

D3.2. Report on the current state of innovation system -

To understand the complex set of relationships (structure) and processes that create and enable the flow of knowledge/technique/data into geofencing (identifying the activities and dynamics of the innovation system)



GeoSense

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

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Summary

This document, "GeoSense – Geo-fencing Strategies for Urban Traffic Management and Planning," presents the findings from the GeoSense project, an initiative funded by the European Union's Horizon 2020 program under the ERA-NET Cofund Urban Accessibility and Connectivity initiative. The project is a collaborative effort involving partners from Germany, Norway, Sweden, and the UK, aimed at designing, testing, and evaluating innovative geo-fencing concepts to enhance urban traffic management and planning.

Central to this report is the application of change theory and transformation frameworks to urban traffic management. The project leverages the Three Horizons model and the theory of transformation and change to understand and manage the transition from current practices to future states in complex urban systems. These theoretical frameworks guide the strategic planning and implementation of geo-fencing technologies, ensuring that innovations are not only technologically advanced but also socially and organizationally integrated.

A significant focus of the report is on the workshops and use cases conducted in Stockholm. These workshops were instrumental in exploring new innovative ways of working to implement geo-fencing solutions in daily traffic planning and management. The Stockholm use case specifically investigated the integration of geo-fencing for speed limits, utilizing data management and digitalization strategies to enhance traffic flow and safety.

The report provides detailed accounts of the methodologies and findings from these workshops, highlighting the challenges and opportunities associated with implementing geo-fencing in a real-world urban context. The use case in Stockholm serves as a practical example of how geo-fencing can be applied to achieve urban transformation, demonstrating the potential for significant improvements in traffic management through strategic innovation and digitalization.

By combining change theory with practical applications, the GeoSense project offers a comprehensive approach to transforming urban traffic management. This document serves as a valuable resource for policymakers, urban planners, and stakeholders, providing insights and recommendations for leveraging geo-fencing technologies to drive urban transformation.

Keywords: Geo-fencing, urban traffic management, change theory, transformation, Stockholm workshops, use cases, digitalization, data management, system innovation, Horizon 2020, ERA-NET.

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List of abbreviations

Abbreviation	Description
A-GPS	Assisted GPS, a system that improves the startup performance of a GPS satellite-based positioning
Digitalization	The use of digital technologies to change a business model and provide new revenue and value-producing opportunities
Double Loop Learning	A process of learning that involves questioning and modifying underlying assumptions and values
ERA-NET	A European research area network that supports collaboration among national research and innovation programs
GDPR	General Data Protection Regulation, a regulation in EU law on data protection and privacy
GeoSence	Geo-fencing strategies for implementation in urban traffic management and planning
GNSS	Global Navigation Satellite System, a system of satellites that provide autonomous geo-spatial positioning
Innovation	The act or process of introducing new ideas, devices, or methods
IT	Information Technology, the use of computers to store, retrieve, transmit, and manipulate data
JPI	Joint Programme Initiative, a collaborative research program funded by the European Union
LBS	Location-Based Service, a service that uses location data to control features
NVDB	National Road Database, a Swedish public database containing road and traffic data
STFS	Swedish Transport Administration's system for managing traffic rules
Transformation	Comprehensive change in structures, systems, and processes to achieve significant improvements
Transition	The process or a period of changing from one state or condition to another

Preface

The GeoSense project, funded by the European Union's Horizon 2020 under the ERA-NET Cofund Urban Accessibility and Connectivity initiative, aims to revolutionize urban traffic management and planning through the implementation of geo-fencing strategies. This report presents the findings of the GeoSense project, which is a collaborative effort involving partners from Germany, Norway, Sweden, and the UK. The primary goal is to design, test, and evaluate innovative geo-fencing concepts to enhance urban traffic management, focusing on improving traffic flow, safety, and air quality.

Geofencing is defined as a virtual boundary set within a specific geographical area, either statically or dynamically defined. The GeoSense project is pioneering in exploring the holistic impacts of geo-fencing, working closely with local planning authorities to design, test, and evaluate new concepts and solutions. This report, "Geofence as an Enabler in Urban Transformation," delves into the theoretical frameworks and practical applications of geo-fencing in urban settings.

The project employs change theory and transformation frameworks, such as the Three Horizons model, to manage the transition from current practices to future states in complex urban systems. These frameworks guide the strategic planning and implementation of geo-fencing technologies, ensuring that innovations are integrated technologically, socially, and organizationally.

A significant part of the report is dedicated to the workshops and use cases conducted in Stockholm. These workshops explored innovative ways to implement geo-fencing solutions in daily traffic management. The Stockholm use case, in particular, examined the integration of geo-fencing for speed limits, utilizing data management and digitalization strategies to enhance traffic flow and safety.

This report provides detailed accounts of the methodologies and findings from these workshops, highlighting the challenges and opportunities associated with implementing geo-fencing in real-world urban contexts. The use case in Stockholm serves as a practical example of how geo-fencing can achieve urban transformation, demonstrating potential improvements in traffic management through strategic innovation and digitalization.

By combining change theory with practical applications, the GeoSense project offers a comprehensive approach to transforming urban traffic management. This document serves as a valuable resource for policymakers, urban planners, and stakeholders, providing insights and recommendations for leveraging geo-fencing technologies to drive urban transformation. We express our gratitude to everyone who participated and contributed to the project, with special thanks to the City of Munich, Deutsche Bahn Connect GmbH, and MSP's Bolt, Lime, Tier, and Voi for their support.

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1. Introduction

1.1 Background

Project GeoSense develops geofencing solutions to improve traffic flow, safety, and air quality. It is the first project to explore geofencing (geofence) and its impact holistically, working closely with local planning authorities.

GeoSense aims to design, test, and evaluate new geofence concepts and solutions for specific urban cases and propose new ways to deploy geofence applications through tests, demonstrations, and evaluations in participating cities.

Funded by the European Union's Horizon 2020, GeoSense is a joint program initiative (JPI) Urban Europe project involving partners from Germany, Norway, Sweden, and the UK. The project runs from April 2021 to March 2024 with a budget of approximately 1.6 million euros.

Partners include the cities of Gothenburg, Munich, and Stockholm, the Norwegian Public Roads Administration (NPRA), Chalmers University of Technology, RISE, SINTEF, Technische Universität Dresden, University of Westminster, and CLOSER.

The report "Geofence as an Enabler in Urban Transformation" focuses on:

- How can geofences enable urban transformation?
- What is required for geofences to enable urban transformation?

These questions are examined from three perspectives, integrated into strategies, action plans, and activities in trials, pilots, and implementations:

- Innovation and capability¹: planning and acting for transformation in complex systems.
- Digitalization: a key enabler for significant transitions in complex systems
- Data: the fundamental raw material for transformation.

1.2 Geofencing application

A geofence is a collection of technologies that together enable actors to implement digital geofences. Geofencing is when someone or something connects geofencing to a specific geographical area. An example of use involves a location-aware device of a location-based service (LBS²³). The geofence can be dynamically generated, such as in a radius around a point location, or match a predefined set of boundaries, such as school zones or neighborhood boundaries. An example of use might be a location-aware device of a location-based service (LBS) entering or exiting a geofenced perimeter. The activity can trigger an alert to the device's user as well as notifications to the geofence operator.

The geofence application uses technologies such as GPS⁴, or for example IP address ranges to build their digital fence. In many cases, devices such as mobile phones, for example, use combinations of positioning methods, such as Assisted GPS (A-GPS). The global tracking and

¹ The prerequisite for an individual, an organization or an ecosystem to be able to act and navigate complex contexts in such a way that the right obstacles and the right enablers are processed for an effective transformation.

² LBS – Location Based System

³ GPS – Global Positioning System användarkomponent, rymdkomponent och kontrollkomponent, systemet ägs av USA

⁴ GNSS - Global Navigate Satellite System – Samlingsnamn för alla navigationssystem med global täckning. Sputnikovaya (Ryssland), Galileo (Europa), Navstar (GPS), BeiDo (China)

³ LBS – Location Based System

⁴ GPS – Global Positioning System user component, space component and control component, the system is owned by the United States

⁴ GNSS - Global Navigate Satellite System – Collective name for all navigation systems with global coverage. Sputnikovaya (Russia), Galileo (Europe), Navstar (GPS), BeiDo (China)

geofencing system are supported by a group of subsystems based on global navigation satellite system (GNSS) ⁵services. In theory, GNSS can mean an accuracy of a few centimeters, but in real conditions there are many difficulties that make the real outcome usually look different. Among other things, factors in the physical environment come into play and create problems such as radio shadow, interference or other types of disturbances that impair the possibility of precise demarcations with the help of geofences.

The report takes a broader concept of Geofences and focuses more on the application of the features that can occur rather than the combination of technologies required to plan, implement and manage virtual or dynamic digital geofences.

The report is based on a review of articles and grey literature and learning from use cases. The learning comes primarily from the project's Stockholm-based use case. The Stockholm use case has explored the data access and data asset characteristics to enable solutions related to speed limits and geofences.

