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Show case - using TravelVu and TravelViewer in Trondheim

Report

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0 Contents

1 Introduction

1.1 Travelviewer - data for low-carbon sustainable transport systems

In September 2018, Trivector started an international project aiming to test the travel survey app TravelVu in four locations outside of Sweden. The app has previously been used in several research projects in Sweden and Norway. NTNU was invited to join the project and be responsible for data collection in Norway.

Travel survey data is important – it provides data on how people travel. This is data used by transport planners and the transport authorities to keep track of travel patterns and changes in these patterns over time, or as a reaction to more specific changes in transport services. Travel survey data is in important source of information to efficiently make strategies to meet carbon targets, improve air quality, making right investment decisions, and is the main input data in developing transport models.

With co-financing from Climate-KIC within their demonstrator program, this project is demonstrating the use of the TravelVu app in 4 countries; Denmark, Norway, Germany and Italy. The project has developed a dashboard to view details of local travel surveys online, and thus be able to access data and download reports. The new travel survey service is named TravelViewer. The project started September 2018 and ends September 2020.

1.2 SmartRVU

NTNU stated the SmartRVU project in 2016 searching for new methods to carry out travel surveys in collaboration with the Norwegian Public Roads Administration. Testing tracking technology with smart phone app's is one of the approaches in the project, and thus TravelVu has been tested in several pilot projects.

Traditionally the Norwegian national travel surveys have been carried out with a wide range of background questions regarding person, household, car ownership and details about trips. The burden of the respondents is beyond acceptable with an average duration of interviews in the 13/14 survey of 23 minutes. The more trips, the longer time on the phone. Thus, from 2017 the respondents also could report their information on a web-based platform. Although this probably reduced some of the burden for the respondents, the results show suspicious results, and a still declining response rate, down to 16%, from 20% in 13/14.

The goal of Smart RVU is thus to collect data in a smart way, enhancing the data quality while reducing the burden on the respondents. A Travel Survey should require not more than 2 minutes of the respondents' time. This is an ambiguous goal, and we are not there yet, but we believe that a Smartphone app, like TravelVu, is part of the solution to get there.

1.3 TravelVu

TravelVu collects two types of data, 1) information about the respondent and 2) travels.

1.3.1 Information about respondents

Information about respondents is important for three main purposes:

- Controlling the representativity of the selection in the survey. Thus, we ask for gender, income, education to reveal if the selection is skewed compared to the overall population. The normal procedure is to weight up underrepresented groups and weight down overrepresented groups.
- Comparing travel possibilities and patterns between groups of the population because it is expected that various groups have different travel possibilities and behavior.
- Following the development in travel behavior over time, also within and between groups.

Within the SmartRVU project our approach has been to reduce the background questions to a minimum, especially around details regarding car ownership. This has been collected in traditional surveys to detect trends over time among the general population. It is expected that such information in the future can be provided from car owner databases. Other databases could also contribute with other background information, but currently it is strictly regulated. Ideally the travel survey could start with the respondent allowing downloading public information about him or her, and just confirm or correct the information. That would probably save a lot of time for them.

1.3.2 Information about trips

The TravelVu app uses sensors in smartphones to identify how people are travelling, prompting them on how they have travelled with an easy-to-use interface where users can review their trips and correct where necessary.

TravelVu tracks peoples' movements and the respondent states what is done at any stop in movement, whether it is e.g., waiting for a bus, parking the car or stops which is interpreted as part of a trip, or doing an activity, like being at work, shopping or leisure activity which is interpreted as a trip purpose.

TravelVu saves information about each person, meaning that if the respondents revisit a site, TravelVu suggest the same activity there as before. This learning process makes it easier to correct days, if the collection period is several days and the respondent corrects days consecutively.

The data about trips from TravelVu are expected to be complete; covering all trips during the day, correct; as it is tracked and not reported all time components are more precise, and with a wider span of information, basically because the tracking gives information about route choices and delays along the way.

