The individual acceptability of students for travel demand management measures

A research in the Dutch context of overcrowded trains

TU Delft

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A research in the Dutch context of overcrowded trains

By

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Preface

Dear Reader,

It is with appropriate pride that I present to you my thesis, titled, *The individual acceptability of students for travel demand management measures.* This research explores the acceptability of travel demand management measures among the most impacted actors, student and teachers. The thesis has been written in fulfilment of the requirements for my graduation from the Complex Systems Engineering and Management programme at TU Delft, towards obtaining the 'MSc degree' and the title of 'ir.'.

In 2017, during my final secondary school exams for the HAVO, I could never have imagined that I would one day submit a master's thesis at Delft University of Technology in pursuit of the 'ir.' title. To this day, I regard my decision to shift from HBO-level to WO-level of education as one of my most valuable choices. I must take this opportunity to express my gratitude to the Dutch education system, which made this academic progression possible.

While working on this master's thesis, I began to grow into the role of a researcher. Towards the end of the project, I even experienced a sense of loss at having to complete the research, as the topic had become almost a part of me.

Now, it is time to express my thanks. First, I extend my deepest appreciation to my entire thesis committee for their support and feedback the whole period. I am especially grateful to Professor Dr Van Wee, who served as Chair, Professor W.W. Veeneman and Dr M.L.C. de Bruijne as my second supervisors.

And, in particular, Dr J.A. Annema, my first supervisor, for the invaluable feedback sessions. At times, I found myself lost in the complexity of the research process, uncertain of the direction to take. In such moments, I could always schedule a meeting with you, despite my strong desire to complete this thesis as independently as possible.

Lastly, I would like to thank those without whom this research would not have been possible: the interview respondents.

With my thanks extended, the real work now begins for you. I wish you an enjoyable read!

December 2024, Rotterdam.

D.J.H. (Dennis) Botman

Summary

Train overcrowding during peak-time has become a serious issue in the Netherlands, with Nederlandse Spoorwegen (NS) identifying it as one of its most pressing challenges in the coming years. This problem is worsened by staff shortages, particularly among conductors, and limited capacity expansion options due to infrastructure constraints. Current railway infrastructure is already at maximum capacity, and any expansion efforts would involve substantial financial investments and will take a long period. Consequently, NS incurs high fixed costs associated with accommodating peak-time demand, which it warns will only increase if the current rush hour issue is left unaddressed. Overcrowding negatively impacts potentially both operators, through increased delays, high costs and inefficiencies, and passengers, who face discomfort and stress during crowded journeys. One of the largest groups of rush-hour travellers nowadays is the Dutch student. At the same time, Dutch students hold a unique position regarding travelling with public transport. Students in the Netherlands benefit from government-subsidised travel through an OV subscription, allowing free public transport during the week, including peak hours, which contributes significantly to overcrowded trains. This subsidy arrangement places the financial responsibility for student travel on the government rather than students, reducing direct incentives for students to avoid rush-hour travel.

In the academic literature, there is limited insight into the specific acceptability of Travel Demand Management (TDM) measures within the Dutch student context, a gap that this exploratory research has addressed. By exploring various TDM strategies – both pricing and non-pricing measures aimed at managing travel demand - this research provides a foundation for future academic hypotheses that can be used to guide further research and address other knowledge gaps in the academic field. The academic objective of this research was to explore TDM measures that could reduce student train travel during peak hours by identifying the measures with the highest acceptability. The societal relevance of this research is the contribution of the insights for further policy making about TDM measures in the Netherlands. The central research question guiding this study is therefore:

What is the acceptability of different travel demand management measures among the direct impacted actors to reduce the number of students on trains during rush hours?

The most impacted actors are the students and teachers. Both actors, and specifically the students, will be affected by nearly all TDM measures which will be designed for students. Therefore, during this research an individual acceptability framework specific to students was developed, based on academic literature on acceptability factors. This had resulted in a two-sided framework, with factors independent of TDM measures on one side and factors dependent on each specific TDM measure, such as effectiveness, fairness, and affordability, on the other. For teaching staff, no individual acceptability framework was created, and they are not interviewed based on such a framework. The inclusion of teaching staff in this research was intended to broaden the perspective on TDM measures by examining potential impacts on educational quality, teaching practices, and potential objections.

The TDM measures central to this research are grounded in a review of academic literature, considering the landscape derived from the actor analysis. Based on this literature review, six TDM measures were selected, comprising one pricing measure and five non-pricing measures. The pricing measure is ‘increasing the cost of train travel for students during peak hours by 50%’. The non-pricing measures include ‘adjusting schedules with or without a reservation

system[1]', 'compressed workweeks', 'online education', and, lastly, 'increasing the availability of hospita housing'.

Semi-structured interviews were conducted with HBO-level and WO-level students to assess the six TDM measures against the factors in the individual acceptability framework, in total 12 students were interviewed. Simultaneously, semi-structured interviews with 5 teachers were conducted to capture the potential impact of TDM measures on educational quality, teaching methods, and therewith possible concerns from them. Because it is crucial for policy making to avoid TDM measures having a high acceptability to students but rejected beforehand by the teaching staff.

The findings from the interviews indicate that the students interviewed demonstrate a notable awareness of the issue of overcrowding in public transport. However, this awareness is primarily driven by personal discomfort experienced during peak travel times rather than by non-personal concerns. This contrasts with existing literature, which suggests a stronger or more explicit relationship between awareness of such issues and a sense of moral responsibility to adjust behaviour. Despite this, the interviewed students show some willingness to adapt travel behaviour in general, particularly when incentives are provided.

Among the measures evaluated, 'increasing peak-hour travel costs by 50%' emerged as effective in shifting travel behaviour, However, concerns were raised by both students and teachers regarding the perceived fairness of this measure and its potential negative impact on educational quality, especially due to missed early lectures. 'Adjusting schedules, potentially alongside a reservation system for study spaces', is seen as both fair and effective for especially the morning rush hour by the respondents. Additionally, the measure 'compressed workweek', with as a result fewer travel days, is widely favoured for its potential efficiency by students. However, concerns regarding the feasibility of maintaining focus during extended study days were particularly highlighted by teachers.

Fully 'online education' is perceived highly effective for decreasing the number of students in the train but is very unpopular, as recent experiences with remote learning during COVID-19 underscore its limitations for educational quality according to both student and teachers who were interviewed. Moreover, it is important to emphasise that the primary aim of this research is not to eliminate student travel entirely but to achieve peak spreading. From an academic perspective in hindsight, therefore, fully online education is considered a disproportionately drastic solution to the problem of overcrowding. This aligns with literature describing the paradox whereby highly effective rush-hour avoidance measures could significantly reduce overall public transport usage, which is not the intended goal of TDM. The measure 'more availability of hospi housing' has a high acceptability, although this was largely due to a consensus that more student housing is needed in general, rather than specific support for the measure 'hospi housing' itself. The decision for students to choose for hospi housing depends on very various factors, which are beyond the scope of this research.

Based on the research, it is recommended to further explore the measures of 'adjusting schedules' and 'compressed workweeks.' Both measures demonstrate promising acceptability within the target group, providing a strong foundation for further academic and practical societal research. However, potential logistical and organisational limitations should be carefully considered. Future societal research could investigate the acceptability of these measures in a multi-actor context to ensure broader institutional acceptability and increase the likelihood of successful policymaking.

[1] Reservation system for students in order to reserve study spaces later then 08:30 - 09:00.

This research concludes that no single ‘silver bullet’ solution has been identified that directly can be implemented and can receive a high level of acceptability. Nonetheless, the measures ‘adjusting schedules’ and ‘compressed workweeks’ show significant potential as said. Therefore, it is recommended that another future research could focus on refining these measures into more nuanced sub-measures. These sub-measures should then be tested for their acceptability, with the potential of offering a more targeted and effective approach to addressing the issue for specific groups.

In the existing academic literature, a significant gap was identified concerning the acceptability of TDM measures among Dutch students. In addition to the practical recommendations above, this study has yielded some noteworthy academic insights. While students exhibit a high degree of problem awareness, this does not, contrary to what is suggested in the literature, translate into a moral responsibility to change their behaviour without getting something in return. Furthermore, this research reveals that the Dutch student population is characterised by greater diversity in acceptability perceptions than initially assumed.

This diversity appears to be influenced by variations in socio-economic backgrounds. As a result, the acceptability framework presented in this report has been expanded to explicitly incorporate socio-economic factors. Building on this, future academic research is recommended to investigate the potential relationship between socio-economic factors and the acceptability of TDM measures. Such research could inform the development of tailored measures for groups with similar socio-economic profiles, thereby improving both their effectiveness and fairness and therewith their acceptability. Furthermore, it is advised that future research maps the geographic distribution of overcrowding to avoid implementing nationwide measures for issues that may be regional in nature.

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1. Introduction

Each day, approximately 1.1 million passengers use the Dutch railway system, with the primary users during peak hours being two groups: a) working commuters, travelling between home and work, and b) students, commuting between home and their educational institution (CBS, 2024; van Daalen et al., 2018). NS, the Dutch railway operator[2], identifies one of its most pressing future challenges as train overcrowding (NS, 2023). This issue is exacerbated by significant staff shortages, particularly among conductors, limiting the operator's capacity to run trains at full service. Furthermore, NS currently has all its staff and rolling material set to peak times, while the rest of the day the trains are mostly empty. On average throughout the day, only 1 out of 3 seats is occupied. As a dilemma, NS therefore writes in its last annual report, “as a result, our fixed costs are high and if we do nothing about the hyper rush hour they will continue to rise” (NS, 2023, p. 13).

Peak hours, as defined by NS, occur between 06:30 and 09:00 in the morning, and between 16:00 and 18:30 in the evening. The simultaneous travel demands of large groups of passengers for different purposes create a daily congestion problem during these periods (Daniels & Mulley, 2013). Whereby, the morning peak is larger than the evening peak. Overcrowding is described when passengers experience negative feelings due to crowding during their trip. Notably, the Dutch student population, due to government-subsidised travel as part of their student finance scheme, constitutes a significant portion of non-directly paying passengers during these times. This subsidy arrangement means the financial burden of student travel is shouldered by the government rather than the students themselves. So, at this moment there is no direct pressure for Dutch students to not travel during the peak hours.

Overcrowding poses multiple challenges for both the rail operator and passengers. For NS, congestion on trains can lead to increased delays and disruptions, impairing the efficiency of its operations (Yoo et al., 2022). For passengers, crowded trains often result in an uncomfortable travel experience, potentially inducing stress, fatigue and anxiety (Cox et al., 2006). More critically, overcrowding may drive paying commuters to opt for private car travel, a more polluting alternative, thus exacerbating negative externalities, including a greater negative environmental impact (Evans & Wener, 2007). So, these implications make it important to think about options to reduce the crowdedness during peak hours.

Addressing overcrowding, particularly during peak times, requires strategic intervention. In the literature, two main approaches are discussed: increasing rail capacity or reducing/spreading demand. Expanding capacity, although common, is often suboptimal due to the high investment required, the extended timelines for infrastructure development, and the potential for additional negative externalities (Preston et al., 2017). Furthermore, capacity enhancements drive up the overall cost of public transport, as peak-hour traffic is a significant cost driver (Eriksson et al., 2023b).

A potentially short- and medium-term effective solution to reduce overcrowding is to target student travel behaviour, specifically by encouraging students to travel outside peak hours. This can be achieved through the implementation of TDM measures. Demand management can be described, according to Mahudin (2018, p. 492), as “the collection of operational, administrative, and economic policies designed to ensure that demand for the utilisation of rail transportation resources is kept at a manageable level, especially during peak commuting periods”. While there is a wealth of research on TDM measures, much of the focus has been on reducing car usage and a shift to public transport, primarily for environmental reasons or to alleviate road congestion. The unique context of student travel in the Netherlands, where students enjoy free weekday travel, remains underexplored in literature.

[2] In Dutch: Nederlandse Spoorwegen

Central to this research is the concept of acceptability, which is used to assess the potential support for various proposed TDM measures. Acceptability is defined by Schade & Schlag (2003, p. 47) as, “acceptability describes the prospective judgement of measures to be introduced in the future, so before the measure is implemented”. In the Netherlands, where consensus politics plays a key role, the acceptability of measures is particularly important. Research indicates that the acceptability of travel demand management measures is crucial in determining not only their effectiveness in changing travel behaviour but also a step before in their political feasibility (Schade & Schlag, 2003).

An actor analysis conducted reveals that numerous stakeholders are involved in this issue. However, it has also become evident that there are two actors who will be directly affected by almost all TDM measures, namely the student and, to a lesser extent, the teaching staff. Additionally, students are the end-users of nearly all potential TDM measures, which are specifically tailored to meet the needs of Dutch students. It can be logically anticipated that these directly impacted actors are likely to be the most vocal in opposition, thus presenting the greatest research potential regarding acceptability in this specific case and are academically the most interesting.

Accordingly, the focus is on individual acceptability rather than institutional acceptability. Focusing on individual acceptability will provide this research with critical insights into students’ willingness to adapt their travel behaviour in response to new measures, a factor essential to the practical success of TDM strategies. By contrast, focusing on institutional acceptability could overlook these crucial individual perspectives from the most impacted actors. Furthermore, in this research, the decision was made to focus exclusively on students in higher education. The primary reason for this choice is that there are fewer HBO and WO institutions in the Netherlands than MBO institutions. As a result, HBO and WO students typically travel longer distances by train, making their travel patterns more relevant to this research (Bakker & Wortelboer, 2014).

While the existing literature provides a comprehensive understanding of TDM measures as a means to influence travel behaviour, there exists a notable gap in research concerning the acceptability of such measures in the specific context of Dutch student travel. Additionally, from a societal perspective, it is also valuable to gain further insight for policymakers into the most promising TDM measures for students. Given the importance of acceptability for the successful implementation of policy measures in the Netherlands, the following main research question has been formulated:

What is the acceptability of different travel demand management measures among the direct impacted actors to reduce the number of students on trains during rush hours?

To answer the main research question the following sub-research questions are formulated:

1. *Which actors are involved and what are their interests?*
2. *Which factors influence the degree of acceptability of a travel demand management measure?*
3. *What demand management measures exist to reduce student travel demand during rush hours?*
4. *What is the current level of acceptability of various travel demand management measures to reduce the number of students on trains during rush hours in the Netherlands?*

Study programme relevance

The master's programme in Complex Systems Engineering and Management (CoSEM) at Delft University of Technology prepares students to address challenges within complex socio-technical systems. This programme emphasises the importance of adopting a broad perspective. In this research, such a wide scope is crucial due to the many interests involved and the presence of a multi-actor environment. The social component lies in the potential sensitivity of the issue among different stakeholders, especially the actors which will lose something, while the goals and technical aspects must not be ignored. Furthermore, various methods, techniques, concepts, and, above all, skills are employed that are central to the CoSEM programme. This aligns the research with the focus on navigating socio-technical processes from a multi-actor perspective.

Report structure

The following chapter lays the foundation by introducing and clarifying the problem and key concepts that ultimately had led to the formulation of the above sub-questions and primary research question. Subsequently, the research approach is outlined, guiding the methodology used to address the various sub-questions aimed at answering the main research question. The next three chapters will each address one of the first three sub-questions. From Chapter 7 onwards, the focus will shift to data collection for answering the fourth sub question by using the method semi-structured interviews. A chapter will then be dedicated to interpreting the obtained results of all chapters and discussing potential possibilities for future research. Finally, the report will conclude in Chapter 9 by answering the main research question in the conclusion.

2. Literature overview

In this chapter, several concepts, primarily drawn from the literature, will be introduced to provide context and further explanation and justification for this research. This foundation is essential for understanding the broader environment within which the research is situated.

2.1 Trains and students in the Netherlands

In the year 2023, NS passengers made a total of 15.5 million passenger kilometres, representing a percentage increase of nearly 17% compared to the year 2022. In the Netherlands, the management of the railway is unbundled from the use of the railway for transporting passengers and freight. The rail network in the Netherlands is managed by ProRail on behalf of the Ministry of Infrastructure and Water Management (van der Velde, 2013). NS holds the main rail concession until 2033 and therefore the majority of passenger rail transport in the Netherlands. Besides the NS, there are some other operators operating on single rail links or small regions, these are negligible for this research.

From 2009, the OV-chipcard was gradually introduced in the Netherlands, with an anonymous variant and a personalised variant (NOS, 2011). This OV-chipcard replaced paper train tickets, and paper subscriptions. This new card allows travellers to use it to check in and out of the public transport in the Netherlands, either by putting credit on it in advance or by linking a banking account from which the fare is debited. The OV-chipcard also allows subscriptions to be placed on it, such as a route-free subscription or a subscription offering discounted travel during off-peak hours.

Since 1991, the governmental rule was introduced that students could travel entirely for free on public transport (Westendorp, 1997). This rule for students falls under the overall Student Finance Act[3], this law regulates study financing for all students in the Netherlands (Tweede Kamer der Staten-Generaal, 1994). This new public transport regulation was driven by the desire of the Dutch parliament at the time to simplify study financing regulations. The OV student card would replace the then individual travel reimbursement that had become unworkable due to many changes and more and more students. From 1994, the scheme changed that students had to choose between either travelling for free on public transport during the week and then with a discount in the weekend, or vice versa. The reason for this downsizing of the travel product was driven by cost savings. Since the introduction of the OV-chipcard in 2009, the student scheme can be added as a subscription on the OV-chipcard. According to the Dutch government, anyone eligible for student finance is also entitled to the student travel product (Rijksoverheid, 2024). A few conditions have been set by the Dutch government: students must be enrolled full-time at an accredited institution in MBO-, HBO- and WO-level of education, and the person must be under the age of 30 at the start of their financial aid eligibility.

In 2023, 56% of Dutch students were still living at home with their parents (Kences, 2023). More students would like to live in his or her student city, but affordability is given as the main reason why students still live at their parents' place. Another reason heard from students surveyed in the Kences (2023) study is the fact that there is simply no housing available, this scarcity will in turn lead to rising prices. In the year 2023, there was a housing shortage of over 23,000 student houses in The Netherlands (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2023). The proportion of students living at home has only increased in recent years (Kences, 2023). And with it, so has the number of students using the train to get to the city of education. Research form NS shows that during rush hour, nowadays, 26% of train passengers currently use this student public transport card (Wagemans, 2023). In the

[3] in Dutch: 'wet op studiefinanciering'

year 2013, the motivation 'educational participation' was about 20% of the total kilometres travelled by train (Bakker & Wortelboer, 2014). The assumption is made that students living at home or not in their student city are the vast majority of student travellers who use trains during rush hour to participate in education. The student group can be considered as a group of travellers who are all characterised by their entitlement to the student public transport card. A measure that is motivated by political will and, unlike the other rush-hour travellers, does not impose any cost on the traveller.

2.2 (Over)crowded trains

"The need for many people to travel at similar times, albeit for different purposes, creates the daily peak problem with weekday morning and evening peaks" (Daniels & Mulley, 2013, p. 144). In general, according to Daniels & Mulley (2013) and Hale & Charles (2009), the morning peak is larger than the evening peak due to limited options for leaving earlier due to daily cycles of working hours and simply existing biorhythms. The evening peak is according to the same researchers smaller and more dispersed because there is a wide range of activities that travellers can do before going home, giving them more flexibility in planning their trip home. Research by Van Daalen et al. (2018) indicates that during peak hours, more than 90% of train passengers travel with the purpose of work or education. During peak hours, train passenger demand is four times higher than during off-peak hours. Figure 1 below illustrates passenger demand at different times of a working day, with the blue line representing relative travel demand throughout the day with travel motive 'work/study'. This figure also reflects the observations of Daniels & Mulley (2013) and Hale & Charles (2009), namely that the morning peak is more significant than the evening peak.