1.3 Transformation

The concept of transformation and transition can be understood in different ways depending on the context. For the transition to be meaningful, understandable and navigable for the individual, the organization and the ecosystem, it must be linked to a clear and meaningful mission, a mission (figure 1)

Ensuring that governance, funding, and capabilities are harmonized to enable the mission and also ensuring that the transition itself takes place in such a way that powerful enablers such as digitalization, data management and innovation capabilities are harmonized towards the mission means that space is created for the mission to succeed. The assignment is given room for change/transformation. If the harmonization succeeds to a high degree, a great deal of room is created for transition, and if one succeeds to a lesser degree, less room for change is created. To make processing areas visible, the project developed this transformation model (figure 1)

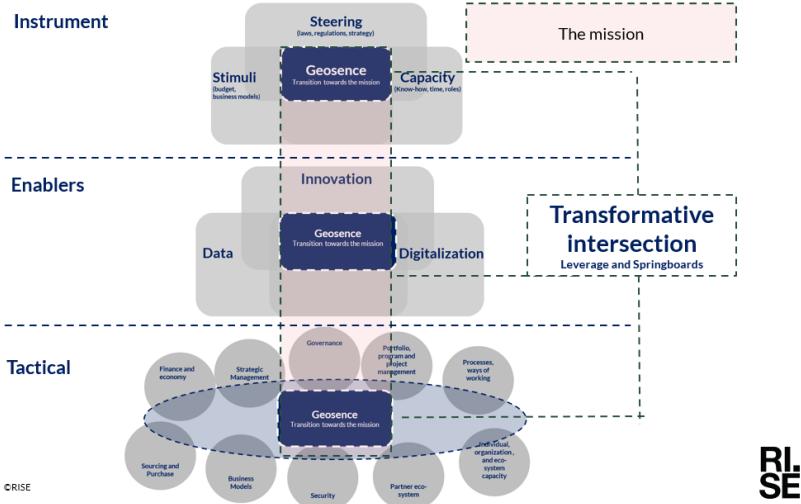


Figure 1: We are limited in time, money and resources. Hence it is important that we are focusing our transformation efforts in places where leverage points and springboards can occur. To free the potential in Geofencing, identify the transformative intersections.

1.4 Data and Data Management

Data management is at its most effective and relevant when all levels (the individual, the organization, and the ecosystem) see data as a valuable strategic resource. Data management is often talked about from two perspectives. The application of data, such as analytics and data-driven decisions. The hard and soft digital infrastructure that enables data to be used as a strategic resource in the organization, for example, interoperability, dataspace, instruments such as SUMPs⁶.

1.5 Digitalization

Digitalization has long been considered one of the key enablers of transition to reach European, national, regional and local missions. As an example, we can see that the Government Offices expresses an ambition that Sweden should become the best in the world at taking advantage of the opportunities of digitalization. Another example is the City of Stockholm, which describes that the City takes advantage of the opportunities of digitalization and develops internal processes so that they become more efficient. This can lead to the city's employees being able to devote their working hours to a greater extent to resident-related, value-creating and qualified issues.⁷

1.6 System Innovation

System innovation⁸ involves comprehensive transformations across economic, social, and technical dimensions to address complex societal challenges. It adopts a holistic approach, recognizing the interconnectedness and complexity of systems, and requires collaboration among diverse stakeholders such as governments, businesses, and communities. This type of innovation emphasizes the importance of socio-technical changes, combining new technologies with shifts in societal norms and practices. Managing system innovation involves understanding the interactions and emergent properties of system components, often requiring adaptive policy frameworks and extensive stakeholder engagement to drive sustainable and effective outcomes.

1.7 Theoretical Framework

The research question was: How can cities approach the transition based on a use case where Geofencing is used for speed limits in a specific defined area? The question was approached based upon the transformation model (figure 1) as well as the theory of transition from current state to future state.

1.7.1 Transition from current state to future state from a 3-horizon perspective.

The Three Horizons model⁹ serves as a strategic framework for navigating transformative change. Rather than focusing solely on individual events or trends, it emphasizes systemic patterns

⁶ SUMP stands for Sustainable Urban Mobility Plans. A concept developed in the EU to manage sustainable mobility plans in urban environments. The concept describes the main functions of a modern and sustainable urban mobility and transport plan

⁷ <https://start.stockholm/om-stockholms-stad/sa-arbetar-staden/digitalisering/>

⁸ P Senge et al, Essential of social innovation, 2015

⁹ Strategic Foresight in Action: Leveraging McKinsey's 3 Horizon Model for Balanced Financial and Strategic Planning April 2024 International Journal of Science and Research (IJSR) 13(4), DOI:10.21275/SR24401010207

across three distinct horizons. The purpose of this model lies in its ability to map transformational potential. By understanding which horizon a particular initiative or idea belongs to, we can act skillfully and creatively in the present, both individually and collectively. The Three Horizons model encourages us to balance short-term stability with long-term innovation, fostering resilience and adaptability in a rapidly changing world.

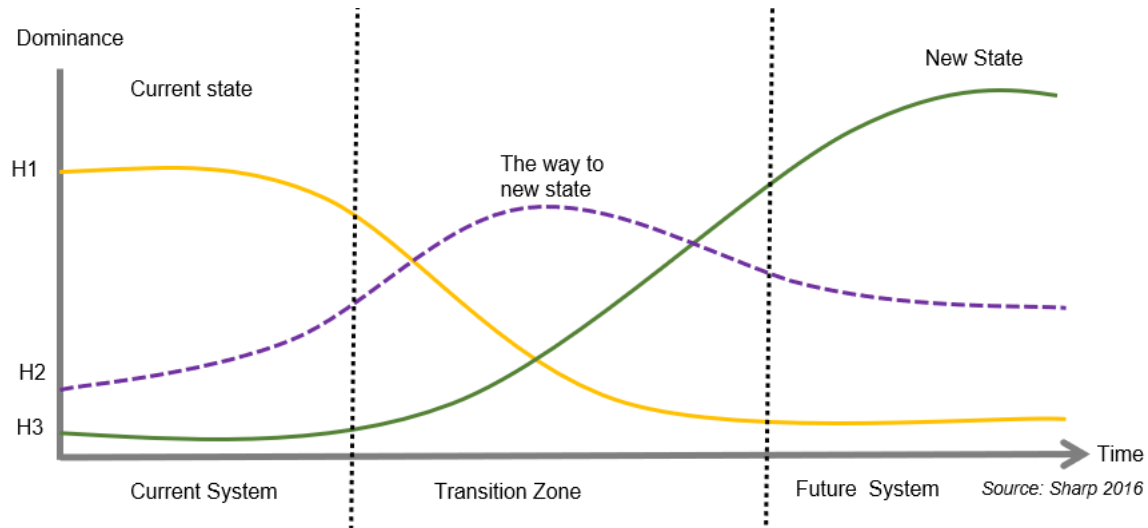


Figure 2: The level of success moving from current state to future state will depend on the level of success, in making room for transformation (transition zone)

Description 3-horizons

On every horizon, there are dominant patterns in how we do things, what technologies we use, what values are important, and the need to change in a transition. First horizon (H1) **The current state** of affairs in how we organize and deal with various issues (such as transport, crime) – 'business as usual' must change, but there is also a lot that we want to keep. Third Horizon (H3) **Vision of the future**, vision – where do we want to go; new situation. We are starting to see contours, different elements are already taking shape. Second horizon (H2) **Transition zones**, innovations that we test to deal with a changing landscape and new challenges.

The 3-Horizon method can be used in five steps. This report was limited to step one to three.

- Step 1: Examine current issues and challenges. The way we organize and do things is no longer suited to a changed environment and new challenges.
- Step 2: explore and formulate future ambitions, visions, goals. What new opportunities arise? How can we replace 'business as usual'?
- Step 3: explore inspiring practices in the present. Identifying the "pockets of the future in the present" – concrete examples of where new ways of doing things are visible in the margins of the current system.
- Step 4: Innovations underway – transition zone between H1 and H3. What innovations/changes can respond to current problems and open opportunities for the future?
- Step 5: What do we want to keep? There is a lot in the new situation that is important and that we do not want to throw away.

1.7.2 Theory of transformation and change

Stockholm Geosence a study in the logic of change 10 (David, 2019) Genomic Geofencing techniques. In a world of constant change, the common perception and application of the concept of innovation has evolved. In the 80s The public sector's view of innovation has undergone a significant change from the 1980s to the present day. Organizations' focus was more on dealing with complex technical, logistical and marketing problems¹. Innovation was then a complex concept that overlapped with other prevailing concepts such as technology, creativity and change. Research on innovation spanned many research fields, including business, economics, technology, and public administration.

Today, innovation is not just seen as an isolated process, but rather as an integral part of the overall organizational transformation. This shift in approach reflects an understanding that successful transformation requires a more comprehensive approach. In fact, only 22% of companies succeed in their transformation, which shows how difficult it is to implement such a change⁵. However, successful companies share a common focus on initiatives that prioritize employees, including diversity, equity, and inclusion programs, as well as support for female managers. Transformation is no longer just about embracing new technologies but must also include change in thought and organizational culture for the transformation to be effective. There is a need for organizations to address the change in business scenario, dynamic business requirements, and find innovative ways to quickly respond to these changing needs.

