Digitalization of mobility data

COMPLEXIFICATION VS SIMPLIFICATION; WHAT ARE THE CHALLENGES?

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POLIS Network
Mirelle Peters

Digitalization of mobility data

The digital transition is getting up to speed and cities and regional and national governments are challenged to keep up with the developments. For years people are talking about working more data-driven, but especially within government there is still a lot to accomplish. The digital transition is a cultural change in organizations, it's technical and requires certain knowledge and governments still face a lot of challenges. This transition is definitely complex and by taking a look at the challenges faced in different organizations, we can hopefully learn and try to find solutions together.

When I speak in this report of digitalization of mobility data I mean arranging the whole data flow of mobility data. For the data flow there can roughly be distinguished the following steps: collecting data, preparing data, storing data, using and analyzing data and sharing data. That means that when you want to digitalize mobility data the collection, storage and sharing of the data needs to be taken care of. With each step it needs to be decided and thought of the conditions relating to the step. For example, when you collect certain data, you need to think beforehand how you are going to store the data and if you want to publish it as open data to take the necessary technical and juridical steps.

Because of the complexity that I see in my work within the Dutch national program of digitalization of mobility data, as a policy advisor, I am curious about how we can ensure that we can bring this to a good, and above all, valuable result. Can we make it simpler on some levels or do we need to make it even more complex than it already is? Are all stakeholders involved and if not: is it a problem? Do we have all problems in sight and is the content complete? These questions I would like to answer during this internship. As the Dutch program is a result of European regulations, other member states are also going through this transition. With this internship I get the chance to look also outside the Netherlands and from a European perspective, as well as I get to improve my English. During the 4 weeks of this internship I try to find the answers to the main research question:

> ***Can we make a bigger impact on this digital transition by complexifying or is simplifying a better way to approach?***

Choice of organization:

POLIS is "the leading network of European cities and regions working together to develop innovative technologies and policies for local transport". European, local and regional authorities work together within POLIS to promote sustainable mobility through the development of innovative transport solutions. The focus is on the exchange of knowledge, providing access to European research and innovation and to be the go-to European network for mobility issues.
This made POLIS the perfect place to research the challenges of digitalization of mobility data and the possibilities of complexifying this transition.

Theoretical aspects

The theory of complexification and simplification was handed to me during the fourth module of Metropool. In a group context we could establish in a short amount of time the complexity of the national program of digitalizing mobility data, which I am working on. Because digitalization is not solely a national or Dutch matter, I wanted to look at the possibilities of making it more complex when looking at European level at digitalization. For this it is necessary to look more into the theory of complexification and simplification as well as European legislation.

Simplifying vs complexifying and digitalization of mobility data.

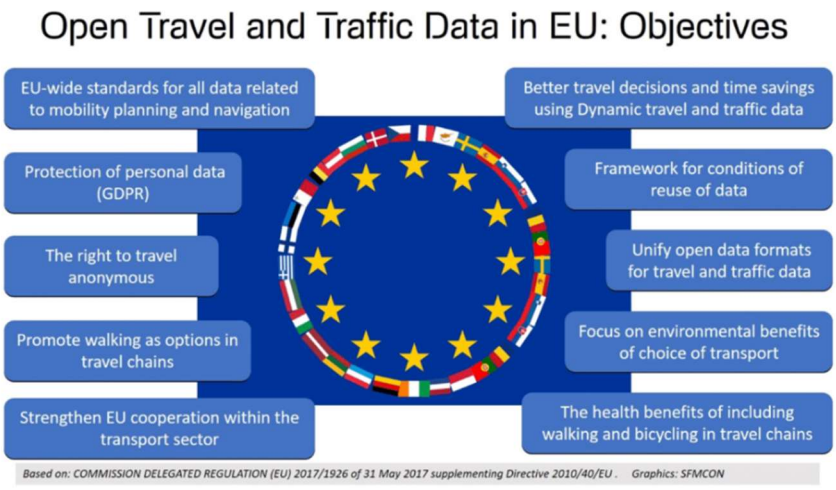
As Hans Joosse states in "The Quest for complex policy", modern history has shown how governments have reduced the space for complexity in their policies. Since the industrialization period machines have captured the idea that a society is controllable and knowable (Terpstra, 1998), so we reduce complexity in policymaking where we can, but that can result in two reactions: confining or accommodating. "This new policy paradigm assumes that increasing the intersections between diverse problems can improve the quality of policy and create (unexpected) win-win situations".

