high potential for conflict due to busy sidewalks. As part of the process, the mobility service providers also provided the city with data on e-scooter users, allowing the city to position parking zones based on information about where e-scooter users typically end their trips. With this data, the city was able to better plan the parking zones and make them more useful, as the previously installed parking zones were sometimes under-utilised. This process is characterised by a give-and-take mentality between the city authorities and the mobility service providers. The city has been transparent with the service providers about its future plans, which helps the service providers plan their operations and expansion plans. They have also shared data to ensure that the plans are beneficial to both stakeholders and to Munich's residents and visitors. Most mobility service providers are willing to share data with city authorities as long as they are transparent about their urban mobility development plans. Stakeholders value transparency as it leads to trust and understanding. The city also took into account the wishes of the providers, such as the need for a minimum number of parking spaces in the old town to ensure customer success, so in the end 43 parking spaces were installed for Use Case A in the GeoSense project.

In order to ensure that the e-scooters were parked in the designated zones, the e-scooter provider, City, introduced a geofencing application to send virtual geofences to the mobility service providers to ensure that the e-scooters could only be parked where they were allowed to be, once the mobility service providers had integrated these zones into their apps. The geofencing application is also developed from a user perspective, as the service providers take into account the needs of their customers. Although some user acceptance issues were anticipated, the implementation of the parking zones and the geofencing solutions to ensure compliance resulted in relatively few complaints from

both e-scooter users and road users. The number of incorrectly parked e-scooters was greatly reduced, resulting in a satisfied city administration, satisfied service providers and satisfied end users, as evidenced by the fact that by 2023 almost 90 % of e-scooters were parked in a designated parking zone in Munich's old town.

The Munich case worked very well from a stakeholder management and participatory perspective. The municipality identified and involved key stakeholders at an early stage in order to solve a problem that the city had identified and that the other stakeholders could understand and relate to. Regular meetings were organised about every three months, where the council was transparent about its plans and willing to take input from service providers. This emphasises that the city's objectives (more sustainable mobility, with micro-mobility playing a central role) are in line with the service providers' opportunities. Ultimately, the service providers are the stakeholders who have implemented the given geofences to solve the problem identified by the city authority. Their experience and expertise allowed the solution to be better designed in terms of usability and customer needs. The key to success here was working with stakeholders on an equal footing. For example, despite the voluntary nature of the cooperation with the city, the mobility service providers implemented the geofences in their systems. Involving all stakeholders as early as possible in the creation of the zones proved equally valuable.

Main learnings from Munich

- It was important to gain a common understanding of the problem that geofencing was intended to solve and that all stakeholders would benefit from the introduction of the technology.
- Transparency was key to building trust and a high level of equality between stakeholders. Stakeholders felt part of the city's planning for the mobility of the future.
- Roundtable discussions were valued. However, commercial actors may be reluctant to share upcoming developments in larger forums, which means that city representatives may not receive important information about upcoming developments in roundtables. Individual dialogues were also needed.
- Data from external stakeholders (e-scooter vendors) was used as a basis for decision making.
- International standards and specifications, such as the Mobility Data Specification (MDS), are crucial for the allocation of geofenced zones and traffic policies for shared mobility, but need to be further developed.
- Cities were willing to understand the business of private actors - to match the city's objectives with the business opportunities of service providers.
- Personal qualities were important for progress. In Munich, a younger generation was involved in the project, which was seen by external stakeholders as more understanding of new trends and open to change.
- Mobility service providers want to work closely and in the long term with city authorities. Good relationships with city representatives can create business opportunities in the future. This approach was used by the municipality to build trust and new solutions together with the mobility service providers.
- The "end goal" of solving the specific problem of wrongly parked e-scooters to ensure traffic safety was more central than the technology itself - geofencing happened to be the best solution for this problem. Geofencing was then mainly implemented by the mobility service providers with a strong focus on the usability of the application for their customers.