To summarize, the view of innovation has changed from being an isolated process to becoming an integral part of the overall organizational transformation. This shift has led to organisations now seeing innovation as a necessary part of their adaptation to an increasingly dynamic and changing business environment.

The need to take a broader approach to the concept of innovation to achieve desirable effects means that in this report we adopt a transformational perspective instead of an isolated innovation perspective, as in this report we include innovation as one of several areas that need to be addressed to bring about a shift.

1.7.3 A three level perspective on strategic and tactical measures

Effective transformation intertwines change at the individual, organizational and system levels. Changes at one level can affect and are affected by changes at other levels. For example, a change in an organization's culture (organizational level) may require individuals within the organization to change their behavior (individual level), and these changes may in turn be influenced by changes in the broader system (system level). Transformation at different levels means that changes take place on different levels and in different contexts.

When an organization wants to achieve something specific, such as for example, meeting the mission of zero fatal accidents by 2030, then the change must be focused on the transformative intersections (Figure 1) to be synchronized at the individual, organization, and system level

¹⁰ (David, 2019) Det är en del av den institutionella teorin, som betonar kulturella förståelser och delade förväntningar som nyckelkällor till organisationers strukturer, handlingar och resultat¹.

System Level	At the system level, transformation means changing the entire system, which can mean changing laws and regulations, introducing new technologies, or changing how resources are allocated. For example, the Swedish Transport Administration has been tasked with implementing information and knowledge-raising initiatives in Mobility as a Service ¹ . This includes exploring the feasibility of a single national access point for combined mobility services and carrying out a demonstration project of at least one interchange point supporting combined mobility as a service.
Organizational level	At the organizational level, transformation means changing how an organization works, for example by changing its structure, culture, or work processes. This could mean introducing new ways of working, changing leadership styles, or changing the organization's values. These changes can be challenging to implement, but they can also lead to improvements in the organization's efficiency and productivity. For example, the Swedish Transport Administration has a new structure for its research and innovation (R&I) activities that are based on the fact that we need to improve the transport system we have today, but also find solutions that can lead to renewal at a system level.
Individual level	At the individual level, transformation involves changing an individual's behavior, attitudes, or skills. This could involve learning new skills, changing behavior, or developing new attitudes. These changes can be challenging for the individual, but they can also lead to personal growth and development. For example, in speed limits, the Swedish Transport Agency may introduce new rules that require drivers to change their behavior in order to comply with the new speed limits

Figure 3: Tactical and strategical measures needs to be integrated and adopted to the targeted level (eco-system, organisation, individual)

2. Transformation capacity in the City of Stockholm – An integrated approach to innovation and digitalization

2.1 Use case description

Within the framework of GeoSense, Stockholm will explore how new innovative ways of working can be developed to implement geofencing and other connected solutions in its daily traffic planning and management activities. This will be done by mapping relevant existing processes, including issuance, updates to local traffic rules, network editing, as well as creating new routines and processes for data management. The focus will be on data, including its production and provision, for all modes of transport (goods, micromobility, service vehicles), mainly for static geofencing but also guidelines for dynamic and smart geofencing.

The city will be the first demonstrator to fully adopt and integrate the strategic implementation guidelines for geofencing. By mapping relevant processes and identifying gaps as well as other related initiatives, we are expected to get a picture of the current situation as well as the changes we want to see in order to scale up and implement geofencing as part of traffic planning and daily operations.

The Department of Transport in Stockholm, which is responsible for the operation and maintenance of the city's public streets, squares, and parks, will investigate the need for organizational changes and process development to fully integrate geofencing as a way of working in the city organization and make geofencing based on the city's policy and regulatory data possible. With previous experience from the Swedish National Geofencing program and ongoing related projects, Stockholm will continue to be a frontrunner in this field.

The purpose of the use case is to investigate how new innovative ways of working can be developed to implement geofencing and other connected solutions in the City of Stockholm's daily traffic planning and management activities. This involves mapping relevant existing processes, identifying gaps, and creating new routines and processes for data management. The goal is to integrate geofencing as part of traffic planning and daily operations, which could contribute to more efficient and sustainable urban planning.

Question: Based on the data management issue; how new innovative ways of working can be developed to implement geofencing and other connected solutions in the City of Stockholm's daily traffic planning and management activities.

Hypothesis: An obstacle factor that inhibits development linked to the strategic issue is that the management processes that make data available linked to speed limits are not sufficiently efficient, which in turn leads to the data provided to regulate speed not being of sufficiently good quality. This is described, among other things, in the Accessibility Strategy, where the City describes that the quality of soft and hard digital infrastructure must be improved as it is not of sufficient quality.

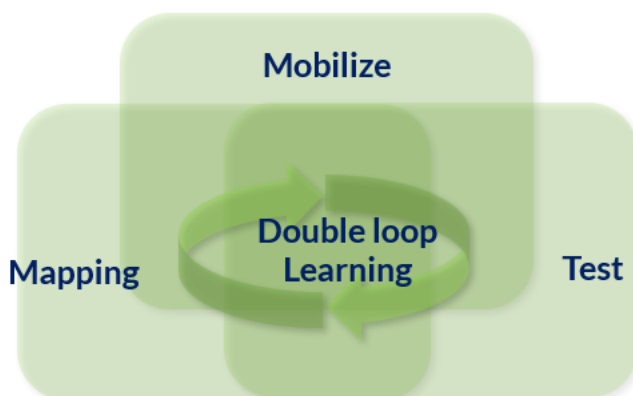
Use case limitations:

resource-related, geographical and focus-related aspects. Technically, geofencing and other connected solutions may be dependent on technical infrastructure, data availability, and compatibility with existing systems. Regulatory, the implementation of geofencing must comply with all relevant laws and regulations, including data protection and privacy laws such as GDPR. In terms of resources, there may be limitations in how much can be done within the framework of the project, depending on available resources such as staff, time and budget. Geographically, the use case focuses on the City of Stockholm, so the results may not be directly transferable to other cities or regions. Finally, while the focus is on data management, other aspects of geofencing and traffic planning, such as user experience or sustainability issues, cannot be addressed to the same extent. The use case examines several aspects of geofencing from the point of view of data management.

Depending on the strategic hypothesis of the use case linked to data availability and data quality, testing and mapping focused on: Data from Swedish public actors NVDB, provision of data and traffic rules.

2.2 The three phases of the use case

As the user case was developed over time in accordance with the project group's approach to carry out the user case with an exploratory approach with a strong focus on strategic learning through a formative process ¹¹This meant that the user case was methodologically divided into the parts Mobilization, mapping and testing. The parts were iterated as needed



¹¹ In this case, a formative strategic learning process means a process in which change and learning take place in a way that shapes and develops individuals, groups or organizations. This type of process often involves a profound change that can affect behaviors, attitudes, values, or knowledge. The reference number for the government assignment "TEST- OCH DEMOPROJEKT MED GEOSTAKET I URBANA MILJÖER" är **N2017/05987/TS**¹.

Mobilize and map by interviewing and communication.

2.2.1 Mapping strategy

Nationally, Sweden has a clear strategic focus on geofencing and digitalisation. Already in 2017, the government assignment Test and demo project of geofences in urban environments was decided ¹². Here the government writes that: *"The test environment shall be designed so that geofences can be evaluated on the basis of the transport policy objectives, including the environmental quality objectives included in these."*

The assignment resulted in an Overall Action Plan: joint efforts on digitalization for safe and smart urban environment.

The city shows clear strategic ambitions linked to applications of Geofences, as an example, the City writes in its accessibility strategy that geofences should be a tool in the areas of accessibility, drive technology development through innovation and procurement, security. The City also highlights geofencing as an application in the City's work with Traffic Safety, where the City highlights that Geofences should be implemented in the City's own vehicle fleet and in external parties' electric scooters. Furthermore, we can see that the City already in 2021 allocated a budget to implement Geofence in the city's cars. *Here, the City writes that "the Traffic Office, together with the Traffic Board, implement geofences for speed compliance of the City's company cars where technically possible."*

Results: The city has a clear strategic ambition for the introduction of Geofences in the city's cars. The city has allocated a budget for the introduction of Geofences, the budget of SEK 1 million is not sufficient to implement all the improvements pointed out in the City's Accessibility Strategy and Road Safety Plan.

2.2.2 Mapping implications and learnings from previous and ongoing projects

There are a number of related projects that in various ways pave the way for or work with issues that contribute to the possibility of implementing geofencing in the city. Some examples are:

1. Nordic Way 1, 2 and 3¹³: A collaborative project that develops IT-based tools and business models to enable secure sharing of data between vehicles, infrastructure and authorities. This contributes to increased safety and efficiency in the road transport system.
2. **Smart Urban Traffic Zones**¹⁴: The project "Smart Urban Traffic Zones" aims to create smart solutions in the city that contribute to increased flexibility in how the urban space is used, more efficient transport and increased traffic safety. The project focuses on developing tools to address a number of challenges that have arisen in connection with increased urbanization, high environmental goals and intermediate goals for road safety on the way to Vision Zero. The goal is to fill the gaps identified in earlier stages of the

¹² The reference number for the government assignment "TEST AND DEMO PROJECTS WITH GEOFENCES IN URBAN ENVIRONMENTS" is **N2017/05987/TS**¹.