So, let's take a look at the transition of digitalizing mobility data. The two dimensions can be described on content, process and structure:

Dimensions of policymaking	Simplification	Complexification
Content	Constructing problems and solutions as bounded, one-dimensional, and stable, from a distant position, based on rational and abstracted knowledge	Constructing multi-dimensional and interconnected definitions of problems and solutions, from a close perspective, based on practical wisdom and experience-based knowledge
Process	Formulating pre-defined and consistent steps and stages, predictably leading to result	Designing non-linear processes of small steps and on-the-moment responsiveness, from which result gradually emerges
Structure	Division of precisely formulated tasks and (job) positions, both horizontally and vertically	Facilitating and stimulating the self-organization of roles responsibilities, both outside and within the organization

From: The Quest for Complex Policy, Hans Joosse, Eleven, 2022, p. 63

When looking at digitalization of mobility data in general the content, problems and solutions, are multi-dimensional and intertwined. Most of the times we try to construct them as separate steps. That is not only in the European Union, but also on national and local levels. This is the execution of a part of the objectives:



Take for example the national access points: the EU calls for better access to static and dynamic transport data and requires the creation of a national access point (NAP) in all member states so users of mobility data know where to find this data to facilitate their reuse. Intelligent Transport Systems (ITS) can improve safety, traffic efficiency and drive comfort and EU rules aim to accelerate the deployment and use of these systems. There also is a commission expert group focusing on digital transport and logistics for data sharing in freight transport and logistics sector.

Digitalization of mobility data in itself doesn't end or begin with creating NAP's or a digital transport and logistics forum, but is a predefined step in the process which leads to result. Both are different ways to different results, but part of a bigger picture, so the European Union tries to simplify the objectives by their regulations in content (logistics) or structure (NAP) to unlock the value of this data later on. It is not all predefined and the EU has designed non-linear processes of small steps from which results emerge. Also member states have some freedom in the organization of the steps. The digitalization is therefore already complex and organized in a combined complex and simplified way. So, before we look at how the challenges and solutions are even more complexifying the transition, we have to know if there are strengths or weaknesses which can tell us, if we need to incorporate this or just 'keep it in mind'.

The protection of personal data has become a core aspect when working with data, since the General Data Protection Regulation (GDPR) got implemented. The individual rights of natural people are prioritized above all else. When looking at one data source it is often quickly noticed if it involves individual personal data, but it gets more difficult to decide if it involves personally identifiable data when connected to other data sources. This makes it an issue in all steps of the data flow.

We can distinguish strengths and weaknesses of both dimensions:

	Simplification	Complexification
Strengths	Targeted action and problem-solving: categorization invites action, dynamism, and solving problems within the boundaries	Policy enrichment: adding connections and diversity from the lifeworld increases the capacity to find high-qualitative solutions
		Network empowerment: creating space to contribute to a set of interrelated goals empowers network actors to form innovative collaboration/consortia
		Collaborative innovation: improvisational processes facilitate innovation and progressive learning
Weaknesses	Policy poverty: uniform and one-dimensional categories have limited possibilities to find effective, efficient and attractive solutions	Lack of clarity and grip: explorative processes risk a lack of codification and deconstruction (reformulating the parts)
	Boundary interferences: rigid boundaries can create (and even evoke) reactive effects, manipulation, and ambivalence	Regime alienation: complexification easily involves distancing from the own organization, resulting in normative and organizational incongruence
	Undesired path-dependency: linear processes with fixed steps limit the space to manoeuvre and change	

From: The Quest for Complex Policy, Hans Joosse, Eleven, 2022, p. 98

Hans Joosse also explains in his book about policymaking as moving on a the scale between simplification and complexification which allows more nuance in the analysis of periods of simplification and complexification:

From: The Quest for Complex Policy, Hans Joosse, Eleven, 2022, p. 123 Policymaking as Moving on a Scale between Simplification and Complexification

This helps us to move away from the categorical boundaries of both methods and combine them in synergy in time and activities.

These strengths and weaknesses and the scale of these methods will be further discussed and applied in the light of digitalization and the challenges in the chapter with the conclusions.