4. Conclusions and recommendations

4.1 Different geofencing applications need different approaches

Depending on the application of geofencing to a specific transport problem, different approaches for stakeholder management and participatory processes will be needed to increase stakeholder acceptance. There will be different stakeholders, different attitudes and different values to consider. It is important to identify at an early stage all potential stakeholders through a stakeholder analysis, and also what value they would place on a geofencing solution. It is also important to have a common understanding of the actual traffic problem that needs to be solved and whether geofencing is the main solution to solve that problem. In particular, it is important to consider who the end users are and who will be affected by the implementation of the proposed geofencing application, such as drivers or other road users. How drivers perceive the usability of the geofencing application will in many cases determine whether a geofencing application will be used on a wider scale. It is therefore important to involve the stakeholders who can create the best user experience. Where possible, eliminate unnecessary middlemen who do not perform any real tasks and activities in the solution development process and whose role is simply to relay messages between the stakeholders involved.

Furthermore, it is important to consider private company interests. All geofencing applications will to some extent involve private companies, either to supply hardware or software services to enable geofencing, or mobility operators or mobility service providers. It is important to understand the private interests among these companies, what their main objectives are and that they need to protect their intellectual properties. By building a continuous dialogue between city and involved companies increases understanding of what aspects are most important for the private companies and the geofencing application can be tailored to better fulfill its purpose to solve a traffic related problem and to increase user experience.

A city authority considering the initiation of a geofencing development or implementation process needs to acknowledge the unique circumstances specific to that city. These include the internal organizational structure, the primary traffic problems, the main stakeholders related to those traffic problems, and whether there is mutual interest in mitigating those traffic problems. Additionally, the authority should assess the potential value that can be created for private entities and end users. Once all of the above factors have been identified, it is time to proceed to the next step and determine whether geofencing is indeed the primary solution for the identified traffic-related problem.

4.2 Do not necessarily consider geofencing as the main solution

Geofencing has during the past years been more prominent in discussions on how to use digitalization as a tool to solve some of the major traffic problems in cities. Cities have been involved in several workshops and numerous discussions on how geofencing can be used in relation to traffic safety, reducing environmental impact and increase transport efficiency. The technology is to be used as a tool for various applications. However, from the GeoSense project, it can be considered that the best outcomes, meaning highest acceptability of geofencing, are applications where mobility service

providers or a transport operator propose or integrate geofencing in their vehicles as solution to a traffic related problem.

Mobility service providers and transport operators have their customers or drivers at first priority, meaning that they can have an important role in designing a geofencing solution with focus on user experience and customer needs. Furthermore, by only focusing on geofencing as the main solution to an identified traffic problem may be contra-productive as other measures might get neglected or overlooked. In the Stockholm case, by mainly focusing on data and data management processes that can enable geofencing, there was a higher commitment and interest among employees within the city authority as this focus was more multifaceted than geofencing. People could see different values and usage of data and to establish efficient data management processes, while geofencing could be considered as a fairly niched technology.

Various geofencing applications can be used tools to address different traffic-related problems. However, the most efficient and widely implemented use cases today involve private companies with a vested interest in geofencing. The key is to identify applications that create a win-win-win situation for the city, the mobility service provider and the end user. Therefore, it can be valuable to focus on the underlying traffic problem and the processes that can enable geofencing, rather than solely promoting geofencing as the primary solution. In the case of e-scooters, for example, geofencing technology is now widely used in several cities. The primary focus of the stakeholder meeting was to address the issue of illegally parked e-scooters, a problem that affects both mobility service providers and cities. Rather than directly discussing the application of geofencing, stakeholders met to better understand this common problem. Once a common understanding was established, geofencing emerged as the most cost-effective and straightforward solution. Mobility service providers were then able to develop and implement geofencing with a user-centric approach. At the same time, the data generated by geofencing became valuable to the city council for mobility and urban planning purposes. Similarly, the city gained insight into the needs of the service providers, enabling decisions that benefited both the mobility service providers and the end users.