¹³ <https://bransch.trafikverket.se/for-dig-i-branschen/forskning-och-innovation/aktuell-forskning/transport-pa-vag/nordicway--bilar-som-byter-information-bidrar-till-farre-olyckor/>

project and dig deeper into the parts that create the conditions for the implementation of smart zones.

3. **The Research and Innovation Programme for Geofencing**¹⁵:2017, the Swedish government initiated a project to create safer, more climate-smart cities using geofencing technology
4. **BMW eDrive zones**¹⁶: Stockholm's inner city has become a zone for automatic electric driving via a new function from BMW. When entering the zone with a BMW plug-in hybrid, the car will automatically switch to fully electric and emission-free driving with the help of geofencing

Results: Stockholm has participated in a large number of projects that address innovation capacity, data management and digitalization. As an example, we can see that the Smart Urban Traffic Zones project describes *"The goal is to fill the gaps identified in earlier stages of the project and dig deeper into the parts that create the conditions for the implementation of smart zones"*.

2.2.3 Mobilizing the system innovation eco-system on an organizational level.

The City of Stockholm is one of Sweden's largest employers, and our operations span a number of different areas. We have over 40,000 employees working in more than 300 different professions.

The Traffic Office, which is responsible for ensuring that the public spaces have efficient transport solutions and good accessibility, has about 450 employees who are divided into 58 job groups. The five largest position groups at the Traffic Office are traffic planners (about 35) in the Traffic Planning Department. It is obvious that there are many employees who must be mobilized in each issue, hence issues such as the use of Geofences to solve the assignments have easy to get lost in the large mass of other intentions and activities. We have already established that a transfer requires that the individual, the organization, and the system must experience the goal and the task as meaningful. Here, the project group experienced clear challenges in finding a coherent common thread around how the application of Geofence technology becomes a natural part of solving the assignment. To address this interesting question, the project took several measures.

Mobilization through interviews and strategic communication

With the aim that key people and the project group will gain a common understanding of: How the work with speeds is done and how business development takes place, test the questions in the innovation analysis, get tips on additional interviewees.

The key people identified at this stage were:

1. Robin Billsjö, a traffic planner, handles applications and preparations for geofence projects in Stockholm, with a particular focus on NordicWay3 and the Milky Way.
2. Jessica Danielsson and Jacob Jonsson from the Legal and Parking Unit,
3. Pernilla Eriksson and Ellen Taavo from the Analysis and Strategy Unit, manage the process of setting speeds, how they are saved, withdrawals, sources of error and

¹⁵ <https://closer.lindholmen.se/en/news/speeders-stockholm-be-stopped-geofencing>

¹⁶ <https://www.helahisingen.se/har-skapar-bmws-zoner-for-elektrifierad-bilparkning-med-hjalp-av-geofencing-pa-hisingen/>

collaborate with the Swedish Transport Agency. They are also working on a new ITS directive for standardization, ensuring that critical data is machine-readable.

4. Johan Sundman, from the Urban Life Unit, works with geofencing of shared electric scooters.
5. Jan Alberts, Head of Unit for IT, works with the City of Stockholm's various digitalization initiatives, including those that have a bearing on the digitization of speeds, and also participates in external projects such as NordicWay3.
6. Anna Gren, Development Manager, with how the development work is conducted with the support of the Milky Way business system, including processes related to speeds.

Questions and Result

The people were asked to present what they hoped the Geosence project could lead to?

See summary of answers as follows: One person hopes to create a platform with an open API that includes all parts, properties and streets. Person 1 focuses on determining what type of traffic can be geofenced, while Person 2, Person 3, Person 4, Person 5 and Person 6 want to decide how best to use geofencing to improve the city's traffic flow. Person 3, on the other hand, is focusing on deciding how best to implement geofencing for e-scooters.

The people were presented with what opportunities they saw for the Geosence project: See

summary of answers as follows: When it comes to opportunities, Jacob sees potential in using P-management systems for as many people as possible to find the right and utilization data for yield management. Person 1 sees opportunities in conducting several tests in the field of logistics in terms of geofencing. Person 2, Person 3, Person 4, Person 5 and Person 6 see opportunities in using geofencing for the city's own vehicles and working with the speed plan and NordicWay3. Person 2 sees opportunities in using Vianova, a French-Swedish project, for geofencing of electric scooters.

The people were presented with what challenges they saw with the Geosence project: See

summary of answers as follows: The challenges vary between the people. Jacob sees challenges in getting a GPS-geofenced picture of Stockholm and wants to stop checking the right parked cars. Person 1 sees challenges in ensuring that the speeds are sufficiently flawless and quality assured. Person 2, Person 3, Person 4, Person 6 and Person 5 see challenges in ensuring that the input data is correct, especially when it comes to speeds around schools and at roadworks. sees challenges in getting GPS data to be sufficiently accurate and in setting up rules for geofencing.

In summary

The interviews display a disparate understanding of what the Geosence project can lead to. Implying that the strategic communication and the anchoring process can be enhanced.

Mobilize and map trough visualization.

Mobilization through visualization

Since the development of the project was exploratory in nature, with the result that the mission around the use case was not clear enough or mobilizing, the next step was to mobilize the group around a workshop based on location-based mission-driven development, around speed limits:

The chosen area was sjöviksbacken:



Sjöviksbacken – ett exempel på där data om hastighetsgräns skulle kunna göra skillnad

- Nybyggt område med många skolor och förskolor
- 30km/h föreskrivet och skyltat
- Brant nedförsbacke, dåligt sikt
- Under exploatering – avvaktar med åtgärder
- Busstrafik och byggtrafik på vägen
- Boende i området känner sig otrygga – många som "tycker till"
- Hastighetsdämpande åtgärder kostar pengar

In summary:

The experiment in place-based mission-driven development yielded only some results. If transformation work linked to speed limiting with Geofencing application is to be done, a much clearer mission is needed, the place needs to be personally meaningful to the actors who participate. The actual application of a feature such as Geofencing cannot be the purpose of location-based mission-driven development. Location-based mission development is therefore particularly ill-suited to the use case that would be processed in this context.

Mobilize and map through transformation workshops

2.2.4 Mapping and mobilization connected to organizational general capacity, digitalization capacity and data management capacity

The hypothesis is that speed limits require that several individuals and organizations need to work together to achieve the mission (the Mission): Not to be able to violate the speed outside the traffic administration plan (walking speed). The purpose of the exercise is twofold. One purpose is that the exercise can be part of strengthening the horizontal collaboration in parts that are affected by transformation, while at the same time giving the participants an opportunity to map, visualize and discuss strengths, development potential and suggestions for activities to strengthen each area.

This particular workshop processed transformation capability, moving from current state to future state (figure 2) assessing the tactical level of the organization.

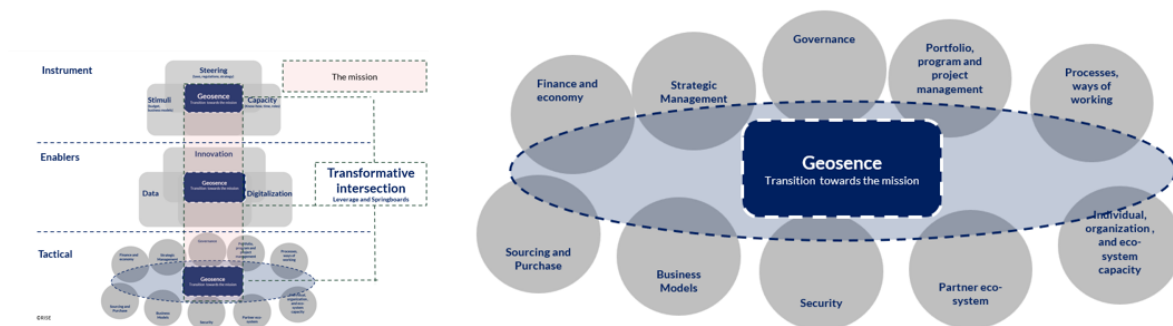


Figure 4: The workshop approached capabilities on tactical level of the organisation City of Stockholm, Traffic department and ecosystem

3.2.4.1 Step 1: Preparation

To ensure the quality of the exercise, preparation is important. The preparations were carried out according to a learning process, which is applied in Sweden's 23 climate-neutral cities, for example¹⁷. The process includes the following steps:

1. Mobilization: Ensure that we have sufficient broad representation to be able to carry out the actual collaboration and mapping
2. Information meeting: Here the group of meeting participants was informed about the project, the purpose of the exercise, gets the opportunity to ask questions, test the digital tools, exercise rules and who can be contacted for questions before the actual exercise
3. Digital material: Before the exercise, preparatory materials, such as the project description, were sent out to the meeting participants.
4. The exercise (see description Step 2: The exercise)
5. Compilation of mapping with suggestions for proposals for next steps.

¹⁷ Viable Cities' Climate Neutral Cities 2030 initiative started in 2019 with nine Swedish municipalities. As of autumn 2021, the initiative includes 23 municipalities, which together have 40 percent of Sweden's population.