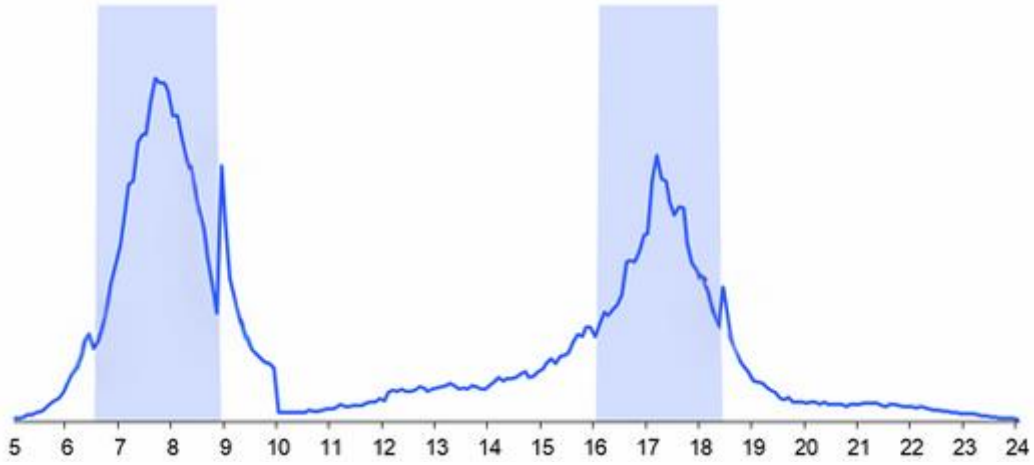

Figure 1, relative passenger demand with motive 'work/study' for Dutch train at different times of working day. From van Daalen et al. (2018, p.29).

Trains have a certain capacity. Several facets determine the capacity of a train such as, the length of the train, the train layout and the number of seats and standing places (Hale & Charles, 2009). Crowding in its simplest form can be defined as "a high level of demand relative to the vehicle capacity" (Pel et al., 2014, p. 112). Overcrowding is then described when passengers experience negative feelings due to crowding during the trip. The Association of Train Operating Companies argues that passengers start to experience a disutility for crowding when the demand exceeds 70% of the seating capacity (Pel et al., 2014). Other research in the UK by e.g. Wardman & Whelan (2011), already shows that discomfort occurs when the demand exceeds 50% of seating capacity.

From the field of social science overcrowding can be described according to Evans & Wener (2007, p. 90) as, "overcrowding occurs when the regulation of social interaction is unsuccessful and our desires for social interaction are exceeded by the actual amount of social interaction experienced". Each individual will describe crowding in their own way, so it is important to

introduce ‘perceived crowding’ as a term. Besides crowding, according to Lizbetin (2018, p. 1), the quality of a transport service is determined by several indicators namely, reliability, regularity, safety, speed, transportation cost, environmental impact, transport comfort, efficiency and availability. Where crowding as part of the comfort indicator is one of the many indicators for an overall satisfying travel experience.

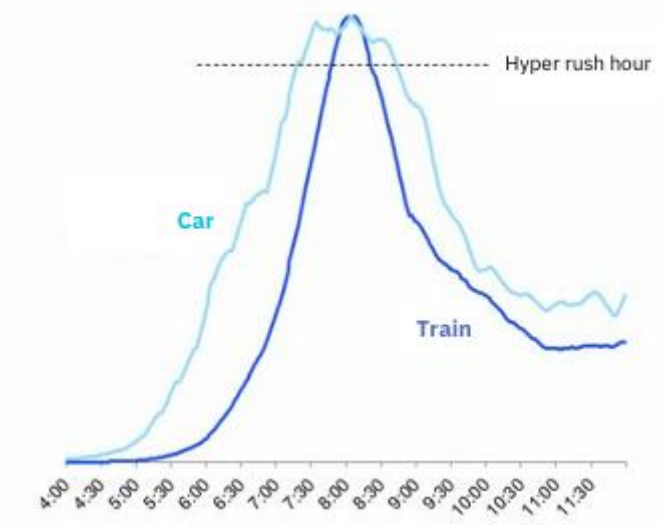

Figure 2, rush hour and hyper rush hour morning peak train and car
From van Daalen et al. (2018, p.28).

NS internally uses a standard for defining a 'crowded train' that says “a train gets labelled 'full' once all fixed seats are occupied and the balconies have 4 passengers per square metre” (NS, 2023, p. 39). Based on NS' definition, there was an average of 94 crowded trains per working week in the year 2023. Furthermore, according to NS (2023), the corona period has permanently changed passenger behaviour. Travellers work at home more often, especially on Wednesdays and Fridays. And on the contrary, they travel more often on Tuesdays and Thursdays during the hyper rush hour. The ‘hyper rush hour’ is defined by NS as the period in the morning from 07:30 to 08:30, see the dotted line in Figure 2 below. The figure also indicates that the peak in car traffic is less concentrated in time compared to train travel demand.

NS currently has all its staff and rolling stock set to peak times, while the rest of the day the trains are mostly empty. On average throughout the day, only 1 out of 3 seats is occupied (NS, 2023). As a dilemma, NS therefore writes in its annual report, "As a result, our fixed costs are high and if we do nothing about the hyper rush hour they will continue to rise. NS therefore wants to spread passengers more throughout the day" (NS, 2023, p. 13). An additional benefit for society is that spreading travel throughout the day can be regarded as more sustainable, as overall capacity requirements during rush hours can decrease (Evans & Wener, 2007). This improvement in efficiency reduces the number of surplus seats outside peak hours, subsequently increasing the occupancy rate of remaining trains. Furthermore, it can be argued that a more efficient distribution of travel throughout the day—and consequently, of train deployment—can reduce costs for the operator, potentially also benefiting the passenger.

According to Pel et al. (2014, pp. 112 - 113), several subjective indicators have been identified that contribute to travellers' perception of crowding. It was found that the perception of crowding is partly caused by the trip purpose, regular conditions, trip time, time of the day, vehicle layout, uncertainty on expected level of crowding and age.

2.3 Effects of overcrowding

Having defined (over)crowding and the factors that determine it, it is now important to describe the effects of overcrowding. This is because overcrowding can cause potential problems for both the train operator and the passengers.

Operators

Overcrowded trains can cause boarding to take longer and thus increase the number and duration of delays. A study by Cox et al. (2006), shows namely that train delays increase with passenger density. For operators, this means that the available capacity is not being used optimally and therefore (financially) inefficient (Yoo et al., 2022). For NS, delays can have negative consequences, besides inefficiencies, it is also expected that for a delay of more than 30 minutes, NS will refund part of the ticket to the traveller (Ministerie van Infrastructuur en Milieu, 2014). For a delay of more than 60 minutes, this amount can rise to refunding the entire train ticket. Furthermore, in the Dutch case, during the concession award, agreements were made between the Dutch government and NS regarding performance, should NS fail to achieve certain performance, a fine follows and, in the worst case, NS may lose its concession for the next concession period (NU.nl, 2024). In addition, overcrowded trains can create a negative perception of train travel in general with the consequence that people will make other choices for travelling (Tirachini et al., 2013). This is undesirable from the operator's point of view, of course, as it may result in a loss of passengers and therefore revenue. But it can also be undesirable from a social and political perspective. If people will avoid the train due to the negative effects of (over)crowding and take the car instead for the same journey, this will have a more negative impact in terms of CO_2 emissions and potential more road congestion (Evans & Wener, 2007; Haywood et al., 2017).

Furthermore, there is, a significant cost component related to the large deployment of staff and equipment during peak hours. In line with this, Eriksson et al. (2023a), argue that one of the main cost drivers identified is peak-hour traffic for train operators.

Passengers

For passengers, according to Preston et al. (2017), the lack of physical space can lead to reduced productivity and increasing levels of stress. By Cox et al. (2006), Figure 3 below was constructed called 'model of crowding, stress, health and safety' and visually illustrates well the influence of (perceived) crowding and its consequences. Research by Mahudin et al. (2011), shows that perceived crowding can be a potential hazard not only for the health of individual travellers but also for organisations. In fact, these researchers argue that through some of the persons who perceived overcrowding during their trip to work, and therefore stress/fatigue, may spill these symptoms into organisations. This stress/fatigue of employees can then have a negative effect on the performance of entire teams, according to the researchers, and thus a negative impact on the work floor, for example by increasing conflicts due to fatigue. There has been limited direct research on the effects of overcrowding in trains on student performance. But the assumption is made that students as being train passengers are part of the model established by Cox et al. (2006) and thus experience negative effects of crowding on trains.

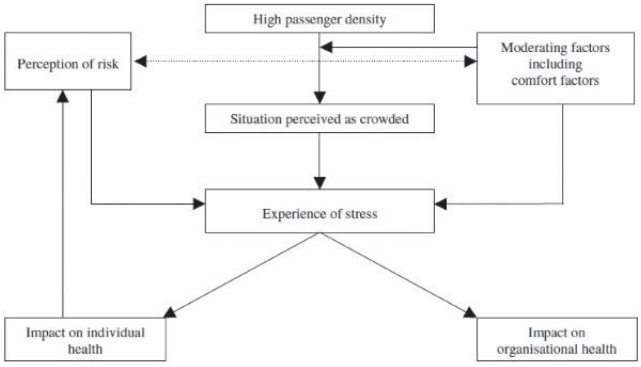

Figure 3, model of crowding, stress, health and safety by Cox et al. (2006, p.250).

2.4 Reducing overcrowding

Now that it has become clear what overcrowding is and what the consequences can be. It is important to review the literature that discusses how to reduce (over)crowding. A comparatively high amount of (academic) research has been done in this area. To reduce crowding, there are actually two main streams in the literature, see Figure 4 below. Namely, a) increasing capacity to reduce crowding and b) adjusting demand to reduce crowding especially during peak hours (demand management).

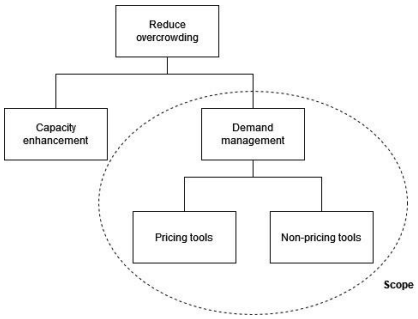

Figure 4, ways to reduce (over)crowding - 2 main streams.

Capacity enhancement

Increasing rail capacity is mainly about expanding the rail network. With options such as running more trains on the same track and thus densifying the timetable. However, this is difficult for NS because the 'track ceiling'[4] is almost reached and there are major capacity bottlenecks due to a lack of staff (NS, 2019; NS, 2023). Other options include expanding the rail network (constructing new rails etcetera), however, these are long-term solutions that are very capital-intensive. Preston et al. (2017, p.3), summarise this straightforward with, "just increasing the capacity to combat crowding can be challenging and may not always be cost-effective". Though an instinctive response to rising public transport demand is to increase capacity, such improvements require long time frames and significant resources (Halvorsen et al., 2019). As a result, capacity expansion to reduce crowding is not a short- or medium-term option and will not be within the scope of this research. Furthermore, capacity enhancement is not cost-effective, particularly for the operator and ultimately for the customer, as the significant extra capacity would only be needed during (hyper)rush hour. This inefficiency is evident from the fact that only 1 out of 3 seats is occupied during off-peak hours. This extra capacity does

[4] In Dutch: spoorplafond

need to be paid for by someone, which will ultimately be the passenger or the Dutch taxpayer if the government will pay.

Demand management

Demand management can be described according to Mahudin (2018, p. 492), as “the collection of operational, administrative, and economic policies designed to ensure that demand for the utilisation of rail transportation resources is kept at a manageable level, especially during peak commuting periods”. These policies can be designed by different actors, like the operator itself or for instance governmental bodies. Travel demand management aims to influence the time, destination, route or mode of the travel behaviour choice through pricing and non-pricing tools (Daniels & Mulley, 2013). Demand management solutions in order to reduce crowding, unlike capacity expansion, is suitable for short- to medium-term results. Demand management solutions could also be long-term, however, the focus will not be on these. It is valuable to consider two potential objectives or effects of TDM measures: peak spreading and peak avoidance. Figure 5 below provides a graphical representation of the distinction between these two concepts.

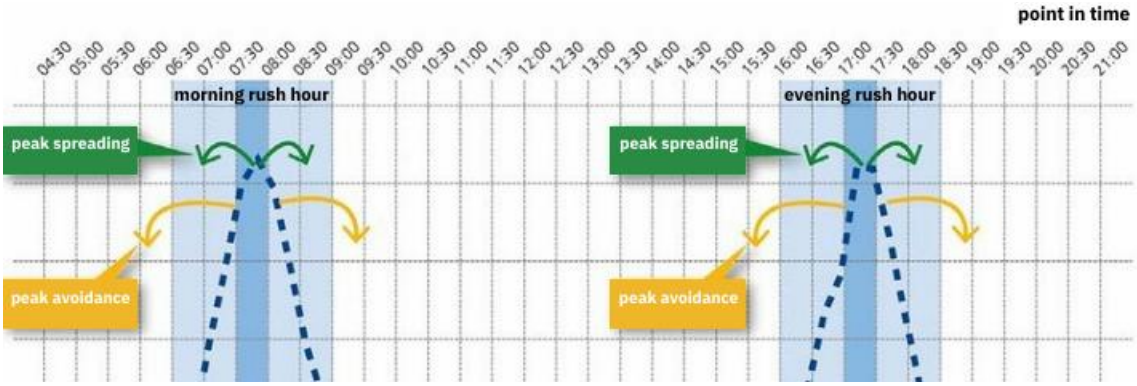

Figure 5, difference between peak spreading and peak avoidance.
From van Daalen et al. (2018, p.29).

Much has been written in the literature about pricing transport during rush hours to reduce peak crowding by dividing travellers over time (Pavlíčcek & Sudzina, 2020; Weesie et al., 2009). Raising prices during peak hours can be characterised as a 'stick measure'. Different traveller characteristics determine the sensitivity to these measures. According to Daniels & Mulley (2013), influencing travellers' choice of time of travel is at the heart of peak spreading. In 2013, research was conducted on behalf of the Ministry of Infrastructure and Environment into the consequences of abolishing free travel for students, conducted by Bakker & Wortelboer (2014). In the research by Bakker and Wortelboer (2014), eight alternative product formulas for the current student travel passes were examined, all of which involved a reduction of existing benefits. The study indicates that, across all eight pricing alternatives, the total number of student passenger kilometres would decrease by between 1% and 15%. There is considerable variation in the impact of each alternative on train usage during peak hours. According to the researchers, the alternative where students no longer receive a discount during peak hours and are required to pay the full fare themselves results in a reduction of up to 50% in the number of passenger kilometres, more details about this research in Chapter 6.

Besides pricing options, there are also non-pricing measures. For example, by Preston et al. (2017), which focused on improving information provision. Other research by Ljungberg (2015) has been done on adjusting (lecture) schedules. This research shows that adjusting the start time of lectures could reduce rush hour congestion and therefore fewer public transport modes are needed overall because the peak amount is smaller due to better distribution of passengers throughout the morning. A similar measure has been introduced in the east of the Netherlands by the HAN University of Applied Sciences and The Radboud University. It turns out that the number of train passengers was significantly reduced at peak times (van Heest, 2018). The

number of peak-time travellers decreased by as much as 19% on trains, 27% on buses, and 19% on the bicycle's paths (Nationale Onderwijsgids, 2018).

Whatever option is chosen within the demand management toolkit ultimately has to be socially and politically supported in addition to being effective. To accomplish acceptance of a measure, the interests of the various actors should therefore be taken into account by decisions according to Macharis et al., (2010). Because an option or combination of options can be effective, once there is no majority for it, it will not happen. Pricing, for example, is a socially and politically sensitive issue. Also, people in general do not like it when his or her existing benefits are reduced (Gärling, 2007). Demand management can also go too far and push travellers away from public transport. Authors Daniels & Mulley (2013), warn that successful rush-hour avoidance can make public transport less attractive to the most likely users and therefore lead to lower overall use of public transport.

2.5 Acceptability

The terms 'acceptance' and 'acceptability' are frequently used interchangeably in the context of defining, obtaining, or generating support for a policy measure, while there is a significant difference (Vlassenroot et al., 2008; Alexandre et al., 2018). It is therefore important to first make a distinguish. Acceptance is defined as "the respondents' attitudes including their behavioural reactions *after* its implementation" (Schade & Schlag, 2003, p. 47). In contrast, as defined by Schade & Schlag (2003, p. 47) "acceptability describes the prospective judgement of measures to be introduced in the future, so before the measure is implemented". Making acceptability crucial for generating insight in potential support of the public before implementation (Nilsson et al., 2016). While, political feasibility often hinges on public acceptability, which complicates policy decisions, especially for coercive measures like several travel demand management measures (de Groot & Schuitema, 2012). Effective policies may be unpopular, creating a tension between political viability and policy effectiveness (Steg, 2003). This tension highlights the importance of measuring acceptability, which will be further explored in Chapter 5 of this report. This fifth chapter will namely focus on developing a theoretical framework to assess the individual acceptability of new measures, particularly in the context of Dutch students.

2.6 Conclusion and academic research gap

Overall, several issues have become clear. In the Netherlands, trains are perceived as excessively crowded during rush hours, leading (potentially) to negative consequences for both operators and passengers. A significant portion of travellers during these hours are students, who predominantly utilise the free student travel scheme, which make them a special group. While expanding rail capacity is not feasible in the short term, TDM measures could potentially help redistribute passengers. However, TDM measures for Dutch students and their acceptability among the direct impacted actors, remain unclear in the (academic) literature nowadays.

To conclude, despite extensive research in the field of TDM measures, a significant academic literature gap remains in understanding the acceptability of these measures within the context of Dutch students and their train behaviour. Much of the existing TDM literature has focused on utilising TDM strategies to reduce car usage, while research on TDM measures in public transport has predominantly centred on their effectiveness in influencing the behaviour of all travellers. There is, therefore, a notable lack of research specifically addressing the acceptability of these measures for a particular group—in this case, Dutch students. This substantial practical research gap presents an opportunity for further exploration, leading to the central research questions as introduced in the introduction above. In addition to addressing this research gap through the formulated research questions, this exploratory study also provide opportunities for follow-up research based on its findings and the constructed conceptual framework.

Besides academic relevance, there is also the social contribution of this research. This social contribution is to gain insights into individual students' acceptability of TDM measures which can be used by different governmental institutions and policy makers in order do design new policies for instance. So, to conclude, the gained insights into students' reasoning, individual acceptability framework and travel behaviour can form a foundation for divers academic as non-academic further research.

3. Research approach

This third chapter will outline the research approach that formed the foundation of this research. First, the general approach will be briefly explained, followed by a discussion of the various sub-questions in conjunction with the specific research methods required. The research was broadly divided into two chronological phases. Initially, it was necessary to address research questions 1, 2, and 3 before proceeding to answer research question 4, see Figure 6 below. And, ultimately, the main research question.