Methodology

For this research question I want to know what the challenges are that municipalities, regions or organizations come across when digitizing and working on mobility data. I wanted to interview around 15 people from different countries and organizations to gain a broad perspective. I used the member-contacts from POLIS and these had to be planned in advance according to their busy schedules. This gave me time to read into theory about complexification, look into POLIS as an organization, read about European legislation

and watch webinars from POLIS workgroups. Also this gave me time to write down the questions and plan interviews. For the interviews I made a list of questions, but let the interview itself take a natural course. By listening, summarizing and follow up with a question I got almost all questions answered during the interviews. Around 2,5 weeks in I needed more interviews, so there were sent out more interview requests which resulted in a total of 14 interviews, 7 of which were from the Netherlands. It was a conscious choice to interview that many people from the Netherlands. Most people were working for municipalities, regions or companies. For the Netherlands I knew people from different parts of the program, which gave me the opportunity to get different point of views of this transition.

In between the interviews I got to process the information and collect it all together in types of challenges. After all the interviews were processed I got to get to some recommendations resulting from the challenges and sometimes coming from the interviewees. For the last part I got to process how the theory applies to these challenges and recommendations.

Interviews:

The Netherlands:

Noor van den Brink – Ministry of Infrastructure and Watermanagement
Vincent Lau – Amsterdam
Eric van der Ster - Ministry of Infrastructure and Watermanagement
Jan Maarten van den Berg – NTM / NDW
Waldo Kolk – Province of Utrecht
Chris Bak and Ruud Schwillens – Province of Limburg
Otto van Boggelen - CROW

Belgium: Tessa Bruneel - Ghent

France: Mélanie Gidel - Paris

Germany: Marlene Picha and Manuel Hautzinger – NVBW (Nahverkehrsgesellschaft Baden-Württemberg mbH)

Portugal: Pedro Machado – Transportes Metropolitanos de Lisboa

Sweden: Mikael Ivari - Goteborg

Open Mobility Foundation:

Andrew Glass Hastings, Michael Schnuerle and Angela Giacchetti

MobilityData: Tu-Tho Thai

Challenges and solutions in practice

To get an insight in the challenges we face with this complex transition, I interviewed people working for governments in Belgium, Germany, France, Portugal, Sweden and the Netherlands but also organizations like Open Mobility Foundation and MobilityData. We can categorize the challenges during the dataflow of collecting, storing, sharing and (re)using the data or somewhere in the governance.

Challenges and solutions somewhere in the dataflow

Collecting

It was mentioned more than once that, whenever collecting data, there should always be a reason why. Why do you want to collect this data? What do you want to use it for? Citizens are critically watching governments when they use data, especially if it contains personal data. It is important to be able to clarify why you collect the data and although it is experienced as a challenge it is a good thing that citizens keep the government on their toes. The GDPR makes sure of this, but with mobility data it differs how privacy officers look at it and how to take the appropriate measures. The data minimization principle demands that only personal or personally identifiable data is collected and stored that is strictly necessary for a purpose. Another multiple experienced challenge is when collecting data you have choice of many (innovative) ways to do this and this can sometimes feel as a little sweet shop where so many private organizations present to you their beautiful, innovative way of collecting your desired data. Still, you need to be critical to the results they claim to provide, because you need a certain quality to be able to use it in specific applications you initially wanted it for. Besides the data quality there have also been challenges in sharing the collected data afterwards. There are old contracts between government and private organizations for the collection of data, but the conditions on openly sharing this data may vary per contract. It was explained during one interview that this was difficult to change and takes a lot of time.

Storage

Storage has been a challenge multiple times. Not the storage itself has been the limitation initially, but more the technical limits of the chosen solution, which is mostly a consequence of lack of technical know-how in the organization. There is a difference between storing raw data vs. edited data. With storing raw data you always have to edit the data before you can use it and you need to have insight in the conditions of the data. For example knowledge of the certain street to check if the data is plausible. When you store only edited data it’s not possible to check if the data has been properly cleaned and outliers are deleted for the right reasons for example. It's a tough decision you need to make. A couple of times challenges were mentioned with storing real-time data vs. historical data. Where real-time data can be a large amount, historical data (or storing the real-time data for a long time) will make the needed storage-space huge. Most of the people from governments are still struggling here. It gets down to the question: what do you really need? For this aspect GDPR is again very important to ensure safeguards are in place.
On the question if the data item should or could be stored locally or nationally, it depends on the data itself.