4.3 Relationships are much – but not everything

Developing and implementing different geofencing applications for traffic management entail involvement of different stakeholders, either during a shorter, time-specific period or for a longer period of time. Several applications still rely on project-based development processes where geofencing has been pointed out to solve a specific traffic related problem. The Gothenburg case is an example of such a process, where geofencing has been identified as a possible solution to ensure that transport services procured by the city to not exceed set speed limits in specified zones. Other geofencing applications rely upon long-term collaboration and continuous dialogue between involved stakeholders. The case of Munich is such an example, where the city authority and the mobility service providers have been in dialogue for several years and continue to have trustful meetings to exchange information. The network in which the city authority and the mobility service providers exchange information has been established for so long that several people report that there is a degree of

personal relationship between the people involved, albeit in a professional way. The long-term commitment has increased trust and understanding between stakeholders.

However, what most stakeholder consider important is transparency in long-term city goals and objectives. Furthermore, as previously mentioned, it is important that there is a common understanding of the problem that the geofencing is aimed to solved. Even if there is a good relationship between the involved stakeholders it is not necessary that it will be a good and effective outcome of the geofencing application if it does not coincide with the stakeholders' diverse objectives.

4.4 Checklist for stakeholder management and participatory processes in geofencing development

The results from the GeoSence project indicate that there are different benefits of increasing stakeholder engagement and to have high quality participatory processes during a geofencing development process. Increase stakeholder engagement in development process indicate a higher acceptance among both end-users, other project partners and among employees within city authorities. This is due to higher trust among participating stakeholders, increased engagement, increased knowledge among participants, better understanding of why geofencing is being used and reduced organizational barriers.

Below is a checklist that summarize what city authorities should consider when initiating a process of working with external and internal stakeholders for developing a geofencing application for traffic management.

Checklist for stakeholder management and participatory processes in geofencing development

- Identify the traffic related problem that is to be solved or mitigated, preferably together with external stakeholders that are part of the identified traffic problem.
- To increase acceptance internally within the city authority, focus on underlying data sets and data management processes that can enable geofencing. The multifaceted use of data can create higher commitment among participants and more end value.
- Ensure that the right competences are involved in the process. Project management skills, procurement skills, IT-skills and mobility management skills are needed. A person with right qualifications and understanding of different perspectives should lead the process.
- For the identified geofencing applications or use areas, identify and involve concerned stakeholders in continuous dialogue regarding city objectives and strategies. Create common understanding of the city's plans and strategies and identify all stakeholders objectives. For instance, set up meetings every three months to ensure all stakeholders are updated according to last developments and trends.
- Do not push geofencing as *the* solution to a specific traffic problem. Discuss other solutions as well. If all stakeholders, especially mobility service providers or transport operators, consider geofencing to be the most efficient solution, it will be higher acceptance and commitment in the process.
- If the geofencing implementation process is in the form of pilot project, gather all stakeholders early in the process to define objectives, expectations, roles, responsibilities, time frame and potential showstoppers.
- Ensure that all stakeholders participating in the process have a common understanding of the *why* of the geofencing application. See to the objectives of the involved stakeholders and their value in implementing geofencing.
- When setting up workshops or meeting, ensure sufficient time for the workshop activities and enable that the participants can revisit their input after the workshop.
- Organize roundtables where all input is equally valued. Also consider individual dialogues with strategic participants as more information can be shared in confined spaces.
- Identify which stakeholder is most likely to develop a geofencing application that best ensure end-user perspective to increase acceptability.
- If possible, exclude middlemen in the communication chain that may hinder effective communication with end-users. Establish possibilities for direct communication with the end-users or the ones considering the end-users as customers.

5. References

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GeoSense elaborates on geofencing solutions aiming at improving urban traffic management and planning.

The overall objective of the project is to design, trial and evaluate geofencing concepts and solutions for specific cases in cities, within the project and from other previous and ongoing geofencing initiatives, and to propose new ways of successfully deploying geofencing technologies. Tools for implementation, as well as approaches to scale-up and spread the innovation further in Europe, will be proposed including e.g. ways of integrating geofencing functionalities in the decision-making, built environment and traffic management in cities.

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