1.4 Intentions with the project

The Climate-KIC projects should facilitate a development towards a greener transport, and it is a general perception that this can be achieved only by transferring the transport demand from using private car towards greener alternatives; walk, cycle and public transport. This is also rooted in the National Transport Plan and local land use and transport plans in Norway. However, decisions about tolling, parking fees, subsidies to the public transport, restrictions on land use and localization of settlements and industry are disputed among politicians and the

public. Thus, we need precise estimates about how these, potentially unpopular decisions, support the development towards the overall political goals; a sustainable development.

TravelVu and TravelViewer are tools to collect data about Travels Patterns and to present/ analyse travel patterns respectively. It is important to monitor current travel patterns and impacts from actual changes in the transport service. Experience from earlier initiatives can increase the knowledge about what impacts to expect from future decisions and support the right decisions about where to go from here to achieve mobility changes and eventually reach the goal of reductions in private car use and a decarbonised transport sector.

This report present findings from Trondheim municipality using TravelVu as data collector tool and TravelViewer as presentation tool. It should be mentioned that TravelViewer is developed in this project and has not reached its full potential in the current version. Thus, evaluation of TravelViewer is a separate task in the TravelViewer project, and feedback from the test sites would initiate further development of the functionality in TravelViewer.

2 Show case: TravelVu-RVU vs NRVU

2.1 Purpose

The tracking method has shown to produce more trips than phone or web-based interviews. The frequency of short trips and soft mode trips are lower in the NRVU than data from TravelVu. The tracking method is expected to take over for interviews, but then we need to ensure that the quality of the data is similar or higher than traditional methods, and we also need to understand the difference between them. Did the respondents in the NRVU underreport trips or is tracking reporting movements that are not considered trips according to the definition of a trip?

In 2019 a pilot was carried out in Trondheim, recruiting respondents to participate in a TravelVu travel survey. The national travel survey was collecting travel survey data as well in the same period, however data from 2019 is not available yet. Still, using data from the NRVU from 2016-2018, and comparing them to the TravelVu data might give some indication of systematic differences which might explain weaknesses and strengths with the two methods.

2.2 Data

To avoid any bias regarding time of year we have selected trips from Trondheim 2016, 2017 and 2018, October and November in the NRVU with distribution on gender and age as shown in Table 1. Number of respondents from the pilot using TravelVu fall 2019 is shown in Table 2. The true distribution of age groups is found in data from Statistics Norway and is shown in Table 3.

Table 1: Age groups from the National Travel Survey, Trondheim fall 2019 n= 1266

NRVU	Frequency	Men	Women	Total Percent
18 - 24	137	55	82	10,8
25 - 44	457	229	228	36,1
45 - 64	510	241	269	40,3
65-70	162	97	65	12,8
Total	1266	622	644	100
		49,1	50,9	

Table 2: Age groups from the Trondheim pilot fall 2019 n= 871

Fra Travelviewer		
18 - 24	96	11 %
25 - 44	386	44 %
45 - 64	326	37 %
65-70	63	7 %
Total	871	

Men 48%, Female 52 %, these are weighted to 52% men and 48 % female to match the ssb data

Table 3: Age groups from the residence data base Trondheim[1], Statistics Norway

Aldersgr	Men	Women	Total	%
18 - 24	11279	10422	21701	15,2 %
25 - 44	34477	30543	65020	45,4 %
45 - 64	23102	22743	45845	32,0 %
65-70	5067	5430	10497	7,3 %
Total	73925	69138	143063	100 %
	51,7 %	48,3 %		

2.3 Key numbers to explain differences

In this comparison TravelViewer has been used to produced statistics from the TravelVu data, while SPSS has been used to produce statistics from the NRVU.
The following key number are selected:

1. Number of no-travel days. The TravelVu app is only reporting days confirmed by the respondents. If the respondent is not aware that days without any trips is important, they might avoid confirming those days. Some of the respondents we wanted to recruit for the survey thought that because they didn't travel much, their participation was not contributing to the survey.

[1] Trondheim municipality, before Klæbu joined

2. Trip number pr age group. Trip frequency is an important key number, and this would help understand the differences. In this report we focus on distribution on trip purpose and mode of transport.