Sharing

With the step of sharing data comes immediately the GDPR to mind: no personal information (or relating to personal information) should be shared as open data and to other parties only under strict GDPR-circumstances. Data can only be shared as open therefore when it is aggregated, in time or space. But privacy isn't the only challenge mentioned during a lot of the interviews. The interviewees who use the data themselves also mention the challenge of the quality of the data and the interpretation. When the quality of

the data isn't as high as possible (at least above 90%) and/or the interpretation is subject to your specific knowledge on the field itself or the data in general, the data can be open but misused. On the other hand, on other levels this fear of sharing the data because of the data quality (for example regions or organizations tell this) isn't necessary and can also improve by reuse of third parties as long as there is a feedback-loop. Mentioned by the organizations and a region was the possibility to openly discuss the quality on for example github for all users.
As mentioned by some cities there is still data based on old agreements or contracts, which date from before the time when we wanted to share our data on open data platforms. This can make it difficult to share the data on an open data platform. They think it would help if on national or European level there would be some obligation for private companies to share data on open platforms, at least for historical data.
One mentioned it as advice and another as already doing this: ask users what they need to make the platforms more user-friendly.

(Re)using

An important part of the data flow: the use and reuse of data. Most don't want to collect data just to have it, but want it to make well weighed decisions to improve the quality of life and use of public space. Navigation needs high quality and available data to guide the citizens to their destination without thinking. There is a need to monitor how the public space is used to improve policies and check if the policies have effect.
Therefore the quality of data should be high and preferably for some goals also real-time, but this is experienced to be a challenge. Some mentioned the quality can be improved by creating a feedback loop between users and providers or owners of the data.
Another challenge that a couple of people who were interviewed faced, are multiple or too many dashboards. For example shared mobility providers have their own dashboards with which they cannot execute all sorts of analysis they need. It is possible to combine, but that costs them a lot of time or a lot of money. The more dashboards you need the higher the costs or the more time you need to not only built the dashboards but also keep them up to date. They feel there should be focus on multimodal dashboards, modular so it is scale able and it updates when there's new data.
Governments want the data to be used by service providers and navigation systems, but the experience from most cities is, when you approach them, the area is too small for them and the service providers won't use it unless the city pays. Also when the city wants them to use their data or applications, service providers won't use it, based on just a theory, but only when there is already a prototype. Letting service providers invest in your solution or data as a city can be hard. But you can get them to participate in a focus group, just as long as it matches with their own roadmap or maybe when you give them a financial incentive. It is experienced as the bigger the partner, the less viable but also the less money is an issue.
A lot of innovative tools and applications are being developed and it gets noticed by everyone. An expressed wish is to exchange this knowledge more with other cities and regions together their experiences to save time and money.

Data standards

There are already multiple data standards which can be used, but there is also a need for flexibility in data standards and especially these being prescribed on national or European level. Differences in data formats and definitions make it difficult to combine and use data. Organizations like OMF and MD are constantly improving their data standards in working groups and through public and private collaboration. Privacy and transparency is getting more attention as well. The working groups are looking for shared solutions, which means it isn't always a perfect fit. But best is to try and limit the number of data standards.
The technical capacity is a mentioned challenge by many: there is no technical expertise in public organizations, which results at being at mercy of private companies. Solutions that came up: organize and manage the technical expertise on a higher lever (larger companies for smaller ones).

Challenges in the governance

Culture

One big challenge seems to be the one in culture, although it is just specifically mentioned by a few. Several people tell they still tend to react on ad-hoc questions with data instead of advising pro-active with the data.
Data used to be a side-product and it is still seen that way mostly within cities, but it is now core business. Cities are working with data for approximately 85%: receiving it, mutating and sending it. New policies are expected to be substantiated with facts, based on data. Where logistics and banks already developed into this transition and have their data management in order, the government falls behind. Big tech companies and they who scream the loudest will determine what happens if the government doesn't speed up.
One of the reasons and therefore challenge mentioned is that working processes are slowly changed. It often means extra tasks when digitalization is coming through, which leads to resistance. These processes need to be revised to work more effectively and efficient, but this can be very hard to accomplish, especially if tools need to be improved or created. When changing these working processes all stakeholders should be involved from the start, because the change affects everyone.
Communication and transparency and knowing why it has to change are important.