The exercise

The exercise was divided into sections with individual work and reflective conversations. With questions based on collaboration theory¹⁸

The exercise was attended by representatives from the fields of innovation, digitalization and data management. For this exercise, we chose to select together some of the functions that exist in many organizations and that cut horizontally across all or several activities.

Övningen delades upp i sektioner med enskilt arbete och reflektiva samtal. Med frågeställningar baserad på samverkansteori (Länka Consulting, 2022)

The exercise was attended by representatives from the fields of innovation, digitalisation and data management. For this particular exercise, we chose to select together some of the functions that exist in many organizations and that cut horizontally across all or several activities. The exercise was carried out at the tactical level (figure 1)

Description of task

- **The mission (Mission):** Not to be able to violate the speed outside the Transport Administration plan (walking speed).
- The areas each answered separately for each function, and then reflected on each area's response.
- **Areas:** Innovation, Digitalization and Data Management
- **Functions:** Business models, governance, organization, process, evaluation and strategic learning.

Workflow:

The areas were asked to answer the question: What are the strengths of your area within the function? What does your area see for development area within the function and what activity do you suggest creating improvements in the area you propose to be developed?

¹⁸ To collaborate in complex systems, Länka Consulting, 2018

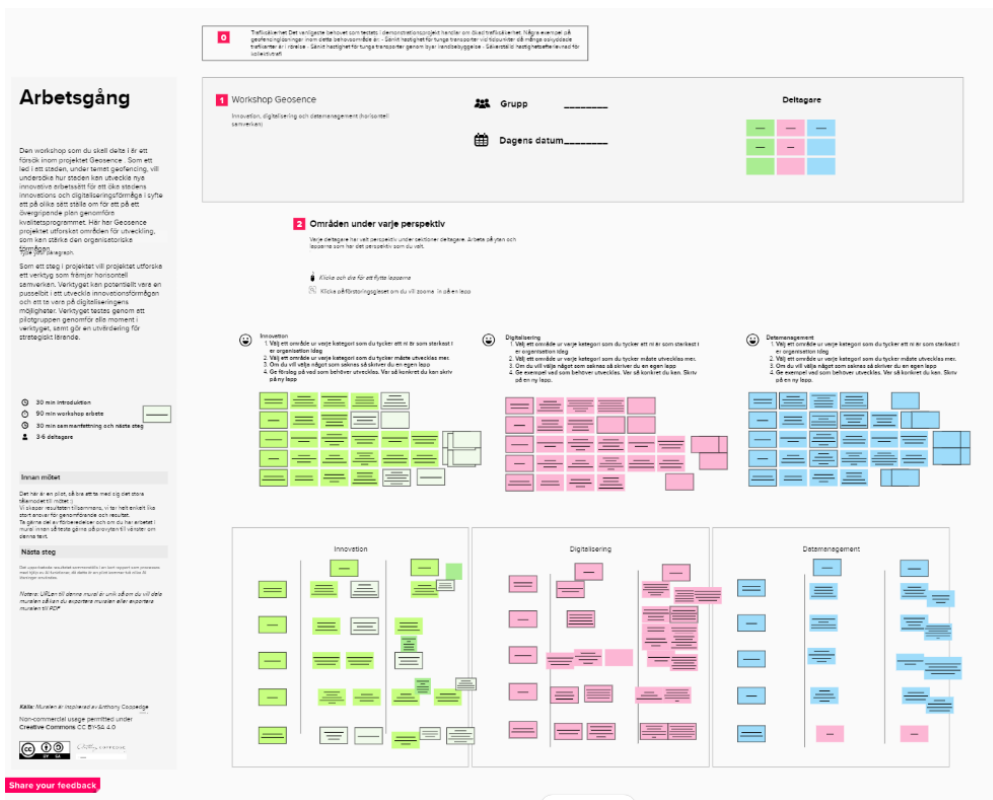


Figure 5: The tools used was a tactical measure intersection Mural as well as chatgpt-4

Workshop results

Business models

The question was asked to ChatGPT4: Make a compilation of what the different areas considered to be strengths, developments and activities. Arrange according to the three headings. Write the answer in running text. Each item can only be found in one place under each heading. Use this text: <text dump from digital tool (Miro)>

Business Models Innovation

- Strength:** Evaluation of whether current utility/business models are adapted to the needs and gradual development of benefit models for increased goal fulfillment.
- Developing:** Models for benefit calculations or benefit estimates linked to the assignments.
- Activity:** Assess the benefit and idea, then compare with the outcome.

Benefit Business Models Digitalization

- Strength:** Impact correlation in road safety.
- Develop:** Methodological approach to creating business models that enable taking advantage of the opportunities of digitalization and evaluation of whether current utility/business models are adapted to the needs and that enable to take advantage of the opportunities of digitalization.
- Activity:** Develop simple templates and working methods for (simplified) cost-benefit calculations.

Data Management Business Models

4. **Strength:** Evaluation of whether current utility/business models are adapted to the needs.
5. **Develop:** Evaluation of whether current utility/business models are adapted to the needs
 - **Activity:** Gradual development of benefit models for increased goal attainment

Leverage strengths to improve functional areas

The question was asked to ChatGPT4: How can the strengths in the above text linked to utility models be used?

The strength of evaluating whether current utility/business models are adapted to the needs and the gradual development of benefit models for increased goal achievement can be used to ensure that the models are continuously updated and improved to meet the changing needs. This can lead to increased efficiency and productivity.

The power of impact correlation in road safety can be used to improve safety in the transport sector. By using digital technologies, data can be collected and analyzed to identify patterns and trends that can help improve road safety.

Business Models Data Governance The power of evaluating whether current utility/business models are aligned with needs can be used to ensure that data management processes are effective and meet the needs of the organization. This can lead to improved data quality and more reliable insights.

Note that it is important that the question is asked sequentially as ChatGPT must use the previous text dump from the previous question. I.e. the result must strictly refer to extracted text without any inputs of ChatGPT

Steering

The question was asked to ChatGPT4: Make a compilation of what the different areas considered to be strengths, developments and activities. Arrange according to the three headings. Write the answer in running text. Each item can only be found in one place under each heading. Use this text: <text dump from digital tool (Miro)>

Innovation Governance

1. **Strengths:** Acceptance and understanding by strategic management as well as the right ability, the right capacity and a permissive culture.
2. **Develop:** -
3. **Activity:** Compile and present barriers to innovation.

Digitalization governance

4. **Strengths:** Quality program and ongoing establishment of new processes/controls and collaboration model.

5. **Developing:** A clear strategy and vision for digitalization as a tool in the transition, acceptance and understanding by strategic management for digitalization efforts, as well as indicators that support strategic learning.
6. **Activities:** Anchor and create commitment broadly in the organization, ws at CK and employee day. As above, with a focus on management team and continuous/recurring measures. Encourage the activities to question existing and propose new indicators that provide support.

Data Governance

1. **Strengths:** A clear strategy and vision for data management as a tool in the transition.
2. **Developing:** A clear strategy, developing a data-driven transition process and creating a vision for which data will help us provide answers to which questions.
3. **Activity:** Maybe prioritize certain data sources as more important. We can't do everything.

Leverage strengths to improve functional areas

The question was asked to ChatGPT4: How can the strengths in the above text linked to governance be used?

Innovation Governance

The strength of acceptance and understanding of strategic management, as well as the right capabilities, the right capacities, and a permissive culture, can be used to foster innovation. By having the right capabilities and capabilities, as well as a culture that allows for innovation, the organization can adapt to change more quickly and find new solutions to problems.

Digitalization governance

The strength of quality programmes and the ongoing establishment of new processes/governance and collaboration models can be used to ensure that digitalisation is carried out in an efficient and controlled manner. By having clear processes and collaboration models, the organization can ensure that all parts of the organization are working towards the same goals and that digitalization takes place in a way that benefits the entire **organization**.

Data Governance

The strength of a clear strategy and vision for data management as a tool in the transition can be used to ensure that data management is effective and meets the needs of the organization. By having a clear strategy and vision, the organization can ensure that all parts of the organization understand the importance of data management and are working towards the same goals.

Note that it is important that the question is asked sequentially as ChatGPT must use the previous text dump from the previous question. I.e. the result must strictly refer to extracted text without any inputs of ChatGPT

Organisation

The question was asked to ChatGPT4: Make a compilation of what the different areas considered to be strengths, developments and activities. Arrange according to the three headings. Write the answer in running text. Each item can only be found in one place under each heading. Use this text: <text dump from digital tool (Miro)>

Innovation organisation

1. **Strengths:** Ability to collect and integrate input from the outside world.
2. **Developing:** The right ability, the right capacity and a permissive culture.
3. **Activities:** Compile and present barriers to innovation as well as the right ability, the right capacity and permissive culture.

Digitalization organization

4. **Strengths:** Horizontal collaborations with the right actors (internal/external).
5. **Develop:** Time for reflection and creativity, as well as the ability to collect and integrate input from the outside world.
6. **Activity:** "Increase the time" for strategic work (preferably with other actors), as this is where we are weak in general at TK.

Data Management Organization

1. **Strengths:** Horizontal collaborations with the right actors (internal/external).
2. **Developing:** The right ability and the right capacity.
3. **Activity:** Implement Information Governance Role. Ownership of data; incl. management, quality, development, new requirements for data, etc.