No travel days are possible to extract directly from the NRVU person-file, but not as easily from the TravelVu-data. This will be followed up later.

Of the 1266 respondents in NRVU, 110 of them had no trips on the selected day. The explanation was as shown in Table 4. Most of them had no need to travel on the specific day.

Table 4: Reasons for not travelling from NRVU

Reason for no trips	#
Had no need to travel	73
Couldn't due to own or others' illness	17
Other reasons	4
Do not want to explain/missing	16
Total	110

The respondents with no trips the reported days should be included when calculating the average number of trips pr person pr day, which imply that the trip production from TravelVu is generally too high, amounting to approximately 0,3-0,5 trips pr day pr person. This needs further development in the TravelViewer tool. In this report the presented data are not corrected.

In Table 5 we have aggregated the trips within trip purposes for the age groups participating in the pilot fall 2019 and compared the trip frequency number from the national travel survey, but selected only respondents from Trondheim municipality interviewed October and November.

Table 5: Activity distribution in trip frequency pr day and respondent from TravelVu and NRVU

	TravelVu						
	Work	School/ Education	Shopping& Service	Leisure	Home	Other activity	Total
18-24	0,2	0,5	0,5	0,4	1,0	2,1	4,6
25-44	0,6	0,1	0,7	0,4	1,0	1,9	4,7
45-64	0,7	0,0	0,6	0,3	0,9	2,2	4,7
65-70	0,1	0,0	0,4	0,3	0,6	2,9	4,3
Total	0,5	0,1	0,6	0,3	1,0	2,1	4,7

	NRVU						
	Work	School/ Education	Shopping& service	Leisure	Home	Other activity	Total
18-24	0,3	0,4	0,5	0,8	1,3	0,0	3,4
25-44	0,5	0,0	0,4	1,0	1,4	0,1	3,4
45-64	0,5	0,0	0,5	0,7	1,2	0,1	3,0
65-70	0,2	0,0	0,4	0,9	1,0	0,1	2,6
Total	0,5	0,1	0,4	0,8	1,3	0,1	3,2

From the comparison, there are several interesting results. We will focus on the following topics:

- The average total trip frequency is much higher in TravelVu than in NRVU
- Other activities are much higher from the TravelVu data
- No education trips in the NRVU
- Higher numbers in Leisure and home in the NRVU

The average trip rate from the TravelVu data set is 4,7 compared to NTVU with 3,2 pr person pr day. Even if we reduce this to account for missing data for persons with no trips for the TravelVU data to 4,2, the TravelVU data has in average 1,0 higher trip rate than the NRVU. Similar results have appeared in previous pilots. The reasons are explored in a master thesis from 2018 with a data set collected among students in Trondheim using TravelVU (Runestad, 2018). The main reasons are shorter trips carried out by foot and in the city center, probably due to many stops in one trip chain. The survey was carried out in wintertime, thus less cycle trips were observed. Another reason might be under reported trips in the NRVU. As people need to remember all trips and report them in a phone interview or self-report on web, there is a chance that they forget stops in a trip chain, misunderstand the definition of a trip or that they get exhausted and avoid reporting all trips. The reason might also be found in the way TravelVu define stops, and thus the destination for a specific trip. If the respondent stops for a prespecified duration, TravelVu interprets this as the end of a trip. If the respondent then fails to correct this, the result will be too many trips.

The purpose “Other activities” from the TravelVu data set is contributing a lot to the average trip frequency. A further investigation of these trips reveals that this is mainly trips with unknown purpose, which means that the respondents haven’t corrected them.

Traditionally the NRVU has recruited people through their home addresses, and students typically are living at a different place then their home address, as registered in the National population Register. Thus, many students are discouraged from participating in the travel survey. This might also be a problem with the data collected in the pilot using TravelVu.