Trust and transparency

Some interviewees notice a lack of trust in the digital transition. Some citizens are afraid of misuse of their personal data. Providers of shared mobility don't want to share all their business data with the cities and cities are hesitant to share data with the public because of the quality and interpretation of the data.
Transparency is also a challenge in the digital transition, besides cultural change and trust. It is considered a challenge as well as a solution. In order to gain more trust and change the culture, transparency is needed. There needs to be more communication on the impact of data and which data is needed and why. Even within municipalities there are different interests for the data. The civil servant doesn't want the work load to increase or wants it to make the work easier, while a mayor would naturally be more concerned about the safety of citizens. Citizens pay taxes and want that money to be well spent. They also want carefully weighed decisions and tools to improve their life. When working with data you must keep asking yourself along the way "Why?" and communicate openly about how this serves everyone.
No matter how many stakeholders there are already involved, there are stakeholders being 'left out'. This often happens for good reasons. Mainly because involving every stakeholder will be too much or even impossible to handle. When operators are building tools for their end-users, they should include them while building the tool. When governments share their data, it doesn't have to be of perfect quality if they ask users, like these operators, to give feedback about the quality. This improves the quality of the data and the tools we are building. Everybody needs to hold each other accountable. One interesting view on the digital transition was the question why we do not approach digital changes as pilots with more participation before and after by for example surveys. Talking about the impact and effect of the decisions from different points of views is mentioned to be necessary to create involvement and cooperation. One example to do this, was by creating a small focus group from the start.

Integrality and adaptation

It is noticed that data is often still stored in silo's per mode, operators or cities. But for policy and social issues these silo's won't suffice. The goal should be to bring the whole public space and stakeholders together.
Working integral can create more effect, add more value to the data and the applications for example in an ecosystem of data. As this is more complex and difficult, it is advised to show the impact on a smaller scale and scale it up. Learn inside an ecosystem, built trust and show the impact.
The digital transition was never a solid and simple project but a complex matter. New insights or changes along the way should never mean having to go back to the beginning, but being able to adapt.

European and national legislation

There are challenges experienced because of European and national legislation but some of these challenges can also be resolved on that level. The EU competition law, GDPR and NAP's are mentioned. Mostly the interpretation can cause differences between member states. So are most member states still figuring out how to cope with the privacy aspects. Mobility data doesn't seem to be involving personal data in itself, the data can lead to a person when combined with other data. To take the necessary measures to prevent this, every city starts from scratch when their privacy officer concludes it's necessary. It would be good to find some common ground on this, between privacy officers of a larger number of cities, in regions or even on national or European level.
Also mentioned is the competition law: in many cases, there isn't much good competition. Even a European competition can still be very national oriented or there are too little experienced companies for the specific field.
National Access Points are also still developed from a national perspective and execution differs for the member states. When it is more harmonized from a European point of view there won't be silo's geographically. It is not always clear for cities what is expected in terms of data. They like to have more clearance on this, if not on a European level, then on their national level.
There are also very specific national legislations, which can make digitalization more difficult. National legislation in Sweden makes it for example harder to be more innovative.

Capacity and competence

In many of the interviews, on local, regional or national level, the shortage and lack of technical know-how is mentioned. This technical know-how cannot easily be 'added' to current employees simply by providing courses, but there aren't enough data experts 'out there' either to provide every city with the necessary technical knowledge they need to get through this digital transition smoothly. Most people with this knowledge prefer to work for the private sector if they have a choice. It is thought that this is not solely a salary issue, but also the reputation. The public experience with government and IT is that it takes long, is more difficult and went wrong or didn't lead to great results.

A lot of the technical issues, data, problems and applications are more or less the same for cities, but certain issues will be specific for certain cities. Take for example floating car data: this is the same everywhere. There is almost a common wish to work together, smarter, not harder. The expertise can be brought together on a national or regional level, where there is technical assistance, centers for support, someone as a reference to proofread guidelines of tenders, especially for smaller cities. That way money can be saved and vendor-locks be prevented. Amsterdam advised: unburden the small cities with for example shared service centers, but also keep in mind that larger cities do have unique problems.

Borders

Borders are present and mentioned in many ways. Without guidelines or strategies on higher levels than in cities, data can be different and difficult to connect. This can be data in the region for neighboring cities, but also across country borders. If there are also mental barriers existent, these differences in barriers can create also a physical barrier. This was mentioned not only in Paris in its suburbs but also in the Province of Limburg, close to Germany and Belgium. The politics are often different as well, which makes it even more complicated to get the data aligned and accessible. A good network, between the governments (and of course the roads and data) is essential and could use some push on other or higher levels (national or European).