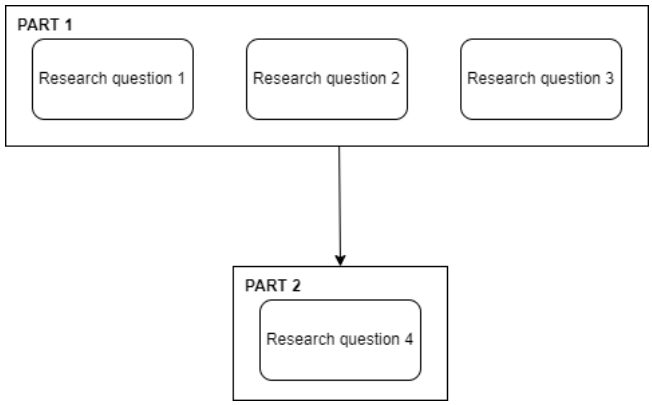

Figure 6, Schematic representation of research approach.

The collected data from the various research questions were qualitative in nature. Table 1 below outlines the method used for each sub-question, as well as the produced outcome of the method and the chapter of the research report it is further elaborate.

Table 1, research question in combination with research method

Research question	Method	Produced outcome	Chapter in research report
1. ***Which actors are involved and what are their interests?***	Actor-analysis (desk research).	Identifying of the most impacted actors.	Chapter 4 + Appendix A.
2. ***Which factors influence the degree of acceptability of a travel demand management measure?***	Literature review (desk research).	Conceptual framework, existing of factors influencing acceptability demand management measures.	Chapter 5
3. **What demand management measures exist to reduce student travel during rush hours?**	Literature review (desk research).	List of possible demand management measures.	Chapter 6
4. ***What is the current level of acceptability of various travel demand management measures to reduce the number of students on trains during rush hours in the Netherlands?***	Semi-structured interviews (field/empirical research).	Acceptability level of the different demand management measures.	Chapter 7

3.1 Part 1. Subquestion 1, 2, and 3

Subquestion 1

To answer the first subquestion, desk research was conducted in the form of an actor analysis based on available literature. In addition to academic literature, grey literature was used, such as government documents, non-academic reports, and news articles. An actor analysis is a "tool for generating knowledge about the involved actors to understand their intentions, interrelations, and interests, and for assessing the influence and resources they could bring to the decision-making table" (Varvasovsky & Brugha, 2000, p. 338). Conducting this actor analysis, in combination with the literature overview from Chapter 2 of this report, provides a comprehensive overview of the issue and all parties involved. For doing the actor analyse the theory of Enserink et al. (2022) was used. The outcome of this second research question was a list of actors, including an interest-power grid. More importantly, this actor analysis provided the opportunity to identify the most impacted actors as referred to in the main research question of this research. Despite the added value of the actor analysis for the research, it was decided to include only a summary of the most important findings in the main text to enhance the readability of the report. The full, detailed actor analysis has been included as an appendix.

Subquestion 2

The second subquestion was answered by conducting a literature review. Jesson & Lacey (2006, p. 140) summarised a literature review as "a narrative account of information already available and accessible to the public, which can be written from various perspectives depending on the author's point of view". A literature review also placed the research in a broader academic perspective. The literature was searched for factors influencing the acceptability of transport measures and especially if available TDM measures. The academic search engines Google Scholar and Scopus were used to find these academic sources. It is good to note that according to Knopf (2006), a literature review also has drawbacks, such as the potential for an overwhelming number of sources or, conversely, too few sources, making it difficult to select the right ones.

Based on the reviewed literature, an academic conceptual framework was developed as the outcome of subquestion two. It is essential to reflect on the meaning and significance of a conceptual framework in academic research. Jabareen (2009, p. 51) defines a conceptual framework as "a network, or a 'plane', of interlinked concepts that together provide a comprehensive understanding of a phenomenon or phenomena". A conceptual framework consists of interconnected concepts that support one another, articulate phenomena, and reflect a framework-specific philosophy, addressing the nature of reality, knowledge, and the processes for understanding the world (Jabareen, 2009).

The conceptual framework for this research includes several factors that influence the individual acceptability of TDM measures. It introduces definitions, concepts, models, and theories related to individual acceptability, particularly in the context of the Dutch case study. Rather than presenting knowledge as 'hard facts', the framework offers a 'soft interpretation of intentions' (Levering, 2002, pp. 37–38). The conceptual framework is academically grounded, meaning that the concepts and presumed relationships within it are based on existing academic findings. This grounding helps ensure the academic depth of this research.

Subquestion 3

The third subquestion was answered through also a literature review. Mostly academic literature were used to identify existing demand management measures. Again, search engines Google Scholar and Scopus were used. Since much is known in the literature about TDM measures to influence car use and public transport travel demand, a list of possible demand management interventions was generated in response to this third subquestion. The selection of this list was primarily guided by the applicability of the relevant TDM measures to the case central to this study, as well as the researcher's insights. The constructed list was also needed as input for the second part of this research.

Selection of academic literature

To address all three research questions of Part 1, academic literature has been searched and used. The academic sources were identified using the search engines Google Scholar and Scopus. Given the exploratory nature of the research, the exact search strings used for each research question were not strictly documented, partly due to the extensive use of the snowballing technique. This approach also aligns with the intent to provide future researchers with an open perspective when they wish to reproduce this research. However, a few basic criteria were consistently applied when searching for and selecting academic sources.

Efforts were made to prioritise explicit research results from previous quantitative studies on the impact of existing TDM measures in other countries, focusing primarily on Western economies, preferably within Europe. Specifically, research findings from Asian countries were avoided due to the significant cultural and behavioural contrasts between European and Asian contexts. Another criterion was ensuring the use of primary sources for definitions whenever possible. Source quality played a central role in the selection process, with the number of citations serving as a guiding metric for choosing the sources for definitions and results. Additionally, recent sources were prioritised to ensure the relevance and adequacy of the research findings, where available.

Any grey literature used was predominantly identified through the search engine Google and government websites. This primarily involves reports published by government agencies or news articles from Dutch news platforms.

3.2 Part 2. Subquestion 4

For the fourth research question, semi-structured interviews were employed as the primary method of data collection. With the benefit of hindsight, as outlined in the introduction and based on Chapter 4, it became clear that many actors are involved in this case. However, based on the actor analysis, it became also clear that students and teachers are the two actors directly impacted by the measures identified in Chapter 6. Therefore, given the resources and scope available for this research, it was decided to focus solely on interviewing students and teachers through semi-structured interviews. Respondents were recruited through the researcher's personal network, snowballing, and by approaching individuals at educational institutions. A total of 17 interviews were conducted for this research, comprising 12 interviews with students and 5 with teachers. These interviews involved students and teachers from two different educational levels, HBO and WO-level. Table 2 below presents the distribution of the conducted interviews in student and teacher amount and the corresponding educational level.

Table 2, number of interviews per group and educational level.

Level of education	Students	Teachers
HBO	7	2
WO	5	3
Total	12	5

Semi-structured interviews as method

As noted by Brinkmann (2020), semi-structured interviews better harness the knowledge-producing potential of dialogues, providing the interviewees with more space to explore what is important to them. Additionally, compared to structured interviews, semi-structured interviews allowed for a more meaningful conversation about issues significant to the research process, rather than strictly adhering to a pre-established list of questions (Brinkmann, 2020; Kallio et al., 2016). Since the focus was on acceptability, the interviews addressed measures that had not yet been implemented, which may have been perceived as abstract. This made semi-structured interviews more suitable researching acceptability compared to structured interviews also placed in the explorative background of this research. The interviews were

conducted both in person and online. The online meetings were conducted using Microsoft Teams.

The interview questions

The complete development of the interview questions for students and teachers can be found in Appendix B at the end of this report. Below is a brief summary of the most important questionnaire, the student version. This student questionnaire consists of four sections.

Part A of the interview gathered basic general information, with the key question being whether respondents commute to a Dutch educational institution by train. If they did not, the interview ended at Part A, as they fell outside the target group.

Part B, based on Eriksson et al. (2006, 2010), assessed problem awareness, such as perceptions of overcrowding on trains, and explored the respondent's sense of (moral) responsibility to adjust travel behaviour. These factors are independent of any specific TDM-measure in contrast with the factors in part C.

Part C focused on six identified travel demand management measures. After introducing each measure, respondents rated their agreement with statements on a 5-point Likert scale, explaining their reasoning hereby. This section is based on questions from Eriksson et al. (2006).

The final part, part D concluded the interview, offering respondents an opportunity to raise any points not previously discussed. And asked respondents to rank the six measures.

Storage and transcription

With the interviewees' consent, the interviews were recorded for transcription and therewith further analysis. Data from an interview included not only the conversation itself but also notes taken by the interviewer or memos/documents provided by the interviewee (Deterding & Waters, 2021). The data is securely stored during the research only on the TU Delft computer and the computer of the researcher.

Ultimately, each interviewee consented to the recording of the interview, which was subsequently transcribed into a written format. It was decided not to include these transcripts, amounting to over 70 pages, as an appendix to this report. Therefore, it has been decided that, as a reader has interest in the research data, they could contact the researcher, D. Botman, or the primary supervisor, Dr. J.A. Annema for the data. The detailed contact information can be found in Appendix C. Both individuals hold the research data, which is available upon request. Furthermore, both a student interview and a teacher interview have been included in Appendices C and D as examples, providing the reader with an impression of the level of detail.

The choice for semi-structured interviews

Given the exploratory nature of this research, and particularly because it assesses acceptability rather than acceptance—a crucial distinction—it is important to note that no actual measure has yet been implemented. This excluded the use of methods such as comparing travel behaviour before and after implementation or conducting surveys on changes in travel behaviour since the measure's introduction. Acceptability is a more abstract concept, and as such, qualitative research through semi-structured interviews can provide greater context and facilitate the collection of more accurate data.

4. The broader field of actors

The second research question focused on mapping the actor environment associated with the central issue of this research. The key insight from the actor analysis was the identification of the Dutch student as the most impacted actor, followed, to a lesser extent, by teachers. Consequently, these two actors form the primary focus of this research, see main research question. In addition to identifying the most impacted actors, the analysis also identified several other insights.

As said, to determine the most impacted actors, an actor analysis was conducted. Upon completion, however, it became evident that while the actor analysis provides extensive information, its utility in justifying the inclusion of the entire analysis within the main body of this report can be questioned. The analysis demonstrated that its most critical contribution was the identification of the 'most impacted actors,' as outlined in the primary research question. For this reason, the full actor analysis is included as Appendix A, a decision that also improves the readability of the main text. Nevertheless, a concise summary of the key findings from the actor analysis is presented below.

Identified actors

First, it is important to define what an actor is. In its simplest form an actor is according to Enserink et al. (2022, p. 79), "a social entity, a person or an organisation, able to act on or exert influence on a decision". The case at the centre of this research is characterised by the involvement of multiple actors. It is assumed that not one actor can unilaterally introduce a solution, but cooperation and alignment between actors is required. This makes it a multi-actor environment (Enserink, et al., 2022). In total there are nine actors identified during the actor analysis, see Appendix A for elaboration. These nine actors are:

- Nederlandse spoorwegen (NS);
- ProRail;
- Ministry of Education, Culture and Science;
- Dienst uitvoering onderwijs (DUO);
- Rover (interest group for train passengers);
- ISO/JOB (student interest organisation);
- AOb (teacher interest organisation);
- Educational institutions;
- Hospita housing organisation.

The actor analysis provided various insights, while it is crucial to continuously consider the subjective nature of this analysis. Therefore, the findings are referred as subjective insights rather than definitive conclusions.

Power Interest Grid and insights analysis

The Power-Interest Grid (PI – grid) containing the above 9 actors is shown below in Figure 7. It can be seen that there are 5 'key players'. The quadrant 'context setters' has no actor. And a total of 2 actors can be called as 'crowd'. And finally, a total of 2 actors can be labelled as 'subject'. Furthermore, a potential coalition and opposition analysis can be found in Appendix A.

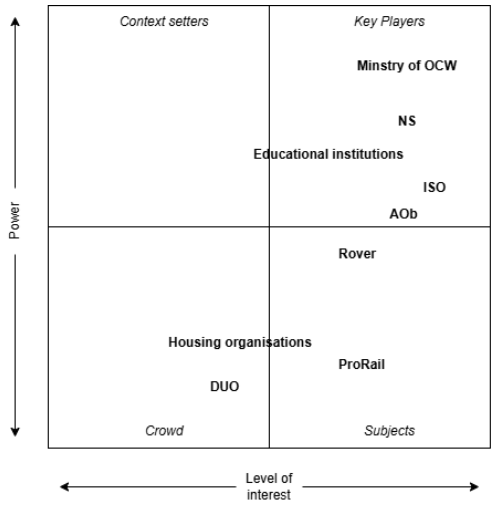

Figure 7, PI-grid with identified actors filled in.

The first insight that can be derived from the actor analysis is the diverging interests driving the involvement of the various actors in this issue, which in turn contributes to the complexity of the problem. In addition to differing interests, varying levels of power among the actors can also be observed.

Ultimately, three questions were central to the process of identifying the actors, as outlined by Enserink et al. (2022). Below, the three questions are presented along with a brief response based on the insights drawn from the comprehensive actor analysis:

- *The institutional approach*; who have in the existing policy-making structure a formal position in policy-making?

It can be said that there is primarily one actor with substantial formal power regarding the adjustments to the regulations that Dutch students are entitled to and under which conditions, which is the Ministry of Education, Culture and Science. NS as an actor cannot independently implement fare differentiation, as it requires approval from the Dutch government. It is expected that the Ministry of Education, Culture, and Science will maintain close contact with the NS regarding any significant changes in student regulations. When it comes to modifications affecting educational institutions, the institutions themselves naturally possess the formal power to implement these changes, such as adjusting class schedules or online and physically scheduling. The remaining actors have relatively little direct institutional power.

- *The interest-based approach*; who has an interest in or feels the consequences of the issue around which the problem revolves, or the solutions that are being considered?
- *The impact approach*; who is impacted by changes in the existing situation?

The actor analysis indicates that two groups—students and teachers—are likely to be directly impacted by nearly all travel demand management measures discussed in Chapter 6. Given their high level of interest, these groups are crucial in evaluating the acceptability of potential measures. In contrast, focusing on actors with limited interest or influence contributes little to this research, particularly since, as noted in the introduction, the emphasis is on individual acceptability. The actor analysis was conducted after initial brainstorming on potential TDM measures had begun, Chapter 6. Consequently, with these insights and the selected perspective, it is evident that students are the group most directly affected by potential measures, with teachers as the second most impacted group. Based on the insights, the decision was made to interview only students and teachers to assess the acceptability of the proposed measures from their perspectives.

The difference between students and teachers in this research

During the research, it was decided to construct an individual acceptability framework exclusively for students in the following chapter, rather than also developing a specific

framework for teachers. The primary rationale for this decision is that students were the central focus of the research and constitute a significantly larger group of peak-hour travellers compared to teachers. When a teacher schedules an educational activity, it naturally attracts a much larger group of students to attend. Given this greater potential impact of insights into student acceptability, combined with limited research resources, teachers were included in the study but did not take a central role. Instead of basing teacher interviews on an individual acceptability framework, these interviews were used as a reflection on the students' responses. Because it is crucial to avoid a scenario where potential TDM measures enjoy high acceptability among students but are clearly dismissed by the other most impacted actor, the teachers.

5. Constructing an acceptability framework

In this chapter, the concept of 'acceptability' will take centre stage, with the aim of constructing a conceptual framework that identifies factors explaining the acceptability of travel demand management measures. First, this chapter will make a distinction between the meaning of acceptability and the important distinction between acceptability and acceptance. Subsequently, the significance of individual acceptability for this research will be discussed. Following this, various factors that may explain acceptability will be introduced and examined based on existing academic literature. Ultimately, based on these factors, a conceptual framework will be constructed at the end of this chapter, comprising elements that align with the Dutch student case central to this research.

5.1 The meaning of acceptability, individual acceptability, difference with acceptance and importance

In its simplest form acceptability of a TDM measure reflects the positive or negative attitude toward that measure *before* its implementation (Nilsson et al., 2016). While acceptance is defined by Schade & Schlag (2003) as the respondents' attitudes, including their behavioural responses, *after* the introduction of a measure. According to Alexandre et al. (2018), acceptability is an a priori phenomenon in the timeframe of our confrontation with a measure, predicting the intent to use. So, acceptability represents the more or less positive mental representation that a user has before using the tool or before implementing the measure (Alexandre et al., 2018). In this research the focus is on the acceptability of the directed impacted actors, students, so the focus will be on individual acceptability rather than institutional acceptability.

Both terms, acceptability and acceptance, are mostly used in the context of defining and creating support for policy measure (Vlassenroot et al., 2008). However, there seem to be as many questionnaires as methods to measure acceptance and acceptability according to Vlassenroot et al. (2008). While much research has focused on measuring people's attitudes toward existing policies, known as acceptance, understanding pre-implementation attitudes is crucial for implementing new policies. This involves providing decision-makers with insights into how and why citizens might respond to new implementations (Ejelöv & Nilsson, 2020). Thus, it is important to note that, unlike acceptance, respondents measuring acceptability will not have experienced any of the measures in practice, making acceptability an attitude construct. This makes measuring acceptability inherently challenging and always subject to uncertainty, as respondents have not experienced the proposed measures in real-life scenarios.

Research indicates that politicians are more cautious about implementing measures when they are aware that public opinion is opposed, thereby rendering the measures politically infeasible (de Groot & Schuitema, 2012; Gärling, 2007). Specifically, coercive TDM measures are subject to political restraint due to potential public disapproval, as citizens could perceive coercive actions as a form of infringement on their freedoms more then non-coercive. Furthermore, decisions regarding new policy measures are made within the political arena, where different goals and priorities among various parties can influence the decision-making process (Gärling, 2007). For instance, Gärling (2007) highlights that green parties support TDM measures aimed at reducing car travel due to their positive impact on CO_2 emissions, while conservative parties oppose these measures, viewing them potentially as more government infringement. This divergence between parties and organisations in objectives can complicate the decision-making process for TDM measures. Therefore, understanding (public) acceptability is important for policymakers and politicians. Political feasibility is partially dependent on public acceptability (Gärling, 2007). Schade & Schlag (2003) notes that the acceptability of Travel Demand Measures is significant in determining whether they will effectively alter travel behaviour.

5.2 Push- and pull measures

In this research, the focus is on the acceptability of TDM measures. The literature on acceptability distinguishes between coercive and non-coercive measures. Research indicates that coercive measures typically have lower acceptability (de Groot & Schuitema, 2012). Coercive measures are more likely to limit freedom of individuals and therefore their will be more resistant (Loukopoulos et al., 2005; Gärling, 2007). According to de Groot & Schuitema (2012), the extent to which a policy measure enforces behavioural change is indicative of its level of coerciveness. Based on this criterion, pull and push measures are typically distinguished. Pull measures encourage desired behaviour by offering benefits for compliant actions and are generally considered non-coercive. Conversely, push measures discourage undesired behaviour by increasing the disadvantages associated with it, making these measures coercive in nature (Loukopoulos et al., 2005).