Leverage strengths to improve functional areas

The question was asked to ChatGPT4: How can the strengths in the above text linked to the organization be used?

Innovation organization

The strength of having the ability to gather and integrate input from the outside world can be used to keep the organization up-to-date on the latest trends and innovations. This can help the organization adapt quickly to change and stay ahead of the curve in innovation.

Digitalization organization

The strength of horizontal collaborations with the right actors (internal/external) can be used to promote digitalization within the organization. By partnering with the right actors, the organization can leverage their expertise and resources to execute digitalization projects faster and more efficiently.

Data Management Organization

The strength of horizontal collaborations with the right actors (internal/external) can be used to improve data management within the organization. By partnering with the right actors, the organization can leverage their expertise and resources to improve the quality of data management and to ensure that data management meets the organization's needs.

Note that it is important that the question is asked sequentially as ChatGPT must use the previous text dump from the previous question. I.e. the result must strictly refer to extracted text without any inputs of ChatGPT

Process

The question was asked to ChatGPT4: Make a compilation of what the different areas considered to be strengths, developments and activities. Arrange according to the three headings. Write the answer in running text. Each item can only be found in one place under each heading. Use this text: <text dump from digital tool (Miro)>

Innovation Process

1. **Strengths:** A process that identifies innovation efforts based on identified needs and a portfolio of innovation activities and initiatives.
2. **Develop:** A clear cohesive innovation process and a methodical approach to scaling up pilots.
3. **Activities:** Connect our development areas into a whole and strategy for implementation throughout the time of the innovation project.

Digitalization Process

1. **Strengths:** An ongoing journey of change within the office and there is OK method support for projects (Lilla ratten) and for IT processes and administration establishment.
2. **Developing:** A clear, cohesive digitalisation process.
3. **Activity:** Knowledge boost within the organization about what digitalization is and what opportunities it provides.

Data Management Process

1. **Strengths:** A clear, cohesive data management process.
2. **Developing:** A methodical approach to scaling up pilots and involving decision-makers early on who can be responsible for implementation.
3. **Activity:** No suggestion

Leverage strengths to improve functional areas

The question was asked to ChatGPT4: How can the strengths in the above text linked to the process be used?

Innovation Process

The strength of having a process that identifies innovation efforts based on identified needs as well as a portfolio of innovation activities and initiatives can be used to drive innovation within the organization. By identifying and prioritizing innovation efforts based on real-world needs, the organization can ensure that they focus on the most valuable and effective innovations.

Digitalization Process

The strength of an ongoing change journey within the office and there is OK method support for projects (Lilla ratten) and for IT processes and administration establishment can be used to drive digital transformation within the organization. By having a clear process and support for digitalization projects, the organization can effectively implement digitalization initiatives and ensure that they deliver value.

Note that it is important that the question is asked sequentially as ChatGPT must use the previous text dump from the previous question. I.e. the result must strictly refer to extracted text without any inputs of ChatGPT

Data Management Process

The strength of a clear, cohesive data management process can be used to improve data management within the organization. By having a clear and cohesive process for data management, the organization can ensure that data management is efficient, consistent, and meets the organization's needs. This can lead to improved data quality and more reliable insights.

Evaluation and strategic learning:

The question was asked to ChatGPT4: Make a compilation of what the different areas considered to be strengths, developments and activities. Arrange according to the three headings. Write the answer in running text. Each item can only be found in one place under each heading. Use this text: <text dump from digital tool (Miro)>

Innovation Evaluation and Strategic Learning

1. **Strengths:** Intercollegial learning and dissemination and dissemination of results.
2. **Developing:** Indicators that support strategic learning.
3. **Activities:** Decide how to increase the ability to learn and the process for the innovation journey start-end that guarantees learning (goals, indicators, evaluation).

Digitalization Evaluation and Strategic Learning

1. **Strengths:** Follow-up of goals and indicators and a pronounced desire to ensure (TK's) own learning in various projects.
2. **Developing:** We do not absorb enough lasting knowledge from various test projects, pilots, etc.
3. **Activity:** Develop a mindset and methodology to enrich the line organization's regular digital capabilities based on these projects.

Data Management Evaluation and Strategic Learning

1. **Strengths:** No answer.
2. **Developing:** No response.
3. **Activities:** No answer.

Leverage strengths to improve functional area strategic learning

The question was asked to ChatGPT4: How can the strengths in the above text be used linked to evaluation and strategic learning?

Innovation Evaluation and strategic learning The strength of intercollegial learning and dissemination as well as the dissemination of results can be used to promote innovation within the organisation. By sharing learnings and results among colleagues, the organization can adapt to change more quickly and find new solutions to problems.

Digitalisation Evaluation and strategic learning The strength of follow-up of goals and indicators as well as a pronounced desire to ensure (TK's) own learning in various projects can

be used to drive digital transformation within the organization. By following up on goals and indicators, the organization can ensure that they are on the right track and that they are learning from their experiences to improve future projects.

Data Governance Evaluation and Strategic Learning There are no stated strengths for data management in the given text. However, generally speaking, in a data governance context, strengths such as a clear process for data management, effective tools for data management, and a culture of data-driven decision-making can be valuable in improving data quality and insights from data.

Note that it is important that the question is asked sequentially as ChatGPT must use the previous text dump from the previous question. I.e., the result must strictly refer to extracted text without any inputs of ChatGPT

Next step recommendations

In order for the tool to work fully, the tool needs to be developed in several ways.

1. The time required for the exercise itself was too short. The exercise would need to be at least 6 hours instead of 3 hours.
2. The tool needs to be improved so that the results and clarifications can be produced "real-time" while the exercise is still ongoing.
3. The process needs to be supplemented with another session where the group can revisit the results, modify and add.
4. The process needs to be supplemented with another session where the working group delves into each area to make decisions about which areas should land in the joint action plan for the mission (mission)

In summary

Using a combination of analogue meeting in combination with digital tools and ChatGPT contributes to the mobilization, and with the improvements suggested in recommendations in the next step, it can become a powerful tool for identifying which areas and functions need to be included in transformation work. The exercise resulted in strong proposals for continued

Mobilize and map to dataflow process workshops

2.2.5 Mobilization and mapping through processing the dataflow

The data and mapping work was carried out in three steps during the dates: 2022-09-27, 2022-10-20 and 2022-10-26). The exercise was carried out in four parts:

1. Part 1: Preparation with information about the project and different data flow models and process maps¹⁹ that can be linked to the use case.
2. Part2: Comments on dataflow models
3. Part3: SWOT Data Flow Process Analysis
4. Part4: Summary and conclusion



Figur 1: Arbetsverktyg SWOT analys dataflöde

Strengths

The question was asked to ChatGPT4: Make a summary description of Strengths. Each answer can only appear once: <text dump from digital tool (Mural)>

The system works automatically and there is a great awareness that everything must be right from the start, even at a detailed level, for it to work all the way out. There is an established LTF system where data is structured and geographically distributed. The system is built according to the TS data catalogue, a kind of Swedish standard for LTFs, and the data is specified in data product specifications. There is also an industry council for information about new versions, etc., which meets once a year. Municipalities have been involved for about five years and the process is standardized and can be found in the Milky Way. The staff is competent and there is a clear template for how the speed should be extended, etc., when it should come into effect, etc. The person who puts up the sign must provide feedback with a photo and the documentation must state exactly where the sign should be placed. There is a working process for how this

¹⁹ The data flow models and process maps used were Issue LTF process, net editing process and LTF investigate and decide

should be done - the Milky Way/Qualiware. Data is widely used by HERE, among others. There is a good cooperation between those who put up signs and those who write LTF - we have learned along the way. There is an alternative to NVDB - reality. The system helps you choose the right paragraph and the entire Swedish road network is "one shop for all"

Achievement strengths linked to the fundamentals of transformation

- **Governance:** There is an established LTF system where data is structured and geographically distributed. The system is structured according to the TS data catalog, and the data is specified in data product specifications. Data is also structured according to the NVDB data catalog. The system helps the user to choose the right paragraph, and there is an alternative to NVDB - reality.
- **Incentive:** The entire Swedish road network is available in the system, making it a "one shop for all" solution.
- **Capacity and capability:** The system works automatically, and there is a great awareness that everything must be right from the start, even at the level of detail. The staff is competent, and there is a person who works with the speed limit and has a close dialogue with those who write the documentation. The person who puts up the sign must give feedback with a photo. There is a good collaboration between those who put up signs and those who write LTF, and we have learned a lot along the way. "We don't think much about STFS except when it doesn't work." There is an industry council for information on new versions etc. The process is standardized and is located in the Milky Way. There is a clear template for how the speed is to be propagated, etc. The documentation must state exactly where the sign is to be placed. There is a working process for how this should be done - the Milky Way/Qualiware. And again, there is an alternative to NVDB – reality.

Conclusion: The benefits of the strengths risk being affected by lock-in effects as the area of stimulus is weak in relation to the other two areas. The recommendation is to explore the area of stimulation in the next step.