Some of the explanation to the high rate of “Other activity”, which basically consist of unknown purpose, might be explained by the low rate of “Leisure” and “Home” in the data from TravelVu. It might be that the respondent didn’t find the right category for their activity, although it should have been within Leisure and Home. Another possibility is that they expected the app to correct the purpose to Home because they had already corrected that earlier. The plan is to investigate this further later and suggest corrections to the data set. One hypothesis is that older people, with less technical experience, found the corrections harder. This might be one explanation, but as Figure 1 illustrates, unknown appears for all ages. Another hypothesis was that this was mainly shorter trips, misreported as a separate trip. As Figure 2 illustrates this does not seem to be the case either. A third hypothesis was that unknown appeared early in the collection period (people hadn’t corrected as many days yet) or late (due to exhaustion). However, as Figure 3 illustrates, the share of unknown purposes follows total number of registered trips quite well. We still haven’t figured out if the hypothesis is still valid, which probably could be checked studying reported days and purpose on those days from each respondent more closely. We also investigated the tracking of the unknown trips, indicating that many of them ended at locations where the purpose might be determined. For instance, if the trip ends in a residence area, the

purpose is probably home or visit. Combining this information with other trips for the same respondent, would possibly also help determine the purpose.

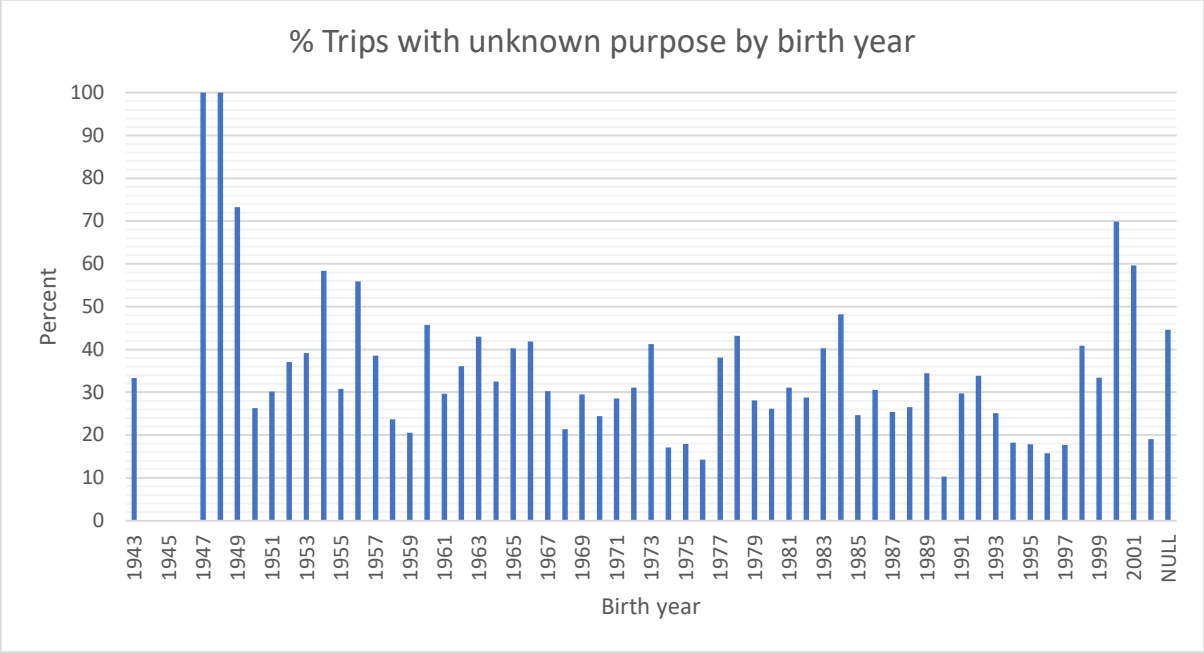

Figure 1: % unknown by birth year from TravelVu data pilot fall 2019

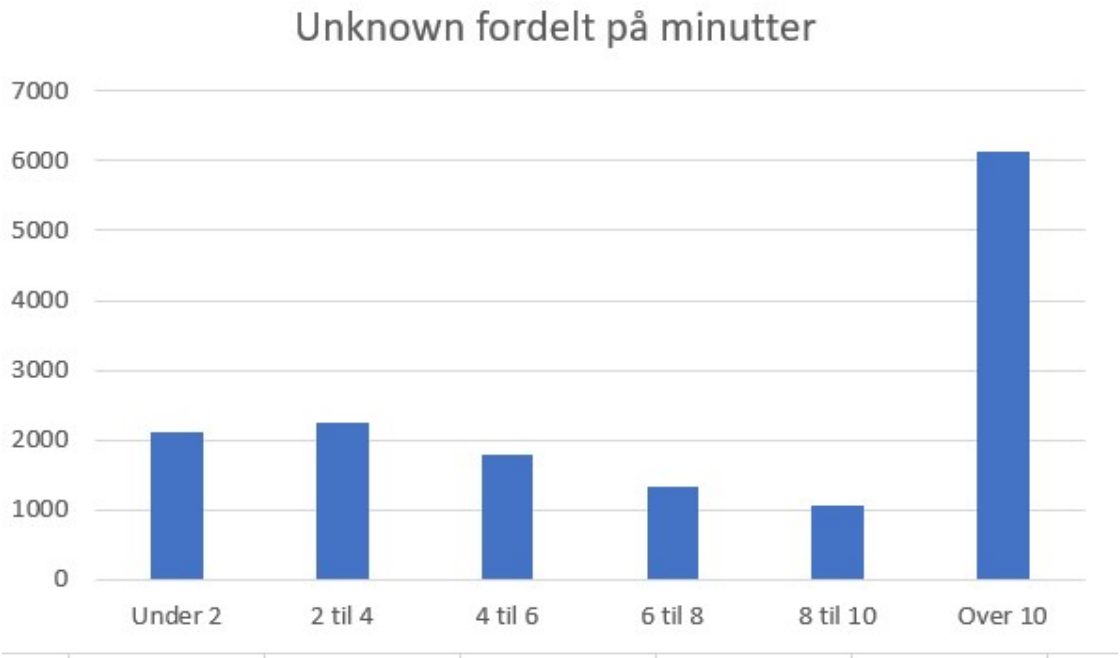

Figure 2: Trips with unknown purpose by duration of the trip from TravelVu data fall 2019