5.3 Factors which influence acceptability

Acceptability is a concept that is often integral to the decision-making process for many policy measures or at least taken into consideration. For example, there has been substantial academic research on the acceptability of environmental transport policies (Eriksson et al., 2008; Garling & Schuitema, 2007). There is also considerable academic literature on acceptability regarding travel demand management measures, typically with the aim of reducing the number of cars (Rienstra, Rietveld, & Verhoef, 1999; Harsmn & Quigley, 2010; Eriksson et al., 2010). The existing literature on acceptability identifies numerous factors that potentially measure/predict the degree of acceptability for specific policy measures. These factors can be categorised into three groups: ‘demographic factors’, such as age and gender; ‘personal factors’, such as values and ideology; and ‘specific policy factors’, such as perceptions of fairness (Ejelöv & Nilsson, 2020). Below, the various identified factors are detailed within these three categories. Subsequently, a conceptual framework based on a selection of these factors has been developed, which is central to this research.

Demographic factors

Examples of demographic factors include income, gender, and age, which could influence individuals' perceptions according to Vlassenroot et al. (2008). However, research by Ejelöv and Nilsson (2020), indicates that demographic factors possess only a modest explanatory power in determining acceptability. In fact, their explanatory power becomes negligible when controlling for other groups of factors, such as personal factors and policy-specific factors.

The group of students eligible for the (free) student travel card can, on one hand, be considered ‘homogeneous’ in terms of age and stage of life. It can be observed that the gender distribution is nearly equal, with 53% female and 47% male students in higher education (CBS, 2023). Moreover, the age range for students eligible for the student scheme is between 16 and 30 years, with approximately 80 - 85% of Dutch students in higher education falling within the 18–25 year age bracket (Huijsduijnen, 2023). Therefore, demographic factors are unlikely to be a significant aspect in the acceptability of measures aimed at reducing the number of students on trains during peak hours. And will therefore not be explicitly part of the conceptual framework.

Personal factors

Many personal factors can be found in the literature that contribute to the acceptability of TDM measures (Eriksson, et al., 2006; Schade & Schlag, 2003; Alexandre et al., 2018; Ejelöv & Nilsson, 2020; Vlassenroot et al., 2008). Several of these factors are written out below with a brief explanation of them. Certain factors are not applicable to this specific case, and, given the feasibility constraints of this research within the available resources, not all factors will be included in the conceptual framework.

Values
According to Schwartz (2006, pp. 142-145), values are deeply held beliefs about what is important or desirable and serve as standards to guide evaluations and actions. Important values in Western society, according to Steg (2003), are for instance freedom, equity, and fairness. Various TDM measures can potentially infringe upon these values. Each individual places different levels of importance on different values. Furthermore, Eriksson et al. (2006), highlight the significance of collective values, emphasizing the collective's interests above one's own. Such shared values can be a powerful force within societies. Values influence the personal factor (see further in this chapter). However, values such as fairness can also be a factor in the category of 'policy-specific factors' and are then dependent on a particular measure, with that measure being evaluated based on this factor. But value is a construct which is a personal-belief and is therefore also independent of every TDM measure, someone has its own values independent of any measure.

(Political) Ideology
According to Martin (2015), ideology is generally understood as a set of beliefs, values, or doctrines that shape the perspectives and behaviours of individuals or groups. Ideology is not just about explicit beliefs but also about unconscious structural elements in belief systems, which people might not even be aware of. Ideology can also be a factor influencing the degree of acceptability for policy measures. For example, research has shown that populations in countries with right-wing ideologies are less supportive of climate policies compared to those with left-wing ideologies (Gärling, 2007). Another example indicates that individuals with right-wing ideologies exhibit greater acceptability for pull measures than for push measures, as push measures are more likely to be perceived as infringing on individual freedom (Ejelöv & Nilsson, 2020). However, it is difficult to test and document ideology fully because of its complex character (Martin, 2015). The scope of this research is limited and therefore ideology is not included in the conceptual framework.

Trust
Trust, according to Rousseau et al. (1998, p. 395), is defined as "a psychological state comprising the intention to accept vulnerability based upon positive expectation of the intention or expected behaviour of another". Trust can be categorised in various ways; given the focus on policy measures, the emphasis is on 'political trust.' Political trust is defined as the extent to which people's evaluation of government performance aligns with their normative expectations of how the government should perform (Hetherington & Husser, 2012). Generally, citizens need to trust their government to support more governmental actions. Therefore, it can be argued that in general terms the degree of political trust positively influences acceptability.

Problem awareness and perception
Problem awareness within the transport policy domain could be described as the extent to which individuals understand the severity and causes of transportation problems, which can influence their attitudes towards proposed policy measures (Eriksson et al., 2006). Schade & Slag (2003) state that perception of traffic-related problems is a necessary precondition for regarding problem solving measures as important. They assume that high problem awareness will lead to an increased willingness to accept solutions that try to solve the perceived problems. This awareness often includes recognising the broader implications of transport-related issues and the potential benefits of an intervention. Understanding this can play a key role in determining whether or not they support various transport policies aimed at mitigating these problems. Furthermore, according to Eriksson et al. (2006), there is also a concept known as 'awareness of consequences'. This entails the belief that one's own actions can prevent those (negative) effects caused by the problem. The opposite of this is when an individual perceives that their behaviour cannot contribute to solving the problem, potentially leading to inaction.

Personal norm
Personal norm could be defined “as feelings of moral obligation to perform or refrain from specific actions” (Schwartz S. , 1977, p. 27). The personal norm varies for each individual and is shaped by various facets. Personal norms are often related to the acceptability of a range of transport policies (Cools, et al., 2011; Eriksson et al., 2006). However, some studies show a weaker relationship between personal norms and policy acceptability, specifically for pull measures (Keizer et al., 2019). Personal norms were found to influence most of the effects of values on willingness to cooperate. Problem awareness could activate a personal norm. Whereby the personal norm can be experienced as a feeling of moral obligation to act (Eriksson et al., 2006). So, this moral drive to act is thus motivated from intrinsic motivation rather than extrinsic motivation. On the whole, it can be suggested that a personal norm aligned with the problem and solutions may lead to high acceptability.

Policy-specific factors

Another category of factors are the policy-specific beliefs. The major distinction between demographic and personal factors, and policy-specific factors, is that policy-specific factors are dependent on the various policy measures. And therefore, these factors may have a different value for each policy measure. Specifically, this means that one measure may score highly on a particular factor, while another measure may score very low on the same factor.

Fairness
Fairness can be described as the distribution of the advantages and disadvantages of a policy measure (Schade & Schlag, 2003; Vlassenroot et al., 2008). Different policies entail various costs and benefits, and thus, the fairness will vary for the different types of policy measures (Schuitema et al., 2011). The researchers Raux & Souche (2000), state that a policy measure is doomed to be rejected if the measure is perceived as insufficiently fair. Fairness can be divided into three categories: a) scenario fairness, b) procedural fairness, and c) distributional fairness (Ejelöv & Nilsson, 2020). Scenario fairness is about the perceived outcome of a policy for an individual. Procedural fairness concerns how a policy is introduced to the public and the decision-making process. Distributional fairness relates to the expected distribution of the costs and benefits across society. According to Ejelov & Nilsson (2020), is in general fairness positively related to acceptability. When measuring acceptability, it is the expected fairness of a policy measure that is assessed, not the perceived fairness, as the measure has not yet been implemented at the time of measurement. Fairness is in general a difficult factor (Graham et al., 2013; Haidt & Joseph, 2004).

Outcome and equity
Expected outcomes are categorised by Ejelöv and Nilsson (2020) into individual, collective, and environmental outcomes of a policy. Schade & Teubel (1997), introduce the term ‘revenue allocation’, which will be in this research the same as outcome allocation. It is important to note that the outcome factor shares similarities with the previously discussed fairness factor. While outcome is assumed to be part of fairness, because fairness is a (too) broad concept for this research. An outcome may be perceived as unfair by someone, but the outcome factor could still be viewed positively. For example, one might find the process leading to a measure unfair, but still consider the distribution of outcomes as appropriate. Thus, outcome is described here as a separate factor, while its relationship with fairness is recognised in the conceptual framework.

Academic studies show that when people expect higher personal benefits from a policy, it is positively related to acceptability. Conversely, the expectation that one will be worse off than others decreases acceptability. A component of collective outcomes is the factor of equity. Equity is a broad category related to the comprehensive objective of reducing inequalities (Raux & Souche, 2000). Transport-related equity is approached by researchers in several ways (Bruzzone et al., 2023). The most common distinction is made between horizontal and

vertical equity. Horizontal equity corresponds to the 'principle of equal opportunity', which concerns, according to Raux & Souche (2000), the equal treatment of users and the user-pays principle. According to Bruzzone et al. (2023), horizontal equity assumes equal abilities between individuals and groups. Horizontal equity aims to maximise two objectives: the improvement of general accessibility, and the equal distribution of accessibility among regions. Vertical equity corresponds, according to Raux & Souche (2000), with the 'principle of difference'. Vertical equity concerns the allocation of benefits among social groups based on their willingness and/or capability to pay for a specific service. Raux & Souche (2000), also add territorial equity. According to them, territorial equity means that society must guarantee access rights to goods and services everywhere. Territorial equity is closely related to the concept of accessibility.

Freedom

The factor of freedom refers to the extent to which a policy measure restricts an individual's personal (choice-) freedom (Vlassenroot et al., 2008). Research indicates that when a policy measure negatively impacts individual freedom, it results in lower acceptability compared to measures that allow for more freedom (Vlassenroot et al., 2008). Freedom influences the factor of fairness. The more a policy is perceived to infringe on individual freedom, the less fair it is perceived to be, which subsequently affects its acceptability (Eriksson et al., 2006; Loukopoulos et al., 2005). The freedom factor is related to the earlier discussion in this chapter concerning pull- and push measures and their impact on acceptability. Since push measures are seen as a greater infringement on freedom than pull measures, the acceptability of push measures is generally lower (Cherry, 2012). This factor also pertains to the expected freedom infringement that individuals anticipate from a policy measure instead of the actual infringement after the policy measure is implemented.

Effectiveness

Effectiveness generally refers to the degree to which the aims of a measure can be achieved with the measure (Steg, 2003). Expected effectiveness pertains to people's expectations regarding the outcome of a policy measure and subsequently their assessment of its potential effectiveness. Research on policy measures aimed at reducing environmental problems in the transport domain has shown that acceptability increases when the proposed measure is perceived as effective in addressing the problem (Ejelöv & Nilsson, 2020). In the transport domain, pull measures are perceived as more effective than push measures according to Eriksson et al. (2008). It is important to consider, however, to what extent an individual can determine the expected effectiveness of a policy measure before it is implemented. Additionally, it can be stated that for policymakers and politicians, the effectiveness of measures is an important factor, as they aim to avoid the implementation of ineffective measures.

Affordability

Affordability concerns the degree of affordability and people's perception of whether the costs are outweighed by the benefits (Vlassenroot et al., 2008). The extent to which someone perceives the affordability of a policy measure will vary significantly from person to person. Affordability depends, for instance, on the individual's budget and potential funding. Related to affordability is the concept of willingness to pay. The willingness to pay is assumed that how higher they are willing to pay, how higher the acceptability will be. Policy measures that decrease the cost could enhance the acceptability of such measures (Vlassenroot et al., 2008; Schuitema & Steg, 2008). Dutch students generally do not have access to significant financial resources (ScienceGuide, 2022). Therefore, affordability can be a highly relevant factor in this case. If, for instance, potential measures were to make train travel unaffordable, it can be expected that the level of acceptability would likely be low. The target group, students, has previously demonstrated through protests about their student financing, this reflects that they are sensitive to negative financial measures and are willing to protest (Het Parool, 2018).

Naturally, this factor is of lesser importance in the case of any measures that, by definition, do not affect the current financial situation of students with regard to train travel.

5.4 Conceptual framework, a two-sided framework

The above discussion has addressed various factors from the academic literature regarding acceptability in the context of transport policies. The factors above are discussed as individual factors. Therefore, it is now important to integrate these factors into a conceptual framework that is appropriate for assessing the individual acceptability of TDM measures aimed at reducing the number of students travelling by train during peak hours. The constructed conceptual framework is shown below in Figure 8.

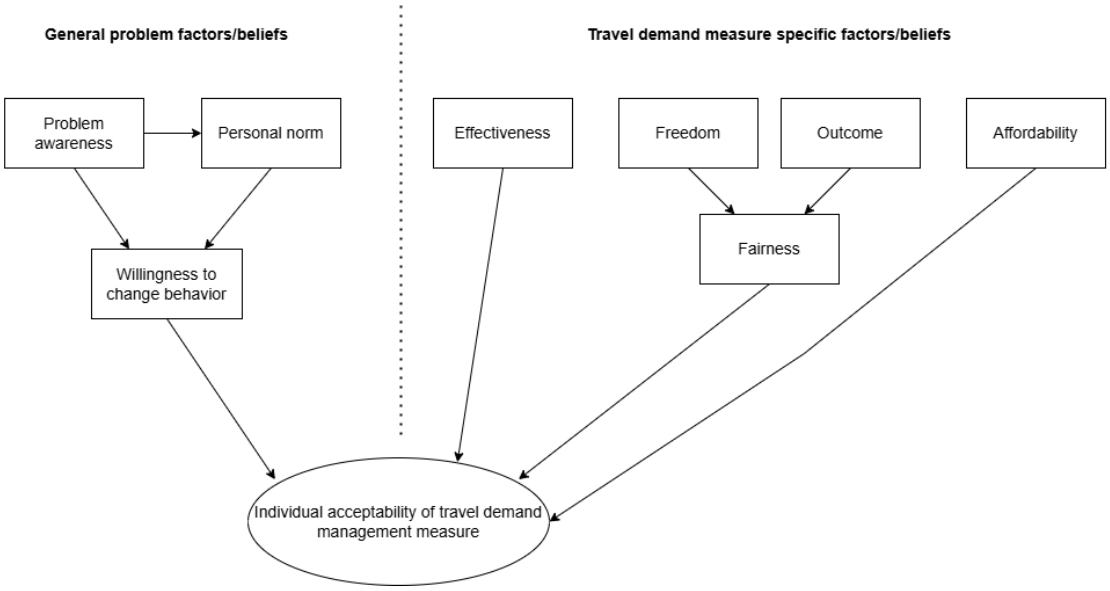

Figure 8, individual conceptual acceptability framework for students

Based on previous research, a distinction is made between 'general factors' and 'TDM-specific factors', becoming a two-sided conceptual framework (Eriksson et al., 2006; Vlassenroot, et al., 2008; Ejelöv & Nilsson, 2020). The separation of both sides is explained by the dependence or independence of the factors on TDM measures. The factors on the left side of the two-sided framework are independent of any TDM measure. In contrast, the factors on the right-hand side are dependent on each individual TDM measure, and thus the scores to these factors may vary (extremely) for each TDM measure separately. As further can be seen, demographic factors are not included in the conceptual model, as they provide little to no explanatory power for acceptability, and the group of students using the train a relatively homogeneous group is.

Furthermore, it was ultimately decided to represent the broad concept of fairness through two sub-factors that determine the degree of fairness in this research. In some studies, the factors 'Freedom', 'Outcome', and 'Fairness' have been described as separate elements influencing acceptability. However, to maintain the model's manageability, and due to the significant overlap among these three factors, it was decided that 'freedom' and 'outcome' would determine the degree of fairness and thereby indirectly influence the acceptability of a travel demand management measure.

General problem factors

Awareness and understanding of the problem have been found to be important factors for willingness to change behaviour (Ejelöv & Nilsson, 2020; Eriksson et al., 2006; Schade & Schlag, 2003). The research shows that higher levels of problem awareness will lead to increased willingness to accept solutions for the perceived problems.

Personal norms, or feelings or moral obligation, are often positively related to acceptability for a range of policy domains, including transport (Ejelöv & Nilsson, 2020). Implicitly part of the personal norm is the factor values, as values contribute to personal norms and habits. Furthermore, a relationship is assumed between problem awareness and personal norm, since awareness of a problem can influence an individual's norm, both positively and negatively. Both the factors ‘problem awareness’ and ‘personal norm’ independently have a direct impact on the acceptability of the travel demand measure.

In turn, the factors ‘trust’ and ‘ideology’ are not explicitly included in the conceptual model. This is due to the fact that Dutch youth, aged 15–35, have significantly higher levels of trust in political institutions and civil servants in the Netherlands then older people, which renders the issue of trust less relevant in the Dutch context (Schmeets & Exel, 2022). The factor of ideology has been excluded because of the difficulty in measuring this variable in a relatively short semi-structured interview (Martin, 2015). And, both factors are assumed to have minimal impact on the case being central in this research at all.

Travel demand measure specific factors
On the right side, the factors can vary per TDM measure which is different in comparison with the general problem factors. Factors with a direct influence are 'fairness’, 'effectiveness’, and 'affordability'. If a TDM measure is deemed unfair, its acceptability will decrease. The factor of affordability is included because the group of students typically uses a free public transport student card for their train travel and is characterised by relatively low financial position (NIBUD, 2024). It is expected that if affordability is compromised, acceptability could decrease. Furthermore, the factor of 'effectiveness' is part of the conceptual model. For clarity, the factors 'freedom' and 'equity/outcome' are included under 'fairness', as these factors directly influence the expected fairness of a measure and thereby indirectly affect the acceptability of the TDM measure.

With the conceptual model, it is important to continuously keep in mind that the degree of acceptability is measured when the individuals have not yet experienced the TDM measures and thus expectations of the measures are at issue rather than experiences of the measures in real-life.

6. Demand management measures

This chapter will focus on the concept of travel demand management. In this chapter, we will first further elaborate about what exactly travel demand management entails. This will be followed by selecting TDM measures from the literature that potentially are applicable to the Dutch case. A desk research approach has been adopted, involving a literature review. As explained in Chapter 2 of this report, measures related to the expansion of the rail network have not been included.

6.1 What is demand management

Demand management can be described according to (Mahudin., 2018, p. 492), as “the collection of operational, administrative, and economic policies designed to ensure that demand for the utilisation of rail transportation resources is kept at a manageable level, especially during peak commuting periods”. These policies or measures can be designed by different actors, like the operator itself, governmental bodies or for instance the educational institutions itself. Travel demand management aims to influence the time, destination, route or mode of the travel behaviour choice through pricing and non-pricing tools (Daniels & Mulley, 2013).

The term travel demand management was one of the first to be introduced in the US in the early 1970s. During that period, urban transportation policymakers in the US introduced a relatively new concept into urban transportation planning namely, how to manage an existing urban transportation system more effectively to increase travel demand without expanding capacity (Michael, 1999). During this period, there was also an oil crisis and, at the same time, an increasing focus on the environment and with it a change in perspective in the transport sector. The focus was no longer on adding more and more cars and adapting the infrastructure to this, but on finding other ways to transport more people without expanding the existing infrastructure.

The literature also makes it clear that travel demand management is not easy and depends on many factors (Michael, 1999; Raux & Souche, 2000; Steg, 2003; Schade & Schlag, 2003; Ejelöv & Nilsson, 2020; Logan et al., 2020). In essence is demand management influencing the individual travel behaviour of travellers. The challenge for policy makers is according to Meyer (1999), to find the right mix of incentives and/or disincentives that will encourage travellers to change their usual travel routines. According to the approach, this can be achieved by (a) offering travellers alternative modes of transportation or services that increase vehicle occupancy, (b) providing incentives or disincentives to reduce travel or shift trips to off-peak hours, and/or (c) fulfilling the trip's purpose through non-transportation methods, such as using telecommunications for work or shopping.