Achievement strengths linked to the fundamental enablers of transformation

1. **Innovation:** There is a strong collaboration between those who put up signs and those who write LTF, which has led to a lot of learning along the way. In addition, the system offers access to Sweden's entire road network, making it a "one shop for all" solution.
2. **Data management:** There is an established LTF system where data is structured and geographically distributed. The LTF system is built according to the TS data catalogue, a kind of Swedish standard for LTFs. Data is specified in data product specifications and is structured according to the NVDB data catalog. There is an industry council for information on new versions etc. In addition, data is widely used by HERE, among others.
3. **Digitalization:** The system works automatically and there is a great awareness that everything must be right from the start, even at a detailed level, for it to work all the way out. The process is standardized and is located in the Milky Way. The staff is competent and there is a person who works with the speed limit and has a close dialogue with those who write the documentation. The person who puts up the sign must provide feedback with a photo and the documentation must state exactly where the sign should be placed. There is a working process for how this should be done - the Milky Way/Qualiware. The

system will help you choose the right paragraph. "We don't think much about STFS except when it doesn't work." Finally, there is an alternative to NVDB – reality.

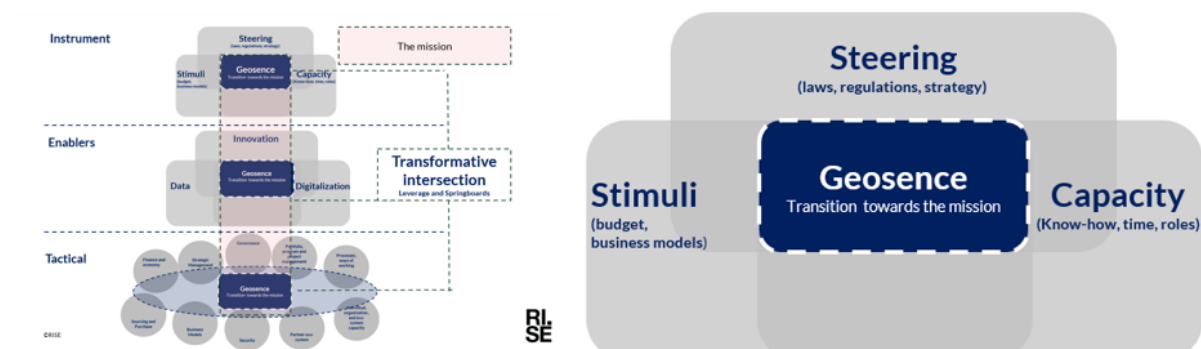
Conclusion: There is a certain balance between innovation, digitalization and data management. In the next step, the project can delve deeper into the harmonization required for each strength to be utilised

Weakness

The question was asked to ChatGPT4: Make a summary description of weaknesses. Each answer can only appear once: <text dump from digital tool (Mural)>

LTFs are exceptions to what applies in the Road Traffic Ordinance and the entire "flora" of the STFS data catalogue is not available. The road network must be digitalized for expansion and there is manual handling and interpretation of data, which can lead to errors. The city does not have sufficient insight into how data is used and does not really know what data quality users need. The Road Traffic Ordinance is old-fashioned and rigid, which is becoming a problem. The process is not integrated with the next step and sometimes there is no geometry to be able to give the regulation a geographical spread. It is not possible to download data from SFTS about speed limit in an area, only PDFs. The system is person dependent and new LTFs are required for each update. It sometimes takes a long time for STFS to update its data catalogue and exemptions are not digitized. There is no automated transfer between SFTS and NVDB and the LTF system does not meet large regulations. The Road Traffic Ordinance says that you must relate to your surroundings, which is difficult for a machine to understand. It is difficult to synchronize when LTF comes into effect and get a sign up at the same time. There are two different departments such as permits and TP, and a third party, the contractor, is also involved. TRV's responsibility to digitize traffic rules, but it is not regulated that they should do so. LTF is retrieved from STFS and manually interpreted into NVDB, which can distort data along the way. The Road Traffic Ordinance will apply to all of Sweden but does not solve the problems of the big cities. There is no system architect and general rules are difficult to visualize. Transient speeds have a variety of challenges and don't have reliable start and end dates. Digital signage is being tested, but regulations are not being written for individual roads. Temporary regulations with a period of validity of less than 6 months are not found in the NVDB. TA plans are very uncertain in time when they apply and therefore difficult to digitize in a static database. More dynamic data cannot be represented.

Short about instruments connected to the data flow case:



Instrument weaknesses.

- **Governance:** The Road Traffic Ordinance, which governs traffic rules, is old-fashioned and rigid, which is becoming a problem. It tells you to relate to your surroundings, which is difficult for a machine to understand. Although TRV has the responsibility to digitize the traffic rules, it is not regulated that they should do so. In addition, the Road Traffic Ordinance will apply to the whole of Sweden, which means that regulations will not be written for private roads.
- **Incentive:** TK has chosen to update templates themselves, even though Sokigo can do so for a consulting fee. In addition, orders are placed to contractors, which means that a third party is also involved.
- **Ability:** There are several challenges when it comes to ability. Not the entire "flora" of the STFS data catalogue is available, and only two people on TRV subscribe to the RSS feed from STFS, which means manual handling and interpretation. The city has too little insight into how data is used and does not really know what data quality users need. TS is not very creative and willing to develop, and the process is not integrated with the next step. In addition, it is difficult to keep data up to date, and new LTFs are required for each update. It also takes a long time sometimes for STFS to update its data catalog. The systems do not have automated transmission, and the LTF system does not meet large regulations. Finally, we don't have a system architect, and general rules are difficult to visualize. Transient speeds have several different challenges, and more dynamic data cannot be represented.

Conclusion: The weaknesses are accelerated by the lack of stimulus opportunities. Here, the project should delve deeper into business models, utility models, purchasing and procurement processes.

Instrument Strengths

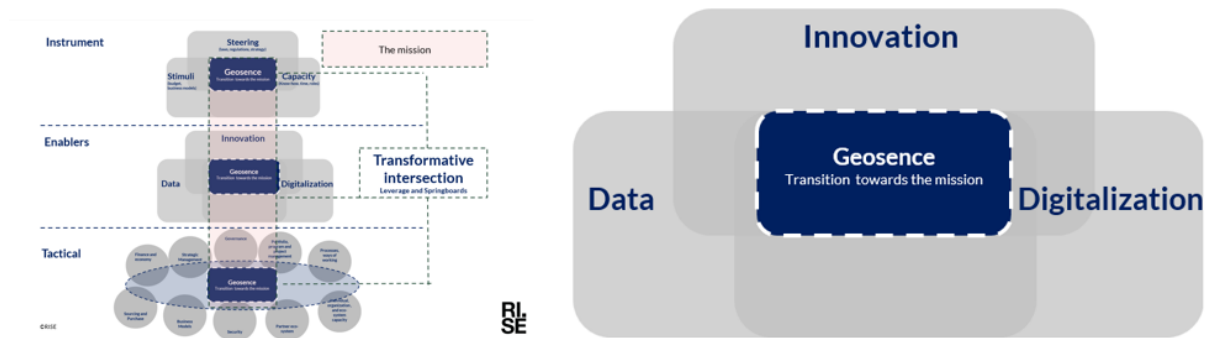
- **Governance:** There are several initiatives related to the Road Traffic Ordinance, including external projects such as "Future Road Traffic Rules". These initiatives provide an opportunity to benefit from lessons learned and improve the Road Traffic Regulation. There is also a strong focus on this area at TRV, which means that we can work together to improve the traffic system. We work together with TRV to ensure the quality of the data, which is important to ensure that the data is reliable and usable. In addition, there

are specific rules, such as BK, low emission zone, and prohibition of traffic, which also need to be taken into account.

- **Stimulation:** Digital twin and METR are two technologies that can stimulate the development of the traffic system. There is also a need for a sign database from several sources, including operations, which can stimulate the development of new solutions. The city may consider providing data directly, for example through the LTF interpreter, even if it is not open data at the moment. This can stimulate the use of data and lead to new insights and solutions.
- **Ability:** By talking to users and leveraging our contacts, for example with Scania and Here, we can improve our ability to understand users' needs and improve our services. Speed limit data from NVDB (indirect city data) is already in use, which shows that we have the ability to use and provide this type of data. The organization's enthusiasts and the vehicles themselves collect data, which can be a valuable source of information. Finally, our data is made available to users via NVDB, which shows that the platform already exists and that we have the ability to use it effectively.

Conclusion: *The three areas are in balance; the next step may be for the project group to delve deeper into each area to find synergies and levers in each area*

Short about enablers in the dataflow case



Weakness connected to enablers

- **Innovation:** There are several challenges when it comes to innovation. TS is not so creative and willing to develop, which can hinder new ideas and solutions. Digital signage is currently being tested, which is a step towards modernization. But there are problems that do not solve the problems of big cities, and general rules are difficult to visualize. In addition, transient speeds have a variety of challenges, and more dynamic data cannot be represented, limiting the opportunities for innovation.
- **Digitalization:** Digitalization faces several obstacles. The road network must be digitalized for its expansion to be effective. Only two people at TRV subscribe to the RSS feed from STFS, which means manual handling and interpretation. The process is not integrated with the next step, which can lead to inefficiencies. In addition, it is not possible to download data from SFTS about speed limits in an area, it is only possible to download pdfs. The systems do not have automated transmission, and the LTF system does not meet large regulations. Finally, the Road Traffic Ordinance says that you should relate to your surroundings, which is difficult for a machine to understand.