> ***"Capacity, Readiness, transparancy and fear is affecting and holding back the transformation"***
>
> *Tu-Tho Thai - MobilityData*

The Netherlands: a closer look on the organization of digitalization

In the interviews I have spoken to people from different organizations working on digitalization of mobility data. The challenges they found and the lessons learned are also covered in the chapter before, but to create a complete picture I will tell more about how it is organized in The Netherlands.

The Ministry of Infrastructure and Watermanagement have initiated 2 programs, one of which is the ***Digitalization of mobility data: the data top 15***. Fifteen mobility data items, static or dynamic, need to be available[1] before the end of 2023. This has been a long process of years which started with 5 data-items and ended with fifteen. In the BO-MIRT of 2019 (the management consultation Multi-year program Infrastructure, Spatial planning and Transport) this was decided for every road manager in the Netherlands. These data items will land on our National Access Point: NTM.
The program consists of a national data flow consultation, lead by the Ministry, in which the chairs of the regional data teams come together (LDKO) and a DO-DTM, a consultation in which the directors or managers of the regions come together. Within the Regional Data Teams road managers in the region will perform tactical and operational implementation tasks together, expertly and efficiently. Ownership and responsibility stays with the road managers or cities itself, but various tasks and disciplines come together in this team ensuring harmonization and standardization. Every Regional Data Team can set up its own governance and decide how they involve the road managers within their region. This freedom resulted in different ways the Regional Data Teams approach this program.
The program started with the regions and all different implementation plans and the obligation of all the road managers (12 Provinces, 344 municipalities, Rijkswaterstaat) to have all the 15 data items available by the end of 2023. How do you involve all the municipalities in your region? And if the municipalities have no time to do this, how can you reach the target? This is a real challenge and there is no one solution.

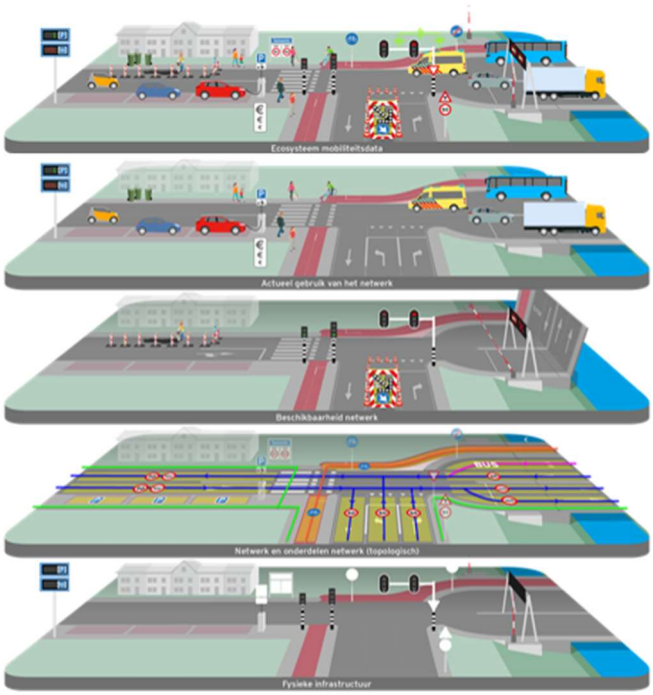
In the region of Utrecht there is a main focus on the “What's in it for me?”. They believe that municipalities will make time to reach the target if it has also something in it for them. For example by producing tools and applications or by expertise or automated collection of data. The region of Noord-Holland and Flevoland developed a website: datapedia.nl. This website informs their road managers on the data items. The good examples from the regions come together in the LDKO where some are adopted on national level for all the regions to use. That lead to Datapedia now being used for all regions. Examples of applications with the data are collected and shared on the website as well. Applications or tools that are developed by cities like Amsterdam are made available for upscaling in other cities or regions (for example bereikbaarheid.amsterdam.nl).

The second program of the Ministry of Infrastructure and Watermanagement, that is just starting, is the digital ecosystem of mobility data. The goal is to start in this ecosystem with use cases on working with and exchanging data and tools between government and private sector.

[1] Current, reliable, correct, cyberproof and compliant to GDPR

National Access Point (NTM)

Our national access point (NTM) is like the catalogue of all the data portals that already store or gather specific mobility data. There are considered 4 layers that results in the top layer, NTM, as seen in the picture here: physical infrastructure, traffic planning of the road network, availability of the road network and the use of the road network. The first layer is consisting of the national road network data itself. The second layer consists of traffic signs, maximum speed, static parking data, logistics and such. This second layer may be considered as a basic registration.
The Vereniging Nederlandse Gemeenten are currently inventorying the impact of this layer as a network registration. The challenges they found in their interviews are similar as were mentioned in my interviews for this research.