The majority of travel demand management literature focuses on reducing the number of cars and car trips, driven in part by current climate policies (Ejelöv & Nilsson, 2020). There has been little to no research in the literature on measures aimed at decreasing the number of train passengers, which also runs counter to contemporary trends. The general trend in Western economies is to encourage the use of public transport. Daniels & Mulley (2013), even warn therefore that successful peak spreading could potentially make public transport less attractive to its most likely users, which might lead to higher ticket prices overall due to the reduced number of travellers.

<u>Push- and pull measures</u>

It is important to examine the distinction between push and pull measures in the context of travel demand management. Push travel demand measures are coercive in nature and are designed to penalise undesirable behaviour. In contrast, pull measures are much less directive and typically encourage desired behaviour by providing positive incentives. A combination of

both push and pull measures is also possible, such as a measure that both penalises undesirable behaviour and rewards desirable behaviour (Garling & Schuitema, 2007).

6.2 Travel demand measures

For the categorisation of Travel Demand Measures, the categorisation of Gärling & Schuitema (2007, p. 140-142), is introduced, namely, a) physical, b) legal, c) economic and d) information/education. Table 8 below clarifies this categorisation with general definition and examples.

Category	Explanation	General Examples
Physical	Physical measures aim to enhance the relative attractiveness of alternative travel modes. Which means also technical advancements. The underlying assumption is that individuals will adjust their habits in response to the changes in the physical environment.	- Improving infrastructure in broadest sense; - Technical changes to make cars more efficient; - Changing land use planning.
Legal	Legal measures are legal regulation in order to change travel behaviour. The assumption is that people will comply with these measures, and it is also anticipated that, in the long term, legal policies will lead to changes in social norms.	- Prohibiting - Control of measures - Decreasing speed limits
Economic	Economic measures aim to make negative behaviour more expensive or/and making desired behaviour less expensive. The underlying assumption is that individuals' travel choices are influenced by cost-benefit analyses of available alternatives.	- Taxation of negative externalities - Congestion pricing - Kilometre charging - Decreasing or increasing cost of public transport
Information/education	Information and education measures aim to change people's perceptions, attitudes, beliefs, values, and personal norms regarding their travel behaviour. The underlying assumption is that individuals' travel choices are influenced by new information.	- Information campaigns - Learn people more about the effects of their behaviour - Social modelling

Table 3, categorisation of TDM measures.
Above table is based on the information in Garling & Schuitema (2007), Gärling et al. (2002) and Steg (2003).

It is important to consider the above categorisation of TDM measures. However, it should also be noted that not all TDM measures fit easily into one of the four categories. Because often, a TDM measure is a combination of aspects needed from multiple categories. For example, the goal of a measure aimed at pricing undesirable behaviour is economic; however, a legal framework is required to anchor such an economic measure. This is because, without regulations and enforcement, such a measure cannot be successfully implemented as a TDM measure.

As an extensive categorisation of TDM measures holds no value for this research, a less detailed distinction between travel demand measures has been introduced. Many researchers primarily differentiate between TDM measures based on whether the measure is a 'pricing' or 'non-pricing' measure, see Figure 9 below. There is chosen to maintain this distinction as the primary categorisation in this research, with the categorisation by Gärling & Schuitema (2007) used as a sub-categorisation as starting point and inspiration in brainstorming/searching for the travel demand management measures which will be central in this research.

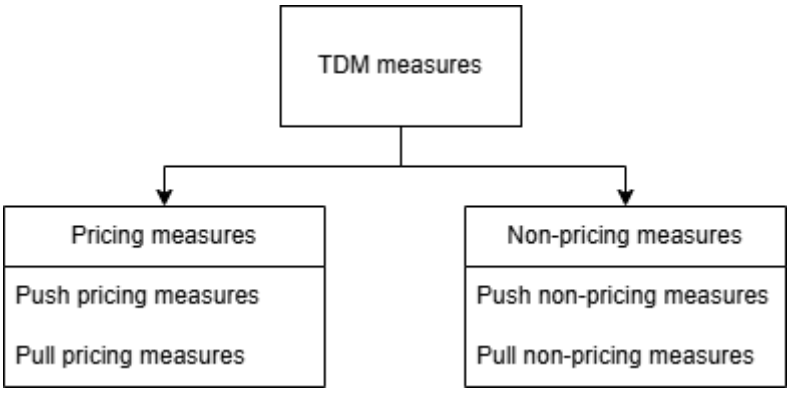

Figure 9, categorisation TDM measures simplified.

Pricing measures

Pricing measures can have both a push and pull nature and can be applied to various transport modes, with a combination of both also being possible. Raising prices during peak hours can be characterised as a 'stick measure'. Different factors determine the sensitivity to these measures (Schade & Schlag, 2003). The pricing of car travel can be based on various factors. Pricing measures have often been implemented with the aim of reducing the number of cars on the road each day. Some initiatives focus on decreasing the overall number of cars in order to reduce vehicle kilometres travelled, leading to lower CO_2-emissions (Eriksson et al., 2008). Additionally, some countries employ pricing measures to reduce the number of cars on the road during specific times of the day, particularly during peak hours, with the goal of alleviating road congestion. In both cases—whether the objective is to reduce the overall number of cars or specifically during peak hours—the underlying assumption is that more people will opt for alternative modes of transport, travel at different times, or work from home.

There have also been pricing measures aimed at reducing the number of cars on the road, not by increasing the cost of car use, but by financially incentivising alternative options, such as making other modes of travel cheaper and thus more attractive. This approach to pricing measures can be classified as pull measures (‘carrot measures’). Research indicates that, unlike push measures, these measures in general tend to achieve a higher level of acceptability (Loukopoulos et al., 2005).

Furthermore, pricing is known to be a social and political sensitive issue. Pavlicek & Sudizina (2020), describe that socio-economic status and political preference, among others, determine the passenger's opinion regarding fair pricing. Price differentiation can also be seen from moralistic and fairness perspectives, and it requires government intervention and is therefore sensitive to fluctuations. Political feasibility is therefore not always guaranteed (Hetherington & Husser, 2012).

Pricing measures public transport

Transportation demand management, traditionally employed to reduce car traffic, is now gaining attention among public transport operators as a strategy to alleviate congestion in overcrowded public transportation systems (Halvorsen et al., 2019). This branch of pricing demand management is therefore less developed in the literature compared to pricing measures for private car use.

There exist major differences between private car use and public transport use. Therefore, the characteristics and solutions for road congestion cannot be directly applied to public transport systems according to Halvorsen et al. (2019). Public transport users typically have less varied trip purposes than car drivers, are constrained by service schedules, and gain less benefit from

avoiding peak travel times. Moreover, unlike own car transport, public transport is a public service the Netherlands. Therefore, preventing or discouraging access is politically unappealing in general (Henn, et al., 2011). Public transport agencies typically seek to avoid losing passengers to other modes of transport; instead, they prefer to redistribute demand, either by adjusting the timing of travel or by directing passengers to alternative routes (Halvorsen et al., 2019). It is therefore important to recognise that traditional car-oriented transport demand management and public transport demand management (PTDM) are not necessarily complementary; encouraging people to shift from cars to public transport during congested periods may even conflict with PTDM policies aimed at promoting off-peak travel.

Price discrimination is a well-established approach for addressing peak period congestion, as travellers are often willing to pay extra to avoid crowded conditions (Halvorsen et al., 2019). Research in France by Prud'homme et al. (2012), demonstrates a significant relationship between an individual's willingness to pay for non-congested travel on subways and trains and the actual level of congestion experienced. According to the researchers, however, it is difficult to determine exactly the value of comfort loss related to public transport congestion than time loss related to car transport congestion. Another study by Henn et al. (2011), in Australia found that, without incentives, only 5% of travellers would choose to take a train at a different time than their preferred one to avoid congestion. However, the study also revealed that a large proportion of passengers expressed willingness to adjust their travel times for a fare incentive. Specifically, with a 30% discount, approximately 21% of respondents indicated a willingness to depart an hour earlier, and 37% were willing to depart half an hour earlier. Interestingly, a smaller proportion of respondents were willing to travel later for the same discount, with 13% indicating a willingness to depart an hour later and 21% willing to depart half an hour later.

As demonstrated above, pricing rush hours to reduce the number of public transport passengers or cars can be an effective strategy. Such measures offer promising potential in terms of effectiveness. Therefore, in this research a pricing measure is included in its examination of the acceptability of TDM measures, which will be outlined below. This measure is particularly interesting to the Dutch context, where students currently do not pay for their travel with public transport.

Measure 1. Increasing the price of trains for students during peak hours.
In the Netherlands, nearly all students have access to the student travel subsidy scheme, as outlined in Chapter 2 of this report. This current policy can be classified as a pricing measure, with the primary objective of encouraging students to use public transport to reach their educational institutions. Given that pricing measures can contribute to reducing congestion on trains, the following measure has been proposed: *increasing the price of train use for students during peak hours.*

However, there are numerous possible variations on this measure. Thus, it should be viewed as a pricing mechanism that can be adjusted to manage the number of students on trains. Fortunately, research was conducted in 2014 by Bakker & Wortelboer on the impact of various modifications to the existing student travel scheme. Bakker & Wortelboer (2014) was commissioned by the Minister of Infrastructure and Environment to investigate the consequences of adjustments to the travel arrangement on public transport usage. Eight new product variants were developed by Bakker & Wortelboer (2014); see Figure 10 below for the different variants and their effects on the number of passenger kilometres per train.

Reizigerskilometers					
Variant		**MaVr Spits**	**MaVr Dal**	**ZaZo**	**Totaal**
1a.	Huidig + € 20,- eigen bijdrage	-1%	-1%	-1%	-1%
1b.	Huidig + € 75,- eigen bijdrage	-5%	-7%	-11%	-6%
2a.	Korting 100% dal, 0% spits	-50%	46%	16%	-14%
2b.	Korting 100% dal, 50% spits	-31%	21%	9%	-11%
2c.	Korting 50% dal, 50% spits	-16%	-17%	-7%	-16%
3.	Trajectkaart: traject naar keuze gratis, daarbuiten 40% korting in dal	-15%	-13%	-16%	-15%
4.	Mobiliteitsbudget € 60,-	-14%	-15%	-2%	-13%
5.	Vrij budget € 60,-	-16%	-16%	-4%	-15%

Figure 10, effects passenger kilometres train after introducing new pricing schemes. From Bakker & Wortelboer (2014, p. 15).

In Bakker & Wortelboer (2014) findings, it is clear that each new product variant has a distinct impact on the travel behaviour. The researchers differentiate between the effects during peak hours from Monday to Friday, off-peak hours during the same days. And the weekends, including Saturday and Sunday. Each variant influences these three travel periods differently. For the purposes of this study, the impact during peak hours is of the greatest significance.

Variants 1a and 1b lead to only a minor reduction in passenger kilometres during the peak hours period, which will be insufficient to significantly reduce the crowdedness on trains during peak hours. Therefore, these pricing variants are not suitable for this case.

Variants 2a and 2b both have a substantial impact on the number of passenger kilometres during peak hours. Specifically, student travel during peak hours is expected to decrease by 50 per cent with variant 2a and by 31 per cent with variant 2b. However, since both variants allow for free travel during off-peak hours, the number of passenger kilometres during these times will increase. It has been found that the specific details of the alternative travel product can significantly affect the distribution of public transport kilometres across different times of the day. A significant difference in discounts between peak and off-peak travel leads to a pronounced shift between time periods (Bakker & Wortelboer, 2014). According to the researcher, this can result in a considerable reallocation of travel across different times of the day.

Variants 2c, 3, 4, and 5 are characterised by a reduction in student passenger kilometres during peak hours of approximately 15%. However, these variants also lead to a significant decrease in passenger kilometres during off-peak hours on weekdays, ranging from -13 to -17%, as well as a minor reduction during weekends. Since the objective and scope of this research are solely focused on reducing student numbers during peak hours, these variants are undesirable due to their pronounced decline in off-peak travel and therewith in overall train kilometres. These variants exhibit the undesirable effect described by Daniels & Mulley (2013), where measures intended to reduce passenger numbers during peak hours result in an overall decrease in total passenger kilometres, thereby leading to a significant reduction in train usage overall.

Considering the findings of Bakker & Wortelboer (2014), variant 2b will be the pricing option in this research which will be used in the interviews in order to answer the main question, so the measure: '*Free travel during off-peak hours and 50% discount during rush hour*'. Where this option could potentially be combined with non-pricing measures, which will be explained in the next paragraph. The peak hours associated with this measure in this research will follow those currently used by NS, which is the morning peak from 06:30 to 09:00 and the evening peak from 16:00 to 18:30 (NS, n.d.).

Non-pricing measures

The above discussion has focused on potential pricing measures. Attention will now turn to possible non-pricing measures to achieve of course the same objective, reducing the number of students during peak hours in Dutch trains.

In addition to travel demand management measures for cars and public transport, it is also worthwhile to consider a brief success story in travel demand management: a story about cycling. Although this represents a different case, it is valuable to reflect on the successful implementation of a non-pricing demand management measure. Research by Pucher and Buehler (2007), titled ‘Making Cycling Irresistible’, shows that, through appropriate policy measures in the Netherlands, Denmark, and Germany, cycling rates have significantly increased. The most important policy measure identified is the creation of separate cycling facilities along heavily trafficked roads and intersections (Pucher & Buehler, 2008). This type of measure serves as a successful example of a non-pricing travel demand management strategy.

Measure 2. Adjusting schedules.
According to Daniels and Mulley (2013), influencing travellers' choice of travel time is central to peak spreading. One option for distributing students more evenly throughout the day could be adjusting lecture times. Jovanis (1983), already discussed begin 1980 the option of adjusting work schedules in order to directly influence travel time patterns. Currently, the first hour during which educational activities can be held at Dutch educational institutions mostly starts between 08:30 and 09:00. For example, at TU Delft, lectures begin at 08:45, while at the Amsterdam University of Applied Sciences they start at 08:30. However, it can be argued that students attending lectures in the first hour are compelled to travel during the peak period of 07:30–08:30, as defined by NS (NS, 2023). Shifting lecture times to a later hour could therefore contribute to reducing the number of students on trains during peak times.

Further research by Ljungberg (2015) on adjusting (lecture) schedules demonstrates that changing the start time of lectures could reduce rush hour congestion, leading to fewer public transport modes being required overall, as the peak demand is lowered due to better distribution of passengers throughout the morning. Recent research by Eriksson et al. (2023b) showed that in Sweden, adjusting bus departure times by up to 15 minutes resulted in fewer buses being needed and a reduction in peak traffic. Eriksson et al. (2023b), also note that for such savings to be achieved, demand must be spread, for instance by adjusting the start time of educational institutions. Even adjusting departure times by as little as five minutes leads to a decrease in operating costs. A similar measure was introduced in the east of the Netherlands by HAN University of Applied Sciences and Radboud University. It was found that the number of train passengers at peak times was significantly reduced, see Chapter 2.4 for exact numbers (van Heest, 2018).

Measure 3. Adjusting schedules in combination with reservation systems.
Adjusting class times will generally affect students who need to be present because they wish to attend educational activities during the first hour. However, there are also students who visit the educational institution for reasons other than attending classes directly in the first hour or at all, such as engaging in group work or for studying. For instance, from the researcher’s own experience, study spaces at TU Delft are often fully occupied from 09:00, particularly two or three weeks before examination periods, compelling students to arrive before 09:00 to secure a place. Similarly, project rooms, which require an entrance pass to be collected before 09:00 to access. Given that study spaces are allocated on a 'first come, first served' basis nowadays at TU Delft for instance, students are unlikely to shift their travel times to off-peak periods voluntarily even when they don’t have lectures the first hour, as they risk losing access to (preferred) study spaces.

During the COVID-19 pandemic, several educational institutions implemented a reservation system for securing study spaces for a few months. A variant of travel demand management could therefore involve adjusting class times in combination with introducing a reservation system for students to book study spaces. For example, students could be given the option to reserve a study space between 10:00 and 10:30, ensuring that the study space cannot be occupied by others before. This would allow the majority of students to travel for self-study outside peak hours. In addition to alleviating peak hour congestion, it can also be anticipated that such a system would provide students with greater certainty about securing a study space, thus reducing the likelihood of unnecessary trips to the university.

Measure 4. Compressed workweeks/consolidation.
Another measure of adjusting schedules is the consolidation of student activities into fewer days. In the literature, this concept is referred to as 'compressed workweeks' (Jovanis, 1983). The idea behind compressed workweeks is that, for instance, individuals complete a 40-hour workweek in 4 days instead of 5, by working 10 hours per day rather than 8. The underlying assumption is that this would result in fewer commuting trips overall.

Currently, educational institutions are open for teaching 5 days a week. Students are expected to be available all 5 days outside of holiday periods, despite having an average of only 15 to 20 contact hours per week, which may or may not be mandatory. It is not uncommon for students to travel to their institution for only one single mandatory activity, such as a lecture, each of the 5 days. In other words, students make the trip to their institution 5 days a week. Logically, by rescheduling, this could be reduced to 2 or 3 days of mandatory educational activities, with the assumption that students could engage in self-study at home on the other days if they live far away. This would, in turn, reduce the number of days they need to travel to the institution each week, thereby easing peak hour congestion.

Naturally, it is essential to remain attentive to the complexity involved in scheduling. It should be noted that when adjusting schedules (measure 2/3) and/or consolidating workweeks (measure 4), and thereby altering schedules, the capacity of buildings and overhead must also be considered. This research assumes that there is sufficient capacity for these measures, or that such capacity can relatively simple be created. The researcher is aware that this is a question related to this measure, but considers this issue to be a subject for further research and will now assume that there will be sufficient capacity. The same applies, for example, to the question of its financial feasibility.

Measure 5. Online teaching.
The fifth measure involves offering online education, thereby eliminating the assumption that students necessarily need to take the train to attend lectures at all. So, what if students were required to attend only one day per week or not at all, as all activities could be accessed online. The COVID-19 pandemic has demonstrated that technology can support such possibilities (Shemer, et al., 2022). As early as 1983, it was noted that technology "may alter our fundamental need to travel" (Jovanis, 1983, p. 167).

The feasibility of this approach will vary between different programmes. For some, it may be more viable than for others, particularly for programmes involving laboratory work or practical sessions that necessitate physical presence. Consequently, a balanced solution is proposed: a workweek consisting of one mandatory in-person day on campus for programmes where physical attendance is essential, with the remaining days devoted to online educational activities. For programmes without mandatory physical activities, which constitute the majority, this measure would imply fully online education, with the exception of examination periods.

Measure 6. Higher availability of hospita renting.
As has become clear, there is a significant shortage of student housing in the Netherlands (see Chapter 2.1). A common initial response to this issue is to increase the amount of student

housing. However, it has proven to be a very challenging endeavour, as numerous factors make it difficult to build additional housing in the Netherlands today (van Gent & Hochstenbach, 2020; Hendriks, 2024). These complicating factors are diverse and not easy to solve, therefore these will fall outside the scope of this research beforehand.