- **Data governance:** Data governance faces several challenges. Not the entire "flora" of the STFS data catalogue is available, which limits access to information. The city has too little insight into how data is used and does not really know what data quality users need. Keeping data up to date is difficult, and new LTFs are required with each update. In addition, it sometimes takes a long time for STFS to update its data catalog. Finally, we don't have a system architect, which can lead to a lack of overall vision and strategy for data management.

Conclusion: *The weaknesses accelerate the lock-in effects in the transformation work. The next step may be to delve deeper into each weakness to investigate what measures are required.*

Potential enablers

The question was asked to ChatGPT4: Make a summary description of possibilities. Each answer can only appear once: <text dump from digital tool (Mural)>

There are several opportunities to improve and develop the transport system. By creating a digital twin of the traffic system, we can simulate and understand the effects of different scenarios and decisions before they are implemented in reality. Through the METR initiative, we can examine issues surrounding the Road Traffic Regulation and find ways to improve it. By talking to users and leveraging our contacts, for example with Scania and Here, we can gain valuable feedback and insights. There are ongoing external projects, such as "Future traffic rules", that we can benefit from and learn from. There is a strong focus on this area at TRV, and by working together, we can achieve more. Speed limit data from NVDB (indirect city data) is already in use, which shows that there is a demand for this type of data. There is a need for a sign database from several directions, including operations. The city may consider providing data directly, for example through the LTF interpreter, even if it is not open data at the moment. We work together with TRV to ensure the quality of the data, which is important to ensure that the data is reliable and usable. Vehicles collect data themselves, which can be a valuable source of information. There are questions about the need for NVDB in the future, which could lead to discussions about alternative data sources and platforms. By taking advantage of these opportunities, we can improve and modernize our transport system.

Instruments

- **Governance:** There are several initiatives related to the Road Traffic Ordinance, including external projects such as "Future Road Traffic Rules". These initiatives provide an opportunity to benefit from lessons learned and improve the Road Traffic Regulation. There is also a strong focus on this area at TRV, which means that we can work together to improve the traffic system. We work together with TRV to ensure the quality of the data, which is important to ensure that the data is reliable and usable. In addition, there are specific rules, such as BK, low emission zone, and prohibition of traffic, which also need to be taken into account.
- **Stimulation:** Digital twin and METR are two technologies that can stimulate the development of the traffic system. There is also a need for a sign database from several sources, including operations, which can stimulate the development of new solutions. The city may consider providing data directly, for example through the LTF interpreter, even if it is not open data at the moment. This can stimulate the use of data and lead to new insights and solutions.

- **Ability:** By talking to users and leveraging our contacts, for example with Scania and Here, we can improve our ability to understand users' needs and improve our services. Speed limit data from NVDB (indirect city data) is already in use, which shows that we have the ability to use and provide this type of data. The organization's enthusiasts and the vehicles themselves collect data, which can be a valuable source of information. Finally, our data is made available to users via NVDB, which shows that the platform already exists and that we have the ability to use it effectively.

Conclusion: The three areas are in balance, the next step may be for the project group to delve deeper into each area to find synergies and levers in each area

Summary of results potential and threats

Innovation: There are several initiatives that can drive innovation. External projects such as "Future traffic rules" provide an opportunity to benefit from lessons learned and improve the traffic regulation. In addition, there is a strong focus on this area at TRV, which means that we can work together to improve the traffic system. We also have the opportunity to talk to users and leverage our contacts, for example with Scania and Here, to gain valuable feedback and insights.

Digitalization: Digital twin and METR are two technologies that can stimulate the digitalization of the traffic system. Speed limit data from NVDB (indirect city data) is already in use, which shows that we have the ability to use and provide this type of data. In addition, there is a need for a sign database from several directions, including operations, which can stimulate the development of new digital solutions. The city may consider providing data directly, for example through the LTF interpreter, even if it is not open data at the moment.

Data management: We work together with TRV to ensure the quality of data, which is important to ensure that the data is reliable and usable. Vehicles collect data themselves, which can be a valuable source of information. Finally, our data is made available to users via NVDB, which shows that the platform already exists and that we have the ability to use it effectively. In addition, there are questions about the need for NVDB in the future, which could lead to discussions about alternative data sources and platforms.

Conclusion: There is a good balance between the main enablers. Here, the project can continue to work on deepening in each area to find additional synergies and leverage effects.

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It is possible to test certain things, but they cannot then be scaled up. Finally, there are questions about the city's responsibility for quality in NVDB, which needs to be clarified.

3. Report Conclusion

The GeoSense project demonstrated that geofencing holds considerable potential to transform urban traffic management. By leveraging strategic frameworks and fostering collaboration among diverse stakeholders, cities can navigate the complexities of implementing innovative technologies. The Stockholm use case serves as a practical example of how geofencing can enhance traffic safety and efficiency. Moving forward, continued focus on data quality, regulatory alignment, and cross-sector collaboration will be crucial to realizing the full benefits of geofencing in urban environments.

Although the use case started with the hypothesis that quality and access to data was the hindering factor for digitalization and innovation it was understood during the execution of the use case that hindering factors was in other parts of the system innovation structure such as:

Organizational and Cultural Integration: Integrating geofencing technologies into existing organizational structures and cultures poses significant challenges. This includes aligning different stakeholders, overcoming resistance to change, and ensuring that the new technologies are understood and accepted by all relevant parties.

Regulatory Alignment: Continuous engagement with regulatory bodies and legal experts is necessary to ensure compliance with relevant laws and regulations. This will also help in anticipating and mitigating potential legal challenges.

Cross-Sector Collaboration: Effective geofencing implementation requires collaboration across different sectors, including public authorities, private companies, and civil society. Building strong partnerships and fostering open communication channels are crucial.

Strategic Use of Digital Technologies: Leveraging digital technologies for data management and geofencing applications can significantly enhance traffic management. This includes using advanced analytics, machine learning, and other innovative tools.

Stakeholder Engagement and Training: Ensuring that all stakeholders, including traffic planners, legal experts, IT professionals, and the general public, are engaged and adequately trained is important for the successful adoption and utilization of geofencing technologies.

Hence the advise is to start to look into these preconditions in prestudies targeting digitalization and innovation transformation and where Geofencing if these other aspects are in place will constitute and excellent tool for transformation

References

- Charabelidis, Y. (2018). *The World of Open Data*. Springer.
- Committee, T. a. (2020). *LEGISLATIVE TRAIN10.2023*. Brussels : European Parliament .
- Commission, E. (2021). *Sustainable and smart mobility strategy* . E.
- David, R. J. (2019). Institutional Theory in Organization Studies. *Institutional Theory in Organization*.
- Deloitte's Technology, Media & Telecommunications (TMT) . (den 15 September 2022). Data: A double-edged sword.
- DIGG. (2022). *Svensk ramverk för digital samverkan 1.3* . Sundsvall : Digitaliseringsmyndigheten .
- Domeyer, A. (2022). Government data management for the digital age. *McKinsey, Insigth Report* .
- Lantmäteriet. (2020). *PSI - regeringsuppdrag till Lantmäteriet*. Stockholm: Lantmäteriet .
- Länka Consulting. (2022). *Att lyckas leda i samverkan* . Stockholm : Länka Publishing.
- MSB. (2018). *vägledning för att upphandla informationssäkert*. Myndigheten för Samhällsskydd.
- Perrier, L. (May 2017). Research data management in academic institutions: A scoping review. *Plos One* .
- Regeringskansliet. (2017). *För ett hållbart digitaliserat Sverige -N2017/03643/D*. Stockholm: Regeringskansliet.
- Regeringskansliet. (2020). *Förslag till förordning om en inre marknad för digitala tjänster-2020/21:FPM67*. Stockholm: Regeringskansliet .
- Regeringskansliet. (2021). *Meddelande om digital kompass 2030-2020/21:FPM94*. Stockholm: Regeringskansliet.
- riksdag, S. (2021). *Faktapromemoria/2021/11/202021fmp44*. <https://www.regeringen.se/faktapromemoria/2021/11/202021fpm44/>.
- Sanchal Tarode, S. S. (2021). A framework for stakeholder management ecosystem. *American Journal of Business*.
- SIS. (2019). *Innovation Mangagement Capability Assessment* . SIS.
- stad, T. S. (2022). *Framkomlighets strategin* . Stockholm: Trafikkontoret Stockholms stad.
- Stockholms stad budget 2021. (2021). *Budget 2021*. Stokholm: Stockholms stad.
- Team, I. G. (2020). *EU GDPR - An Implementation and Compliance Guide | Sweden - IT Governance*. <https://europa.eu/eu-justice/justice-portal/content/eu-general-data-protection-regulation-gdpr-an-implementation-and-compliance-guide-4th-edition> . EU Commission .
- Trafikkontoret Stockholms stad . (2022). *Trafiksäkerhetsplan*. Stockholm: Trafikkontoret Stockholms stad .
- Trafikverket. (2022). *Övergripande handlingsplan: gemensam kraftsamling kring* . Trafikverket .