Recommendations

Through all of the challenges mentioned before we can find the following advice from the persons I interviewed.

1. Start small, but make sure you can expand and continue

Unless there are guidelines laid out, we cannot get all data on all modes immediately available. Not regionally, not nationally and not on European level. It's better to start small, but making sure you can expand, scale up and continue after a pilot phase. And never start your pilot without 2 important aspects: make sure there is money in the future to continue and have a strategy to scale up.

2. Be transparent at all times about what you're doing and why

First of all this will create more trust, but also make sure you keep focused on the initial reason why you're doing this, what impact you want to make. It is easy to lose focus and go with so many interesting ideas in the enthusiasm, that you even forget to communicate what you're doing and making clear for what reason.

3. Include different perspectives and interests when working on digitalization

This can mean involving more stakeholders by co-creation of innovative tools and applications, but also when deciding on what data you want to collect and how to store the data. For example, if a city wants their data to be used by private companies they need to know what those companies need and how they need it. Involve a select representation of end-users from the beginning, but don't make it too big.

4. Create and participate in feed-back-loops and working groups to improve user-friendliness of dashboards, data quality, working processes, data standards or the right interpretations

We already know that the data quality is not as we want it, but we can ask users to give feedback on this as well, so we can improve the data quality. But it also goes the other way around. As governments we can for example participate in working groups to improve data standards. Also working processes need to be changed so the digitalization isn't just an extra task.

5. Make sure you keep being updated on developments and share experiences with each other

There are so many innovative tools being developed and you want to know when someone else tried and failed the exact thing you now want to start. Sharing experiences and knowing 'what's out there' can save a lot of time, money and energy.

6. Work together: organize expertise on regional level or even national level

There is a shortage in skilled people (especially in technical know-how, IT) everywhere and if you want to organize this separately, it will not even be possible. But everybody who is working with data or trying to move forward with this digital transition needs this know-how. For example to help proofread guidelines and help with tenders or IT-architecture solutions for storing and exchanging data, but also for privacy and security help. Join forces and organize this expertise on a regional, or even national level and exchange experiences on national and European level. This is not easily done off course, because of regulations and

jurisdiction, but working towards something like a shared service center would benefit small and larger cities.

7. Work across borders and boundaries

The focus stays on the responsibility of member states itself. It is seen in the execution of digitalization, but also in regulations. But traffic never stops at the border. Different data or different interpretations on both sides of the border isn't desirable as can be seen already within countries, but between countries there is still a challenge to organize the connection of data in a uniform way. With regions it is easier to organize this and some countries already do this, but it is important everywhere. Regions in neighboring countries need to be connected to be able to combine and use each other's data. It would become too complex to connect on a national level, but, again, start small and try this for a small region across multiple countries and make sure you can expand this.

> ***"If you wanna go fast, go alone,***
> ***if you wanna go far, go together."***
> *african proverb*

Conclusions

We started with our main question:

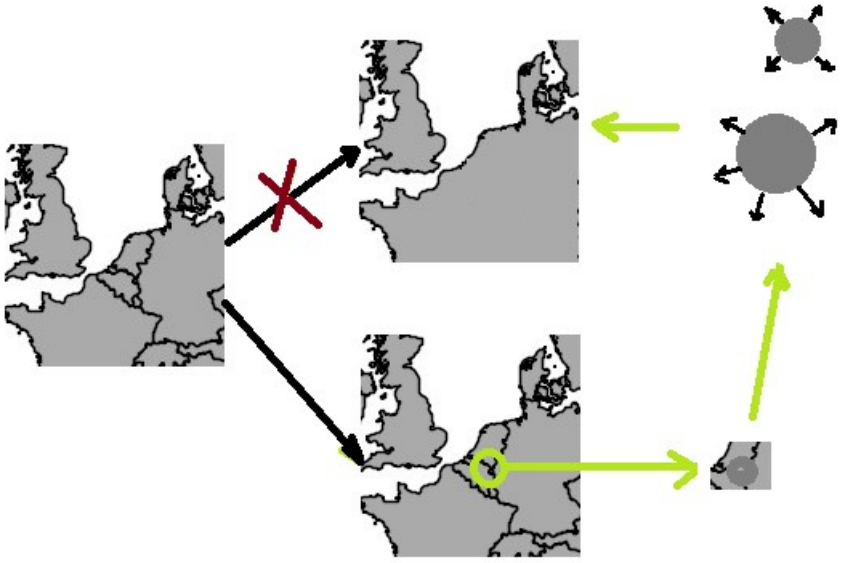
Can we make a bigger impact on this digital transition by complexifying or is simplifying a better way to approach?