In addition to the building of more and new student housing, there are other strategies to increase the availability of student accommodation within a city. It is crucial to examine the existing housing supply and explore possibilities for reconfiguring these spaces or, at the very least, enabling their use by a larger number of residents. One such option is the 'hospita[5]' model of room rental, where homeowners rent out a part of their existing house. This form of renting has been gaining attention and has been supported by a government campaign since the summer of 2024 (Rijksoverheid, 2024). For instance, promoting 'hospita' room rentals is one of the action points in the Student Housing Action Plan, aimed at reducing the shortage of student accommodation (Rijksoverheid, 2022). In 'hospita renting', a homeowner rents out part of their residence while continuing to live there themselves, sharing facilities such as the kitchen, toilet, and bathroom with the tenant (Rijksoverheid, 2020). Often, rental income from this arrangement does not need to be declared to the tax authorities, provided it remains below €5,998 per year. There are, however, certain conditions, such as sharing access to the property, having a rental contract, not being in a registered partnership with the tenant, and both parties being registered at the same address (Rijksoverheid, 2020).

The question remains to what extent students perceive this form of renting as a desirable way of living. Although there is a significant shortage of rooms, and many students wish to live independently (Ministerie van Binnenlandse Zaken en Koninkrijkrelaties, 2024)—which would reduce their need to commute during peak hours—it is unclear whether 'hospita' rentals are an attractive option for them. This raises the question of how viable this model could be as a travel demand management measure in this context. The measure here focuses on increasing the attractiveness of 'hospita' rentals for both the homeowner renting out a room and the tenant (students). The underlying question, in the context of acceptability, is to what extent the acceptability is for this form of living, and, more importantly, whether it is preferred over the alternative: not having accommodation in the student city and consequently relying on public transport.

Deliberately, the obvious measure of 'building more student housing' has not been selected in this research. It can be concluded beforehand that this measure is unfeasible in the short term (Hendriks, 2024). For many years, discussions have been ongoing about building more homes across society, yet for various reasons, progress has been minimal. Simply looking at the current shortage of student rooms illustrates that 'building more housing,' like capacity enhancement, should be classified as a long-term solution with high costs and significant uncertainty regarding its feasibility. Moreover, it can be argued that the acceptability of the measure to build more homes is widely supported, given the difficulty of opposing the construction of more housing in the face of severe shortages. For these reasons, there is specifically chosen to explore an option that has been gaining increasing attention from the government nowadays, but whose effectiveness and more important acceptability of the target group, students, remains uncertain. Do incoming students actually want to live with a homeowner, or had they envisioned a more traditional student house or a self-contained studio?

6.3 Selected list travel demand management measures

In total, six Travel Demand Management Measures have been selected as the focus of this research, as outlined in Table 3 below. These measures consist of one pricing measure and

[5] In Dutch: hospitaverhuur.

five non-pricing measures. It is important to bear in mind that the baseline scenario refers to maintaining the current situation, where students have the choice of travelling for free either during the week or on weekends (see chapter 2). Additionally, for measures 2 to 6, it is assumed that this current travel scheme for students remains in place.

	Category	Measure
1	Pricing	Making student travel with train more expensive during rush hours for students
2	Non-pricing	Adjusting schedules
3	Non-pricing	Adjusting schedules in combination with reservation systems
4	Non-pricing	Compressed workweeks (/consolidation)
5	Non-pricing	Online teaching
6	Non-pricing	Higher availability of hospita rooms

Table 4, Travel Demand Management Measures central to the research

As stated, the researcher is aware that there are additional measures that potentially could be effective. However, a researcher must ultimately make choices to conduct a feasible study within the available time and with the available resources. Therefore, six relatively extreme measures have been selected. Additionally, to maintain clarity in this research, measures that do not appear to be directly applicable to the Dutch student context have not been included. The most notable measure excluded is 'promoting alternative travel modes'. For example, promoting cycling as an alternative to public transport is not relevant, as the distances typically covered by students still living at their parents' home are generally too far for cycling. Moreover, public transport use is free for students, and assuming this remains the case (except measure 1), the alternative of taking the car is also unattractive due to the high costs and the negative environmental externalities associated with car use. Furthermore, promoting car use among students could potentially shift the problem from overcrowded trains to even more congested roads, which is equally undesirable. And if students will take the car instead of the train, there will be a significant higher emission of CO_2.

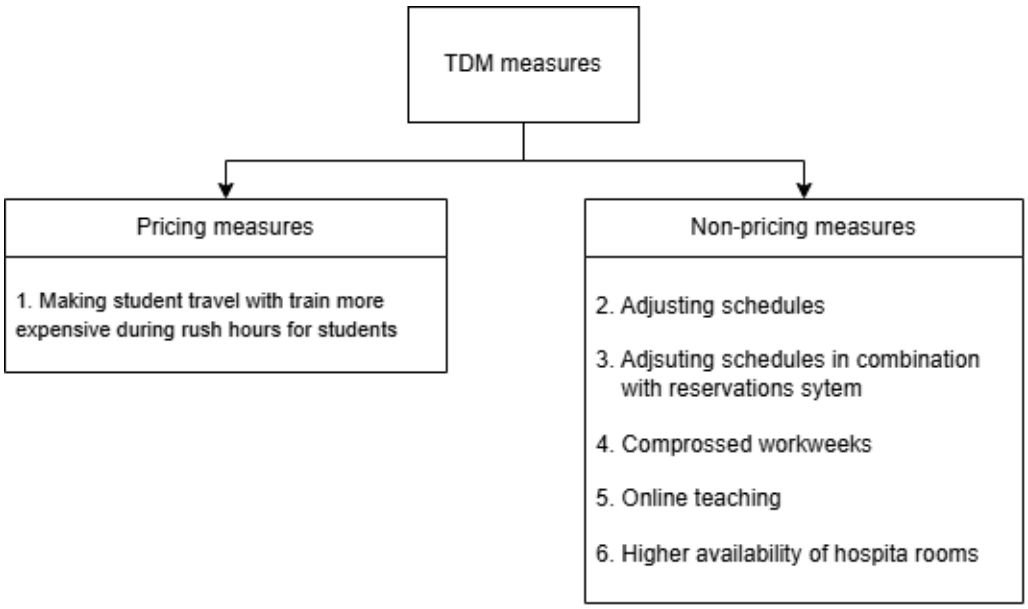

Figure 11, graphical representation selected TDM measures categorised

Naturally, all distinct policies have their limitations and challenges. Any option chosen from the demand management toolkit must ultimately receive both social and political support in addition to being effective. Even if an option or combination of options is effective, it will not be

implemented if it lacks support. Moreover, demand management can go too far with the risk driving travellers away from public transport. Daniels & Mulley (2013) caution that successfully reducing rush-hour congestion can make public transport less attractive to its primary users, potentially leading to a decrease in overall public transport usage. With this in mind, the following chapter will focus on assessing the individual acceptability of these measures, as defined in Chapter 5, while keeping the most impacted actors from Chapter 4 at the forefront. The six identified measures will be central to the semi-structured interviews with students and teachers in the next chapter. Additionally, the researcher is mindful that other measures not mentioned above may be raised during the actor interviews. The semi-structured format of the interviews allows the researcher sufficient flexibility to identify and explore any such measures that are mentioned during the interviews.

Feasibility of the identified travel demand management measures

For the continuation of this research, it is important to briefly reflect at the end of this chapter on the feasibility and practicality of the various travel demand management measures mentioned above. This research does not address the thorough question of feasibility regarding the proposed measures. Of course, a general inquiry was made as to whether the measures are in the basis feasible, to which the answer is yes. However, no in-depth technical, policy-related, or legal research into feasibility have been conducted. Therefore, for the remainder of this research, it is assumed that the measures can be implemented if such a decision is made. This assumption allows this research to focus solely on the acceptability of the proposed demand management measures.

7. Acceptability travel demand management measures

This chapter focuses on answering the fourth research question through the use of semi-structured interviews. The research method itself is further elaborated in Chapter 3. A total of two groups were interviewed, namely students and teachers from various educational levels. The questionnaires used for both groups can be found in Appendix B of this report. This chapter will present the results of the conducted interviews. Each interview was further transcribed by the interviewer, and an example of the transcripts can be found in Appendix C for students and Appendix D for the interviews with teachers. The underlined text in the interviews are questions from the interviewer during the semi-structured interviews. Additionally, 'measure cards' were used during the interviews to make the process more illustrative and to facilitate smoother interview proceedings; see Appendix B.2.

The interview was divided into four parts: Part A - introduction, Part B - general problem beliefs, Part C - TDM specific beliefs, and Part D – closure//conclusion (see Appendix B for further elaboration). Below, the outcomes of the interviews are presented for each section. To provide a structured analysis of the respondents' answers, statements using a Likert scale were used, see Table 5 for the answer possibilities. In addition to selecting a number on the Likert scale, respondents were also required to provide an explanation for their choice. For each statement, a table is included below, showing the number of times, each level of the Likert scale was selected as a response to the respective statement. Furthermore, there is given a reflection on the answers of the statement and a conclusion per statement.

Table 5, 5-point Likert scale

1	Totally agree
2	Agree
3	Neutraal
4	Disagree
5	Totally disagree

7.1 Part A. Introduction questions

In total, 17 individuals were interviewed, consisting of 12 students and 5 teachers. The ages of the students ranged from 18 to 24 years. The educational level of the interviewees varied across both students and teachers, covering HBO-level and WO-level. Furthermore, an effort was made not to go only for students from Delft, but some geographical differentiation was attempted. As a result, there are respondents who had to travel 20 minutes by train, to people who spend almost 2 hours on the train every day for a one-way journey. Table 6 below presents the answers on the introduction questions of each student interviews, while Table 7 shows the same for the teacher interviews.

Table 6, interviews conducted with students

Interview	Student - teacher	Boarding train in	City of education	Level of education
1	Student	Utrecht	Den Haag	HBO
2	Student	Rotterdam	Den Haag	WO
3	Student	Rotterdam	Amsterdam	WO
4	Student	Leiden	Den Haag	HBO
5	Student	Voorschoten	Den Haag	HBO
6	Student	Delft	Utrecht	WO
7	Student	Wehl	Amsterdam	HBO
8	Student	Hoogkarspel	Amsterdam	HBO
9	Student	Santpoort	Delft	WO
10	Student	Didam	Nijmegen	HBO
11	Student	Rotterdam	Delft	WO
12	Student	Lelystad	Amsterdam	HBO

Table 7, interviews conducted with teachers

Interview	Student - teacher	City of education	Level of education
1	Teacher	Delft	WO
2	Teacher	Den Haag	HBO
3	Teacher	Rotterdam	HBO
4	Teacher	Delft	WO
5	Teacher	Delft	WO

7.2 Part B. General problem belief questions

In Part B of the interviews, the focus was on gaining insights into the left side of the two-sided individual acceptability framework from Chapter 5. In this section, three statements were ultimately presented to the students. Below, each statement is outlined along with the Likert scale responses by the students, followed by a reflection on the explanations provided by the students. In contrast, for the teachers, it was not a requirement to travel by train to the educational institution in order to participate in this interview. Therefore, Part B for this group did not yield any significant points to be discussed below.

Statement 1, part B: “During peak hours, the train(s) I need to take are overcrowded, and I experience this as a major problem.”

Table 8, Answers on Likert scale students interviews statement 1, part B.

	Number of times mentioned by students
1. Totally agree	
2. Agree	7
3. Neutral	2
4. Disagree	3
5. Totally disagree	

n = 12

Insight from the student respondents’ answers shows that many view overcrowding as a problem, though not to the extent that they would rate it as a “1” on the Likert scale. The most commonly mentioned irritation is having to stand on the train during peak hours, regardless of

travel duration, thereby missing out on travel comfort. Respondents seem to moderate the severity of the problem if the train journey is shorter. When asked by the interviewer if it matters that they do not directly pay for the train journey themselves, about the half of the respondents indicated that this indeed makes a difference. Students who were interviewed describe that they partly accept the overcrowding because they are not paying for it personally. If they have to pay students maybe make different choices, like choosing a different travel mode for instance is a heard answer (student.5). Furthermore, during the interviews, it became clear that there is a difference in the routes in terms of congestion. One example is that a person from the far north, Hoogkarspel (student.8), and a person from the east of the Netherlands (student.10) both reported experiencing relatively little crowdedness on their route, this is partly also due to the fact that these two respondents begin their journey almost at the start of the route.

Argued from the answers of respondents in this research is that there is a relative quite big feeling of problem awareness. This raises the question of to what extent students, given this awareness, feel a responsibility to adjust their travel behaviour—a topic addressed in the second statement.

Statement 1, part B: “I feel morally responsible to change my travel behaviour to reduce overcrowding on trains during peak hours.”

Table 9, Answers on Likert scale students interviews statement 2, part B.

	Number of times mentioned by students
1. Totally agree	
2. Agree	1
3. Neutral	
4. Disagree	3
5. Totally disagree	8

n = 12

The interviews reveal that many student respondents do not feel a direct moral responsibility to adjust their travel behaviour, only student.5 was an exception. This view is generally informed by three main reasons. First, (a) respondents often feel obligated to be at specific locations at specific times, leading them to feel that the matter is beyond their control and thus not their responsibility. Second, (b) respondents perceive the issue as insufficiently significant to change behaviour by themself, for example, travelling an hour earlier without any incentive. Lastly, (c) some respondents openly question why they should bear the responsibility for solving the overcrowding issue rather than, for instance, other passengers or the NS. There are respondents who already travel outside of peak hours by their own initiative, but upon further questioning, they clearly indicate that they do so entirely for personal reasons and not because they feel the moral responsibility to do so. As one student told, “It’s not that I take others into account in my travel behaviour beforehand. I just try to travel outside peak hours if I can, but I do that for myself, simply because I don’t like the crowds” (student.9).

It should also be noted that not everyone interprets or understands the term "moral" in the same way. However, after clarification from the interviewer—that it refers to an individual’s intrinsic motivation or sense of responsibility to adjust their travel behaviour—the question is better understood. All in all, it can be suggested that there is little to no (moral) sense of responsibility among the respondents, and thus, this sentiment may be of limited use in developing any potential future policy measures.

Statement 3, part B: “I am willing to change my travel behaviour to reduce the negative effects of overcrowding.”

Table 10, Answers on Likert scale students interviews statement 3, part B.

	Number of times mentioned by students
1. Totally agree	
2. Agree	4
3. Neutral	3
4. Disagree	1
5. Totally disagree	4

n = 12

Compared to moral responsibility, there is a group of respondents that express a moderate to relatively positive attitude toward willingness to adjust their travel behaviour to reduce negative effects. However, it is important to note that these students primarily measure negative effects by the inconveniences they personally experience rather than those of others. The responses indicate that, if the right incentives are provided, these students would potentially be open to adjusting their behaviour. One reason for hesitance to adjust is the perception that responsibility lies not with them but with NS, which is expected to provide sufficient capacity, or with other passengers, who could also consider adjusting their behaviour (student.5).

The responses to this statement suggest that there may be a potential willingness among this group to adjust their travel behaviour, with the most critical factor being the specific measures proposed. As one respondent aptly put it, “It depends a lot on what is expected and what is offered” (student.4).

Conclusion general problem beliefs based on interviews students
There is an awareness of the problem; however, this awareness is heavily based on the personal discomfort caused by overcrowding at an individual level. In Chapter 5, it is stated that the potential power of a high level of problem awareness can activate a personal norm, which can be experienced as a feeling of moral obligation to act (Eriksson et al., 2006). Thus, this moral drive to act is motivated by intrinsic motivation rather than extrinsic motivation. However, these moral feelings are absent among the respondents, indicating that extrinsic motivation is more powerful than intrinsic motivation within this group.

7.3 Part C. Policy specific belief question

Part C focused on the six TDM measures as identified and selected in Chapter 6. After introducing each measure during the interview, respondents rated their agreement with statements on a 5-point Likert scale again, and explaining their reasoning behind their choice. Furthermore, respondents were encouraged throughout the discussion to express any thoughts they had. The semi-structured interview format also allowed the interviewer to ask clarifying questions when a response was unclear or when interesting perspectives could be elicited through additional questions (these questions are the underlined text in Appendix C and D). Below, the results of the Likert scale responses for each measure are presented, along with a reflection on the explanations provided by the respondents. The measures that were also presented to the teachers (measures 1, 2, 4, and 5) are added with reflections on the responses from these five interviews, those are not asked the same 5-point Likert scale statements and are therefor not included in the tables below.

Measure 1. Pricing. *Tariff differentiation. Making student travel with train more expensive during rush hours for students, 50% discount during rush hours.*

Table 11, Answers on Likert scale students on measure 1.

➔ Statement	**Effectivity** "This measure will definitely make me take the train less during peak hours"	**Fairness** "I consider this measure to be fair"	**Affordable** "I consider this measure to be affordable"
1. Totally agree	4		
2. Agree	4	2	2
3. Neutral	1	2	7
4. Disagree	1	4	2
5. Totally disagree	2	4	1

n = 12

Based on the student respondents' answers, it can be said that this measure is likely to be effective for the interviewed group. The majority of respondents indicated that they would do very much to avoid travelling during peak hours in order to avoid the costs of it. As stated by one student, "this is so expensive, especially for a student, that it would definitely make me travel outside of peak hours" (student.8). Respondents stated further that they only travel during the morning peak if attendance at morning lectures is indeed mandatory. There is no motivation to leave before 06:30 in order to travel ahead of peak hours and arrive on time at the educational institution for the first lecture around 08:30 – 09:00 without any costs. Considering the respondents' answers, this measure is perceived as relatively unfair. Interestingly, the responses concerning affordability are relatively moderate. Many individuals expressed that they find it quite expensive and would need to make some adjustments to their current spending patterns; however, nearly no one indicated that they are struggling financially as a result.

With this measure, teachers are particularly concerned about the number of students who will still attend the first lecture. The interviewed teachers have already noted that relatively few students attend the first lecture nowadays, and they expect this number to decrease even further due to this pricing measure, potentially impacting the quality of education. As Teacher 4 aptly described, "even fewer students will attend the first hour than now. Attendance is currently at 40%, I fear that with this measure, it will drop to 10-20% the first hour".

Measure 2 and 3. Non-pricing. *Adjusting schedules + adjusting schedules in combination with reservation system.*

Table 12, Answers on Likert scale students on measure 2 and 3.

➔ Statement	"This measure will definitely make me take the train less during peak hours"	"I consider this measure to be fair"
1. Totally agree	8	2
2. Agree	4	6
3. Neutral		3
4. Disagree		1
5. Totally disagree		

n = 12

Based on the responses from the student group, it can be inferred that this measure could be effective, at least within this group of respondents. Furthermore, this measure is generally

perceived positively by nearly all of the respondents. No respondent definitively labelled the measure as negative. The general impression from the interviews suggests that many of the students interviewed would actually find this measure quite nice. This is also reflected in the perceived fairness of the measure, which is largely considered fair. Students appear to be unconcerned about the possibility of having classes until 19:30, with an expectation that their extracurricular activities will adjust to the new reality. In any case, no one seems deterred by the measure in advance, which reflects to its potential.

The addition of a reservation system appears to make little difference. Specifically, for the interviewed students who do not live in their student city, this factor is irrelevant, as these respondents indicated they would not visit the educational institution if no educational activities are scheduled. Based on these interviews, the reservation system seems to have minimal impact on the acceptability of the measures 'adjusting schedules'.