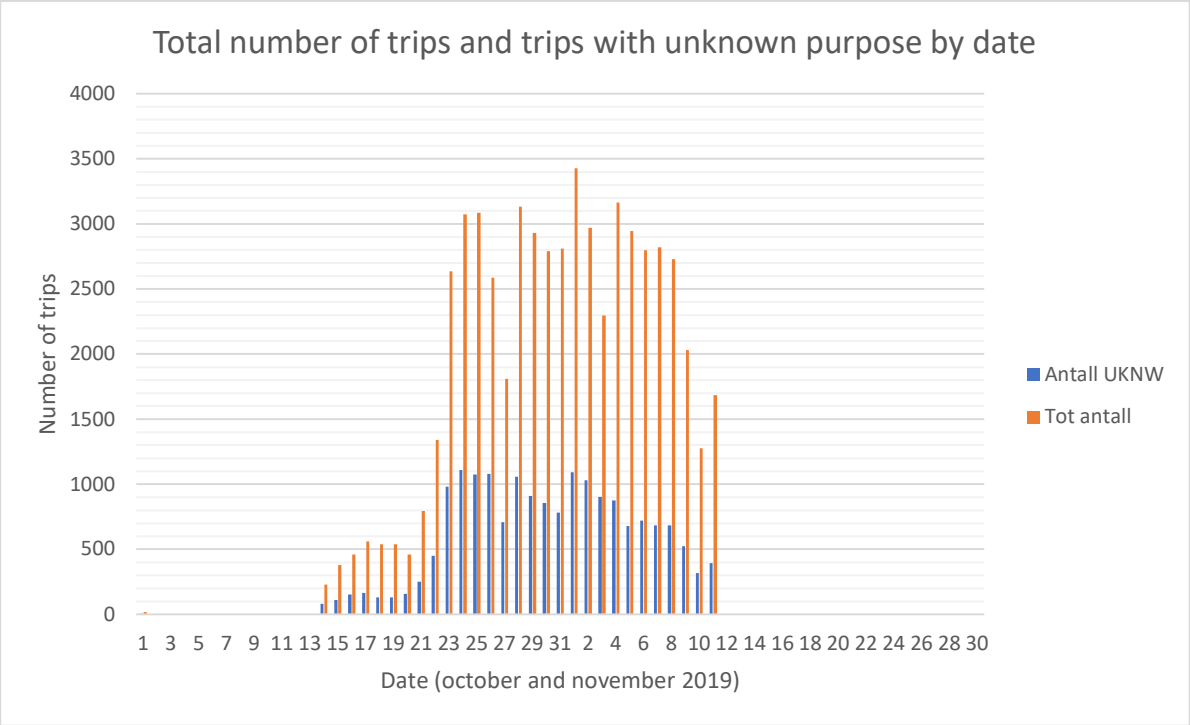

Figure 3: Total number of trips registered and number of trips with unknown purpose each registration day from the TravelVu data fall 2019

Table 6 shows results from TravelVu and NRVU on trip frequency on each age group and mode. The walk mode has many more trips in the TravelVu data compared to NRVU. This is probably related to shorter trips by foot, which are harder to remember by the respondents when reporting trips via phone interviews or self-reporting on web. However, this might also be a result of the app misinterpreting stops on the way as separate trips. We also see a higher rate of trips by public transport reported from the TravelVu data than in the NRVU data. The explanation might be that the respondent has a transfer as part of the trip, and do short errands while waiting, in which case it should be a separate trip, or it might be that the waiting is interpreted as a stop, and is not corrected by the respondent. The over representation of trips from TravelVu and underrepresentation in NRVU seems to be linked to mode choice. We have started a process of looking into explanations for the differences in trip frequencies, which will be completed in the near future.

Table 6: Mode distribution in trip frequency pr day and respondent from TravelVu and NRVU

	TravelVu					
	Walk	Bicycle	Public transport	Car	Other mode	Total
18-24	2,0	0,3	1,3	0,8	0,2	4,6
25-44	1,6	0,4	0,7	1,6	0,3	4,7
45-64	1,4	0,3	0,7	1,9	0,3	4,7
65-70	1,5	0,3	0,7	1,5	0,2	4,3
Total	1,6	0,3	0,8	1,6	0,3	4,7

	NRVU					
	Walk	Bicycle	Public transport	Car	Other mode	Total
18-24	1,2	0,3	0,8	1,1	0,1	3,4
25-44	0,9	0,4	0,4	1,7	0,0	3,4
45-64	0,6	0,3	0,3	1,7	0,0	3,0
65-70	0,8	0,1	0,3	1,4	0,0	2,6
Total	0,8	0,3	0,4	1,6	0,0	3,2

2.4 Discussion

2.4.1 Trip frequency

The trip frequency is a lot higher in the TravelVu data set than in the National travel survey. In average TravelVu produce 1,5 more trips. It is necessary to investigate the reasons for this before the data can be applied for planning purposes.

2.4.2 Activity distribution

As we can see from the tables previously, the other activity is contributing with many trips in TravelVu. A further investigation of these indicate that trips have an unknown purpose. To investigate likely purposes, it would be possible to look at the location of these trips, to explore which activities could be done there.

2.4.3 Mode distribution

The mode distribution has some skewedness, with far more walk trips in TravelVu than in the NRVU. This is probably linked to short trips which have been mentioned in previous studies (Runestad, 2018).

2.4.4 Conclusion and way forward

This investigation, however brief, give some indications about where to continue searching for differences. One main task which needs to be done first is to investigate the activities with unknown purposes.

3 References

Runestad, Ingrid Lunde (2018): SmartRVU – Er det smartere? Eng: Smart Travel Survey – is it smarter? Master thesis at NTNU 2018.

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