In the beginning and the theoretical framework I already stated that the digitalization of mobility data is a complex transition. The digitalization is already complex and organized in a combined complex and simplified way. The interviews gave more insight on the complexity of the transition. The challenges mentioned during these interviewed, showed this as well.

Most of the earlier mentioned recommendations contain a form of complexification. By gathering and using different perspectives and involving more actors, policy enrichment is used. This way high qualitative solutions can be provided.
When creating and participating in feedback loops, space is created to contribute to a set of goals and there can be innovated with collaboration. That is also the case when working on data standards together.
Only the first recommendation states to start small and that is basically simplification. The reasons for this are simple as well: it makes for targeted action and quick decisions and results. It keeps all actors on their toes and prevents cynicism and paralysis. Overall the recommendations tend towards more complexification of the digitalization. So, let's take a closer look at the separate recommendations and the possibility to complexify.

Trust, culture and transparency and communication were mentioned often in the interviews. This shows that digitalization in itself isn't straight forward and for every data source there can be multiple perspectives and interests to keep in mind. It is not only legislation that requires this (like GDPR), but also the working processes that change because of this digitalization. There are so many perspectives that need to be kept in mind, which means there are as many stakeholders. In one way this can create policy enrichment and network empowerment, strengths of complexification, but it can also lead to a lack of clarity and grip. The same stakeholders need to be consulted for many parts of digitalization. It is impossible to combine all content of the transition into one working group. This would be too long, too much and would inevitably result in a need for simplification: handle aspects apart from each other. But with the same people in different themed working groups it is still easy to get sidetracked. To prevent this, instead of handle these aspects completely parallel, it could be handled more in phases, more linear.
The lack of clarity and grip was mentioned often during the interviews. There is a need for more clarification from a higher level on what the boundaries are within the solutions and this is more a simplification strength and a complexification weakness. It is sometimes unclear what is expected specifically from cities for the National Access Points, for example the types of data and format. Clarification, or simplification in this matter, can help for targeted action and problem solving. But it can also get too rigid, which can cause other problems. This happened for example with the required data standard in the regulation, which isn't used by transport companies and resulted in accepting the already used data standard. So staying flexible on the boundaries or determine these very carefully with a pallet of actors (so complexifying again) and it can work out fine.
The recommendation about borders is a good example of how complexifying should immediately be followed by simplification. There are borders everywhere. It is the geographical boundary we use to make it easier for governments to put the digitalization into action. Every country has their own government

control, their own legislation and politics can be different between regions as well. It is difficult to connect regions within one country, let alone when one country connects with their neighboring country. Before the coordination gets too complex, it is better to learn in (a) smaller part(s) and then expand what was learned. It is simplification but with different boundaries. Complex thinking and simplified again.



The goal is clear, but it is not a clear linear path. Complexification can tribute to the challenges in already complex transitions but not without simplification.

Can we make a bigger impact by complexifying?

Yes, but it is moving on a scale between simplification and complexification. Complex thinking helps to see the bigger picture, but it is impossible to create this bigger picture from the start. The bigger picture here is the digitalization of mobility data which is available and connects easily between all member states of Europe. Different aspects have been simplified to get into action mode and that works, but at this point, with the challenges that are faced, it can be seen as learning along the way and adapting to new insights. Keeping it small, but also make sure we can expand. Expand to a wider area, or expand to different data items. Involve more actors, but all of them can be too many and there is a difference between being transparent and informing and cocreation with the actors. So with the actors, the number and involvement, it is sliding along the scale to complexification and maybe back to simplification. There is a choice between co-creation, working groups or focus groups and it is sliding along the scale until there can be found a form which improves the impact, but doesn't paralyze the process.

So, in conclusion: a bigger impact in digitalization can be made by thinking about complexifying the processes and actions and solving the challenges and weaknesses of the earlier simplified processes and actions. Then incorporate the strengths of complexification in a simplified way.