Furthermore, the teachers were not necessarily negative towards the measure. Many of the interviewed lecturers found it more favourable than the previous pricing measure. Teachers seem willing to adapt to some extent and, if necessary, to hold lectures until 19:30 one or two times a week. However, nearly all of the lecturers indicated that they would want to retain control over determining which day evening lectures could be held. Following this, the lecturers also expressed concerns about the expected attendance after 17:30, as well as the potential decline in concentration levels after 17:30. Lastly, the WO lecturers pointed out that they are not full-time teachers, as they primarily are doing research. In contrast, the HBO has more full-time lecturers compared to the WO level.

Non-pricing 4. *Compressed workweeks/consolidation*

Table 13, Answers on Likert scale students on measure 4.

➔ Statement	"This measure will definitely make me take the train less during peak hours"	"I consider this measure to be fair"
1. Totally agree	2	3
2. Agree	9	6
3. Neutral	1	1
4. Disagree		2
5. Totally disagree		

n = 12

The responses of the students indicate that this measure is considered effective by the respondents, as many students would, on average, travel less per week due to this measure they think. Students who live far from the city where their educational institution is located that, on days without scheduled educational activities, they will definitely not travel to campus. Some students do note, however, that they anticipate their concentration might decline if the days are longer and fuller with activities. Nevertheless, many students also express that they find it highly inconvenient to travel to the institution for just one single educational activity nowadays.

Teachers also view this measure positively, provided that it is logistically and organisationally feasible, and that students are able to maintain adequate levels of concentration. In terms of fairness, this measure also scores relatively high. Looking at the factors of effectiveness and fairness, this measure can therefore be characterised as having a high degree of acceptability, with the reservation made that students' concentration must be maintained during the fuller and longer days.

Non-pricing 5. *Online teaching*

Table 14, Answers on Likert scale students on measure 5.

➔ Statement	"This measure will definitely make me take the train less during peak hours"	"I consider this measure to be fair"
1. Totally agree	10	
2. Agree	2	1
3. Neutral		1
4. Disagree		2
5. Totally disagree		8

n = 12

The respondents' answers indicate that this measure is likely to be highly effective in reducing train usage among this group at all. Interviewed students almost unanimous said that they would visit campus significantly less frequently, with their only reasons for doing so being group work that cannot be conducted online or physical exams.

Conversely, both students and teachers agreed that this would not benefit the quality of education at all. Additionally, students clearly expressed that they do not find this measure fair, as the adjustments required of them seem disproportionate to the measure's anticipated effects. Students unanimously recognised the value of in-person education, as one noted, "I don't think this is fair, because there's so much added value in studying in person" (Student.4). Many also questioned why only students are expected to make adjustments, with one interviewed student stating, "Why can't working people make adjustments?" (Student.6). This measure appears to reflect the phenomenon described by Schade & Schlag (2003), who note that highly effective policies often have low acceptability.

As a follow-up, interviewees were also asked for their thoughts on a combination of in-person and online learning. The responses suggest that there may be support for blended learning, which combines in-person and online instruction. In combination with compressed workweeks, blended learning has potential to positively contribute to educational quality. In this study, blended learning is defined following Hrastinski (2019, p. 568) as "the types of education that include aspects of face-to-face learning and online learning".

Measure 6. Non-pricing. Hospita housing availability.

Table 15, Answers on Likert scale students on measure 6.

➔ Statement	"This measure will definitely make me take the train less during peak hours"	"I consider this measure to be fair"
1. Totally agree	-	
2. Agree	-	2
3. Neutral	-	8
4. Disagree	-	2
5. Totally disagree	-	

n = 12

This measure has proven to be the odd one out during the interviews. In principle, it can be inferred from the interviews that no one in the group outright considers the measure to be unfair or is inherently opposed to it. However, everyone does indicate that determining its effectiveness is challenging due to various uncertain factors, such as whether and when individuals might choose this option.

There are also respondents who indicate that they would not consider living in their student city in any form. These tend to be primarily students from HBO level. This is in line with the figures from the National Student Housing Monitor of 2024, which show that 73% of the WO students live out of their parents' place, compared to only 39% of HBO students (Ministerie van Binnenlandse Zaken en Koninkrijkrelaties, 2024). This is further supported by the statement of an HBO student: "People want to live in their city of education much less at HBO than at WO, I think" (student.1). Additionally, for students already living in his or her student city, it is difficult to imagine how this option might have looked, given that it is no longer a necessity for them.

Nevertheless, some respondents who are already living in student accommodation or would consider doing so, indicated that they would consider this option if it were the only way to live in the student city. Especially when their parents live far away from the city of education. However, since all respondents mention that it is difficult to make a decision at this time, the question of effectiveness holds little value and is therefore not addressed in Table 15 above. It is also worth emphasising that one interviewed student indicated a preference for this option of living over a student house, specifically because of the greater sense of calmness he or she expect to find with hospita housing (student.10). Overall, it can be said, based on the interviews, that potentially for a small group of students, this measure could potentially provide a solution, thereby allowing this (small) group to avoid peak periods.

7.4 Part D. Closure questions

Each interview concluded with closing questions. During these closing questions, respondents were given extensive opportunity to address any points that had not been mentioned.

Ranking of the measures

In the interviews, two questions required the student respondents, to rank measures based on two criteria. The first criterion was expected effectiveness, and the second was expected acceptability. This approach aimed to explore whether a relationship exists between effectiveness and potential acceptability. Specifically, it sought to determine whether the most effective measures might be those with the lowest levels of acceptability and vice versa.

After the interviews were conducted, a deliberate decision was made to apply some consolidation and exclusion of certain measures in the presentation of results. For instance, measures 2 and 3 were combined in the ranking, as respondents frequently indicated these measures to be equivalent and a lot of the students told not to make use of the study spaces offered and therefore the reservation system had no added value. Additionally, measure 6, 'hospita housing', was excluded from the ranking, as practically none of the student respondents were in favour of reducing student housing in general. Respondents noted that this measure was heavily influenced by individual preferences and general uncertainties about the potential hospita house, making it difficult to evaluate at this stage. Furthermore, due to time constraints, the effectiveness ranking was omitted in interviews 4, 5 and 7.

With these exclusions and consolidations in mind, the rankings presented in tables 16 and 17 below were developed.

Ranking 1. "Could you rank the 5 discussed measures in order of your top 5, with the measure you perceive as most effective ranked at number 1?"

Table 16, ranking measures based on effectivity.

→ interview ↓ ranking	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	4	5	5	-	-	5	-	4	5	5	5	5
2	5	4	1	-	-	2	-	1	1	2	2	2
3	2	2	2	-	-	1	-	2	4	3	4	1
4	1	1	4	-	-	4	-	4	2	1	1	4

Ranking 2. "Could you rank the 5 discussed measures in order of your top 5, with the measure you perceive as having the highest acceptability ranked at number 1?"

Table 17, ranking 2 measurers based on acceptability

→ interview ↓ ranking	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	4	4	2	4	4	2	2	4	4	2	2	4
2	2	2	4	2	2	1	4	2	2	3	3	2
3	5	5	1	5	5	4	1	5	1	1	1	1
4	1	1	5	1	1	5	5	1	5	5	5	5

Open question closures 1. "Are there any measures, in your opinion, that have not yet been mentioned but could contribute to reducing the number of students during peak hours?"
The researcher made, in Chapter 6, a selection of the measures which would be presented to the respondents. However, other measures could potentially also be considered to achieve the same goal. Therefore, at the end of the interview, respondents were asked if they knew any additional measures they believed might contribute but had not yet been mentioned. The suggested measures are listed in Table 18 below. Measures that belong to the same category or have great similarities have been grouped together by the researcher. This categorisation is represented by an overarching label assigned by the researcher to the respective category. These measures have been translated into English by the researcher; the original Dutch text can be requested from the researcher or the first supervisor at TU Delft.

Table 18, non-identified measures mentioned by students and teachers during interviews

Named by Student/teacher	The named measure (translated)
Category:	Capacity allocation train (equipment) related measures
Student	- Increase the number of double-decker trains. (Associated student observation: currently, there are many trains where passengers have to stand, which I think wouldn't be necessary if they were double-decker trains).
Student	- Obligate NS to operate only double-decker trains.
Student/teacher	- Use of longer trains.
Student	- Create a separate carriage for students, maintaining the principle of 'full is full.' Based on the proportion of student travellers on a route, if X% are students, only Y% number of students are allowed to enter the platform/train.
Student	- Introduce an even cheaper third class. Seats placed closer together or standing areas for half the price for example. This lower class might also attract more travellers who are not commuting for study or work purposes, but for personal reasons.
Student	- Introducing a reservation system for trains, with sanctions for those who do not show up.
Student	- Upgrade the NS Businesscards of employees (for free) who are currently travelling in second class. (Student's observation: first class is rarely full, and I think that's a waste).
Teacher	- Introducing a new safety system for railway tracks to allow for an increase in capacity.
Category:	University (schedule) related measures
Student	- Introducing evening lectures and exams in the evening.
Student	- More efficiently use of class/lecture times.
Teacher	- Introducing lectures during weekends.
Category:	Alternative travel options related measures
Student	- Provide alternative public transportation options. (Example given by student, a tram line connecting Rotterdam and the TU Delft campus, or an improved bus service from Rotterdam Central to the TU campus, with fewer stops than the current service).
Student	- Invest in alternative forms of (public) transportation.
Student	- Increase investment in and promotion of alternative direct transport options. For example, extending metro lines, so that I would no longer need to take the train.
Student	- Make alternative modes of transport more attractive for students. (Additional note student, the funds the government currently spends on subsidising public transport cards for every student could be redirected. The government could assess the annual cost per student and, instead of providing a public transport card, offer alternative options, such as an electric bicycle or scooter. I would certainly try that for a year, for example).
Category:	Tariff increasement and prohibitions related measures
Student	- Introduce measures for individuals commuting from a specific distance, allowing them to travel by train (free of charge) solely during peak hours. (Associated student observation: for instance, I know some offices that have a system where you can only park your car near the office if you live at least X kilometres away).
Student	- Prohibit train travel for individuals living within a certain radius of the educational institution. (Student's comment: I know fellow students

Student		who live in The Hague and travel by train daily to Delft. I then question whether they couldn't cycle or use another mode of transport).
	-	Implement hybrid working for all. The aim should be to create a situation where both employees of all industries and students adopt hybrid working, supported by appropriate compensation structures. This should not be limited to students working online only.
Category:		Rewarded based related measures (carrot-measures)
Student	-	Introducing a motivating reason to travel outside of peak hours for students. (Additional comment from student, for example, I think of lectures where free books were given away, which encouraged people to attend, or interesting guest lectures. I mean measures that offer a reward for travelling after or before peak hours).
Teacher	-	Reward rather than punish. (Additional comment from teacher, for instance, at the gym, I use an app that shows real-time busy periods. A similar approach could be applied to trains. For instance, you could receive a reward for travelling just before peak times, and a small incentive or penalty if you travel during peak hours. Therefore, make the reward dependent on the level of congestion. Nowadays, everything is gamified in the life of the student, so perhaps incorporating elements of gamification could be effective for students).
Category:		Spatial planning related measures
Student	-	Build more student housing on campus.
Student	-	Build more student hotels or similar concepts.
Teacher	-	Greater attention to spatial planning. (Teacher's comment: Ideally, a large proportion of the student population would live in close proximity, which would require building more housing. Alternatively, you could only admit students who live within a specific radius, but this is rarely achievable).
Teacher	-	An extreme idea could be adjusting the tax/fiscal system. (Additional comment teacher, if all students lived in Delft, no one would need to travel. So, how do you encourage students to live in the city where they study? For that, you would need to reorganise financial incentives within the entire (tax) system. But this is definitely not something for the short term").
Student	-	Building more housing on educational campuses, similar to the large campuses in the United States with ample housing for everyone.
Category:		General/other
Student	-	Improved guidance for students in making study choices, so they select a study they are likely to complete from the start, reducing unnecessary years of commuting as students. (Additional comment from student: "Currently, I see people often choose somewhat randomly and then switch after a year to the study they will actually finish, meaning that first year of commuting served no real purpose").
Student and teacher	-	Combination of measures.

At the end of each interview, the following two questions were asked to the students and teachers: *"Space for the general ideas or comments?"* and "If you were in my position (the researcher), what question would you have expected me to ask that I haven't asked?". One student raised the point of why no question regarding efficiency was included, while another individual proposed that it might have been valuable to ask what amount people would be willing to pay in order to travel during peak hours.

Now that all the results of the interview have been presented in this chapter, the next chapter will interpret the results, highlight notable findings/insights and will give direction for potential further research. The conclusion will then be provided in Chapter 9.

8. Discussion

Every research involves a series of considerations, assumptions, and setbacks. In this chapter, prior to presenting the conclusion, reflections on the research will be offered, along with any insights gained. First, the validity of the research will be addressed through the concept of 'theoretical saturation'. Next, there will be a brief reflection on the research methods employed. At the end of this chapter, several notable findings and decisions made throughout the research will be interpret, discussed and more importantly there will be suggestions for future research.

8.1 Validity research

In qualitative research, the sample size itself is not the primary consideration in ensuring adequacy. As Sandelowski (1995, p. 1) notes, "sample sizes could may be too small to support claims of having achieved either informational redundancy or theoretical saturation, or too large to permit the deep, case-oriented analysis that is the goal of qualitative inquiry". Therefore, the concept of theoretical saturation is of more value than the sample size alone. Saturation is defined by Bryant & Charmaz (2007, p. 611) as, "the point at which gathering more data about a theoretical construct reveals no new properties, nor yields any further theoretical insights about the emerging grounded theory".

In total, 12 students and 5 teachers were interviewed**.** Although saturation is always in some way subjective, the researcher suggests that there has some saturation been achieved at the higher level of insights for at least the student group. This refers to the notion that conducting additional interviews is unlikely to uncover major unexpected findings on the top lines. This conclusion is based on the observation that, for the student group, significant new insights emerged during the first interviews, while the emergence of new great insights gradually declined in interviews six to ten, and dropped to a minimum from interview 10 onwards.

This level of saturation is further supported by the exploratory nature of this research, rather than by a highly focused scope. It is important to emphasise that this exploratory nature refers to saturation at the level of broad themes and insights for the student group. Within these overarching themes, variation remains possible, and saturation will decrease when examining micro-level nuances. Therefore, there has to be noted that saturation at a micro-level cannot be concluded within these overarching themes.

Five teachers were also interviewed as part of the research. Although the five interviews revealed considerable overlap in the broad themes, it cannot be claimed that saturation was achieved based on these interviews alone. Furthermore, the researcher acknowledges that the sample size, for both students and teachers, is definitely too small to conduct statistical analyses or to report percentages.

It is essential to consider, in relation to the saturation of the student group, that only students enrolled in HBO-level or WO-level who commute by train to their educational institution were included in the sample. If the scope were to be expanded to include additional student groups, it is possible that saturation for students would not yet be achieved. The narrower the focus group, the more quickly saturation is typically reached, and vice versa (Hennink & Kaiser, 2022). Therefore, if future research on this topic broadens its scope, it is assumed that a larger sample size will be required to achieve an adequate level of theoretical saturation.

8.2 Reflection research methods

Several research methods were employed throughout this research. To answer sub-questions 2 and 3, desk research was conducted in the form of an academic literature review. For answering the first sub question, an actor analysis was used. Reflecting on these choices, the selected methods proved adequate for addressing the research questions. However, with hindsight, supplementing the literature review for sub question 3 with expert interviews or focus

groups might have further enriched the findings. This approach could have increased the likelihood of including unconventional, less-explored measures in Chapter 6. Nevertheless, the absence of such unconventional measures did not negatively impact this research.

Most of the time was dedicated to answering sub-question 4, and consequently, the main question as well. The use of semi-structured interviews was well-suited given the research exploratory nature. This interview method enabled in-depth discussions with respondents, effectively uncovering their perspectives on various measures and the underlying considerations. The flexibility for both the interviewer and interviewee to diverge from the predefined questionnaire in this method allowed for the discovery of new insights that would likely not have emerged in structured interviews.

However, it became apparent that this research method is highly time-consuming, particularly the very precise transcription process of all interviews. Should future studies shift towards a more focused approach or seek to increase the number of respondents, it is recommended to explore alternative methods to semi-structured interviews. For a more targeted approach, surveys might be a suitable option. While surveys may lose some of the nuanced insights gained from semi-structured interviews, they offer the advantage of reaching a larger respondent pool within a shorter timeframe and effort in the form of less transcription.

8.3 Choices and results interpretation and further research recommendations

The following section discusses various decisions made throughout the research process, as well as several (unexpected) outcomes. These choices and findings will be interpreted, with their limitations and implications outlined. Some decisions and outcomes will then be followed by suggestions for future research.

Individual acceptability versus institutional acceptability

At an early stage of this research, a decision was made to focus on the individual acceptability of students within an exploratory research focus. This approach enabled the construction of a focused individual acceptability framework based on existing academic literature. An additional benefit of this focus was the ability to examine in depth the acceptability of new TDM measures among students—a group whose acceptability of these measures remains largely unknown. It is likely that the information would have been less detailed if institutional acceptability had been measured instead. However, a limitation of this scope is that it provided limited insights into the perspectives of other stakeholders regarding the selected TDM measures.

Therefore, this exploratory study on individual acceptability creates significant opportunities for follow-up research with a focus on institutional acceptability. It is recommended that future research builds on the most promising TDM measures by employing focus groups with various stakeholders to explore these measures in depth. Such research can draw on the broader actor field developed during the actor analysis in Chapter 4 and Appendix A. It can be argued that this actor analysis serves as a valuable starting point for follow-up research on institutional acceptability. For instance, the actor analysis revealed that some actors are dependent on others before measures can be implemented; further examination of these relationships in future institutional acceptability research would be highly valuable for policymaking.

Focus on only trains

This study focused exclusively on train travel as the primary mode of public transport associated with overcrowding. However, many examples of crowding can also be found in other public transport services, for instance on bus lines (DUIC, 2019; van der Vegt, 2017; Francke, 2021). These instances of crowding are often regional issues and, in terms of scale, differ from the challenges observed on trains in this research. Mapping these regional bus lines and examining their specific crowding issues would be highly valuable and is recommended for future research with, for example, a specific focus on regional bus networks and overcrowding. The findings of this research about trains could potentially be applied, with some

modifications, to these other forms of public transport, although thorough follow-up research would be required to ensure accurate applicability.

Exclusion of MBO students

This research did not include MBO students. Two main reasons underpin this decision. Firstly, a practical limitation arose in the researcher's difficulty in finding MBO students who commute to their educational institution by train and were open for an interview. The researcher visited an MBO institution on two occasions, engaging with students about their travel habits. Those who commuted by public transport primarily used buses or metro services, while others travelled by bicycle, and one student even commuted by car. While there are certainly MBO students who travel by train, research by Bakker & Wortelboer (2014) indicates that even with an additional 100,000 new MBO students, only a 10% increase in train usage is expected, compared to a 17% rise in bus and metro usage, across a total of 545,000 students. These figures reflect the relatively low train usage among MBO students in comparison with HBO and WO students, influenced in part by the significantly higher number of MBO institutions compared to HBO and WO institutions—approximately 0.5 and 3 times more, respectively. Future research might therefore consider including MBO students within the research population. If other public transport services are included in potential follow-up research, it would be highly advisable to involve MBO students as well.

Unintentional exclusion of non-train travelling students

Unintentionally, the research mainly focused on students who travel to their educational institution by train. This inadvertent focus has consequently meant that students who do not use the train were not included in the interviews. While this omission does not necessarily present a limitation, it is important to consider for potential follow-up research. It may indeed be insightful to explore the perspectives of non-train-using students on the new TDM measures, as well as their priorities in general in this context. For instance, current findings indicate that adjustments to the lecture schedules have a high degree of acceptability to the group of respondents. However, as some respondents hinted already in their interview, students who do not commute by train might not favour these lecture schedule adjustments at all. Therefore, it is recommended that future research also include students who use other modes of public transport as well as those who do not rely on public transport at all.

Geographical focus

It should also be noted that train overcrowding is maybe not present on all train routes in the Netherlands as became clear during the interviews, and this must be kept in mind when interpreting the results. Care should be taken to avoid implementing national measures for what may be primarily regional issues. Some interventions, such as 'increasing peak-hour travel costs', can only be implemented national. However, measures like 'adjusting class schedules' and 'compressed workweeks' could potentially be developed regionally, through cooperation among educational institutions.

Logically, it seems unwise to adjust schedules at educational institutions in relatively peripheral areas, where train routes may not experience overcrowding. Therefore, further research into the specific routes currently affected by overcrowding is recommended, for instance in cooperation with NS. Such data could not only inform future studies on TDM measures for students but also support a broader range of research on public transport overcrowding in the Netherlands. Upon completion of this research, it would be advisable to combine the findings of this research with route-specific data to examine whether regional solutions may be more effective than national approaches in addressing the issue of overcrowding in trains.

Acceptability framework

After analysing the findings presented in Chapter 7, it has become apparent that the acceptability framework developed in Chapter 5 could potentially benefit from an expansion. Chapters 4 and 5 assumed that the student population could be considered relatively

homogeneous. Combined with evidence from the literature, which indicated that demographic characteristics offer minimal explanatory power for acceptability after controlling for other variables, this assumption led to the decision to let demographic variables out the framework. This assumption and choice are defensible, as purely demographic characteristics appear to have minimal, if any, direct influence on acceptability in literature.

However, interviews revealed that socio-economic factors could potentially have a significant impact, e.g. income, education level, housing situation and social class. Chapter 5 assumed, based on literature, that socio-economic factors were implicitly embedded within the 'general problem factors/beliefs' of the two-sided framework. In other words, it was presumed that variables such as income or housing situation would be reflected in the factors problem awareness and personal norms. However, with the insights gained from Chapter 7, it is recommended that socio-economic factors be explicitly included in the framework for further research. A potential objective for further research would therefore be to examine the relationship of these socio-economic factors with various 'general problem factors' and 'travel demand measure-specific factors'. These new insights could, for instance, help design interventions or combinations of interventions tailored to student groups with similar socio-economic characteristics. For example, different policies could be developed for students who live at home versus those who live in their city of education.

Nonetheless, the omission of explicitly addressing these socio-economic factors has not affected the validity of this research immediately, as these factors were still implicitly captured in the responses. However, for further research, a revised conceptual framework is provided below, which now includes the socio-economic factors and for full completeness also the demographic factors, see figure 13 below.

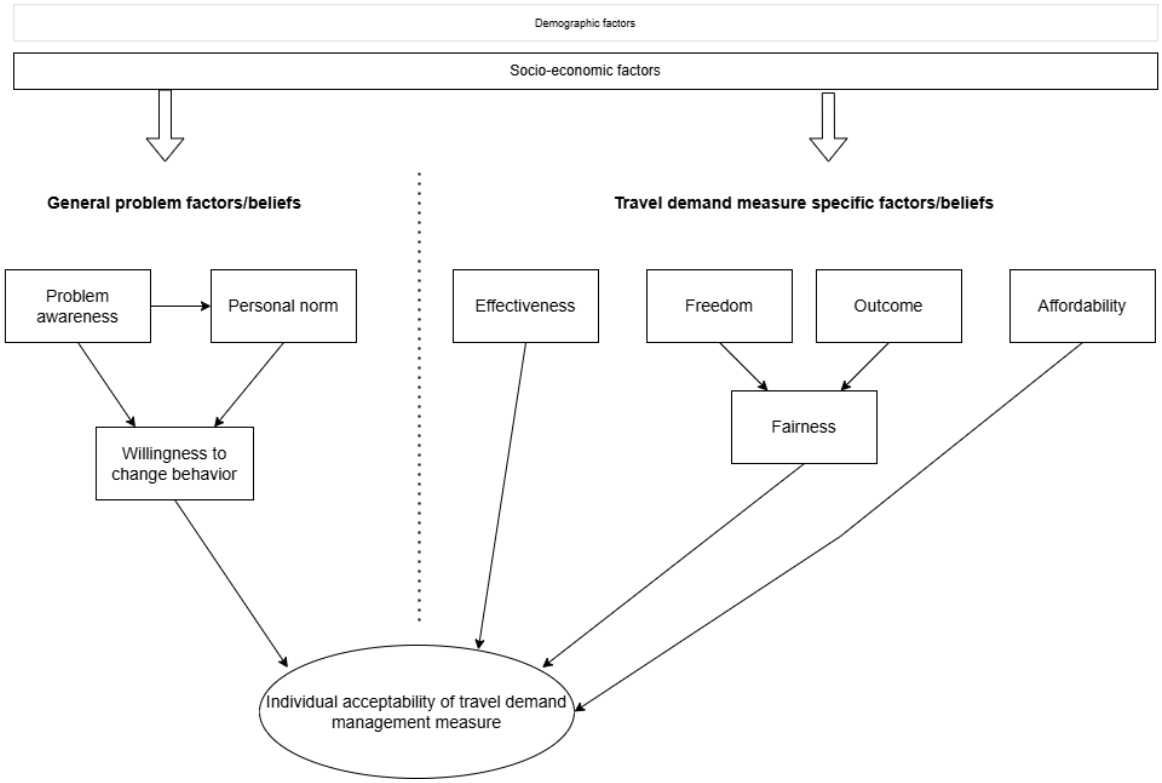

Figure 12, revised individual acceptability framework students

Selection of measures

Throughout the research process, the researcher remained aware that a prior decision was made—based on Chapter 6—to select specific TDM measures as the focus for during the interviews in Chapter 7. This decision inherently imposes a limitation, as potentially promising measures may have been excluded from the research. To mitigate this potential risk, at the end of each semi-structured interview, both student and teacher respondents were asked if there were any additional measures, not yet mentioned, that they believed could be effective. This resulting list of measures is presented in Chapter 7. This extensive list highlights that the research was not exhaustive. More importantly, it underscores the potential for future researchers in this field, for instance to conduct in-depth research into some of these, at times unconventional, TDM measures. It is recommended that a reward-based measure be included in future research, as it has been implicitly revealed that no such measure was included in this research, but is multiple times being mentioned as a potential measure in several interviews.

Furthermore, following the research, it is necessary to question whether some of the measures were potentially too extreme, and whether a combination of measures or a more moderated approach might represent a better alternative. Upon reflection, for instance, it could be argued that fully online education may be considered unfeasible, whereas hybrid models appeared to gain greater acceptability. This raises the question of whether a ‘silver bullet’ exists for this issue. Based on this research, it is impossible to identify a single measure as the definitive solution. However, this exploratory research does indicate that certain measures may have the potential to contribute positively. It is therefore recommended that future research focuses on selecting one promising measure, such as compressed workweeks, and subsequently developing more nuanced sub-measures based on this approach. These sub-measures could then be tested for their (individual) acceptability, enabling future research to provide hopefully a more targeted answer to the ‘silver bullet’ question.

8.4 Academic relevance

This research has explored potential measures whereby the outcomes can be form as hypotheses for further research. The research has contributed to the academic field by shedding light on various opportunities for further investigation. The exploratory nature of the study has revealed several directions, with the potential to formulate multiple hypotheses that could be explored in subsequent academic research. Such hypotheses are closely linked to the discussion points raised above.

It is for future researchers to identify the most promising hypotheses that can be based on the findings of this explorative study. Some potential hypotheses that could be formulated include researching combinations of measures and exploring more moderate approaches. Furthermore, there is relatively little existing literature on the impact of TDM measures on students and their overall effect on factors such as educational quality, attendance, and student well-being. This exploratory study could serve as a starting point for further academic research into these topics. Additionally, this research could form the basis for future studies employing different research methods, such as surveys or serious gaming, offering inspiration and input for such research.

This research reveals that the interviewed students show a relative high degree of problem awareness, yet this does not translate into a strong sense of moral responsibility to mitigate the issue. This finding contradicts what is outlined in the existing literature about acceptability of (transport) measures. This discrepancy, in itself, constitutes a potential hypothesis for future academic research. Possible follow-up questions could be about what the underlying reasons for this discrepancy are. Does it stem for instance from the fact that they are students or are there other contributing factors underlying.

Furthermore, the revised constructed individual acceptability framework could potentially be tested for its effectiveness in addressing issues of acceptability among students beyond

transport-related topics. And the relation between the explicit impact of the socio-economic factors could be investigate. In this way, this research has contributed not only to addressing the theoretical gap concerning TDM measures and Dutch students but also to the broader field of acceptability and student-related studies.

9. Conclusion

In this final chapter, a comprehensive conclusion will be provided. The entire research has focused on answering the main research question, which was:

What is the acceptability of different travel demand management measures among the direct impacted actors to reduce the number of students on trains during rush hours?

Firstly, based on the framework and respondent feedback, it can be concluded that there is a significant level of problem awareness among the students that are interviewed. This awareness is largely driven by personal discomfort experienced during crowded train trips, with students expressing particular frustration at having to stand, which they perceive as an inconvenience and therewith as a problem. The literature suggests a link between the level of problem awareness and a sense of moral responsibility to adapt one's behaviour. However, this effect appears to play only a minor role in this research. There is some willingness among students to adjust their behaviour, but this willingness is generally mild and rarely intrinsic initiated. Notably, willingness seems to increase when students receive something in return which can also been seen in literature.

The right side of the constructed acceptability framework comprised 'TDM-specific acceptability factors'. The research reveals a range of measures with varying impacts on student travel behaviour and therefore on the acceptability of these measures. The first measure, 'increasing train travel costs during peak hours with 50%', appears effective, as many students would shift their travel to outside the rush hours. However, this has adverse implications for educational quality, with students potentially missing their first lectures which is according to the interviewed teachers not ideal for the quality of the education. Additionally, students, particularly those with longer travel time, view this measure as financially burdensome and unfair. Therefore, this measure has a low acceptability among the interviewed students, as also supported by the interviewed teachers.

'Adjusting schedules', with or without a reservation system for study spaces, scores highly on effectiveness and is considered fair by the interviewed students. This measure holds considerable potential to alleviate congestion in the morning peak. The reservation system is potentially beneficial for university students but is not deemed essential to the measure's success. However, for the interviewed group of teachers, it can be said that they wish to retain flexibility in determining which day or days lectures may extend beyond 17:30. Therefore, it is recommended to further research this measure within the context of organisational and capacity-related issues, with an aim to schedule classes between 10:30 and 17:30 rather than 10:30 to 19:30, as the first timeframe is expected to achieve higher acceptability.

A 'compressed workweek', where students have fewer travel days, is viewed positively by the majority of the interviewed students and teachers. While students travel less per week, some raise concerns about maintaining concentration on longer days. Nonetheless, many prefer this option over travelling nowadays for only one single activity each day. With high scores on both effectiveness and fairness, this measure scores high on acceptability, provided logistical and organisational aspects support sustained concentration.

Fully 'online education', although very effective in reducing the amount of students in the train during rush hours, scores poorly on fairness and destroys educational quality in the eyes of as well students and teacher. Negative experiences with online learning during the COVID-19 pandemic weigh heavily here, rendering this solution unsuitable for now. However, blended models of physical and online education show promise and may hold value when applied in combination. In this measure, the paradox identified by Daniels & Mulley (2013) appears

relevant, namely that highly effective rush hour avoidance measures could lead to a highly decrease in overall public transport usage, which is not the goal.

Finally, increasing the ‘availability of hospita housing’ would only appeal to a small group of students. While suitable for a minority, this option’s popularity and impact depend on individual preferences, meaning it is unlikely to significantly decrease the amount of students during rush hours. The conclusion is that this measure should certainly remain in place, but it will not make a significant impact overall, despite its high effectiveness on a micro level.

It can also be concluded that the student group is more heterogeneous than initially thought. A significant contrast was observed between students from HBO-level and WO-level, as well as between students living at home and those living independently in their student city. When implementing any measures, it is important to ensure that no single large group is disadvantaged by the new policies. One potential solution to address the differing perspectives, travel behaviour and preferences among student groups is to offer multiple options for students to choose from. It can also be concluded that this research has produced an extensive list of, sometimes unorthodox, measures that have the potential to contribute to reducing the amount of students during rush hours, as identified by both students and teachers themselves. This list serves as a substantial resource for potential new (academic) research.

Recommendations

Scientific recommendations

From a scientific perspective, it is recommended to validate the newly constructed individual acceptability framework for students. Do socio-economic factors indeed influence the acceptability of measures, this could yield insights for developing measures tailored to specific socio-economic groups in future research. Additionally, from an academic viewpoint, this research offers the opportunity to conduct interviews with other stakeholders involved in the issue as an extension of this current research, thereby adding an institutional dimension to the research. In conclusion, it is recommended to collaborate with NS to create an overview of the (over)crowded routes and make this information available. This list would enable future scientific research to be conducted in a more targeted manner.

Practical societal recommendations

Based on the findings outlined above, it is recommended to further explore the measure of ‘adjusting schedules’ as well as the potential of ‘compressed workweeks’. Both measures appear sufficiently promising in terms of acceptability within the target group, providing a solid foundation for more in-depth research. It is crucial, however, to consider the possible logistical and organisational limitations of these measures. Combining these measures with online education approaches, such as blended learning, could further enhance their feasibility. Finally, it is advised that future research should assess both measures in terms of acceptability in the complex multi-actor environment, rather than focusing solely on the individual acceptability of the targeted group, as has been done in this research.

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Appendices

This section of the report contains the appendices referenced in the main text. A total of four appendices have been included, ranging from Appendix A to Appendix D.

Appendix A – Actor analyses elaboration

This first appendix presents an actor analysis. During the research process, it was decided to move the actor analysis to the appendix to improve the readability of the main report. Through progressive insights gained during the study, it became evident that the primary outcome of the actor analysis was the identification of the most impacted actors, which subsequently guided the continuation of the research with these actors in mind.

As a result, including the complete actor analysis in the main text was deemed to have limited added value. Instead, the analysis and its conclusions are detailed below. However, a summary of the analysis, along with the most critical conclusions relevant to the continuation of the research, is provided in Chapter 4 of the main text.

The actor analysis

The aim of this appendix chapter is to identify the various actors involved in this issue and, in combination with Chapter 2, to clarify the broader context of the issue. To achieve this, an actor analysis will be conducted. This analysis is essential as the insights gained will support the development of a conceptual framework in Chapter 5 and guide the identification of various travel demand management measures in Chapter 6. More importantly, this actor analysis will help identify the most impacted actors.

Being able to successfully manage actors can have a substantial impact on an issue. According to Kennon et al. (2009, p. 9), “satisfied actors can greatly improve the progress and relevance of a process and ultimately contribute significantly to its success”. Therefore, actor analysis is an important step in the decision-making process. An actor analysis is a tool for generating knowledge about involved actors to understand their intentions, interrelationships and interests, and to assess the influence and potential resources they could bring to the decision-making table (Varvasovsky & Brugha, 2000). According to Grimble & Wellard (1997), actor analysis is the process of providing insight into, and understanding of, the interactions between a project and its actors. The steps of the actor analysis are, 1) define aspects of a social and natural phenomenon affected by a decision or action, 2) identifies individuals, groups and organisations who are affected by or can affect those parts of the phenomenon and 3) prioritises these individuals and groups for involvement in the decision making process (Reed, et al., 2009). The aspects of the phenomenon have already been described in this research in Chapter 2. Below, we focus on steps 2 and 3 of the actor analysis. Ultimately, the list of actors was developed through brainstorming.

A.1 Actors

First, it is important to define what an actor is. In its simplest form an actor is according to Enserink et al. (2022, p. 79), “a social entity, a person or an organisation, able to act on or exert influence on a decision”. The case at the centre of this research is characterised by the involvement of multiple actors. It is assumed that not one actor can unilaterally introduce a solution, but cooperation and alignment between actors is required. This makes it a multi-actor environment (Enserink, et al., 2022). Problems can arise relatively quickly in these environments, given that each actor is characterised by different perspectives on the problem. It can be assumed that actors will not always agree on the problem, it is also possible that there are different views on what evidence can be labelled as fact. In addition, each actor has different priorities and preferences. It is therefore important that an actor-analysis provides insight into the range of actors involved and their networks. Therefore, several actors involved in the case have been identified. The actors are listed below in this chapter, along with an

explanation of each actor's background and purpose. Two criteria were taken into account in the selection of involved actors, interest and power.

A.2 Interest and power

Ultimately, the identified actors will be positioned in a power-interest grid. These PI-grid arrange actors in a two-by-two matrix, with the dimensions being the actor's interest in the issue at hand and the actor's power to influence the future of the issue (Bryson, 2007). The power of a PI grid is well explained by Bryson (2007, p. 15), he state, “power versus interest grids typically help determine which players' interests and power bases must be taken into account in order to address the problem or issue at hand. They also help highlight coalitions to be encouraged or discouraged, what behaviour should be fostered and whose ‘buy in’ should be sought or who should be ‘co-opted’”. The visual representation of the PI-grid can be seen in Figure 5, it is able to show at a single glance the important patterns of the actors’ environment.

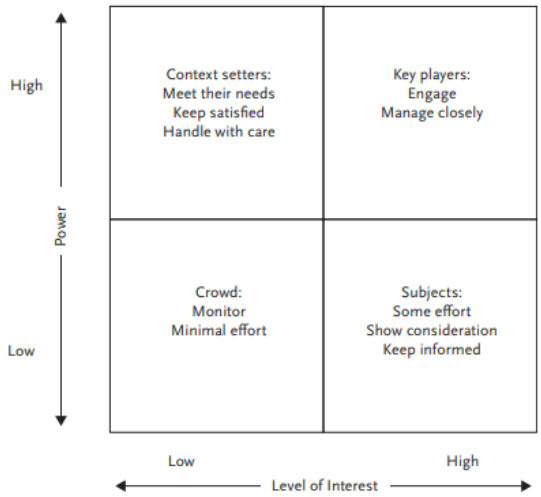

Figure 13, PI grid explanation coming from (Enserink et al., 2022).

Some actors are characterised by a high degree of interest while other actors have little or no interest in the problem. The same is true for the degree of influence of actors, some actors can exert a lot of influence while others have no possibility to do so. Critical actors are those with a high level of power - i.e. important resources - while committed actors are those with a high level of interest in the actors' problem (Enserink, et al., 2022). With this insight, it becomes possible to pre-select the most important actors to keep in mind while designing potential policy measures. However, it is important to bear in mind throughout the analysis that the entire analysis is, and will remain, based on perceptions and is subject to varying viewpoints. For this research especially, it is particularly important to use this analysis to select the most impacted actors as named in the main research question.

Brainstorming actors

To compile the actor list, several guiding questions were used, as described in Enserink et al. (2022). A brainstorming session was conducted, focusing on three key questions, which account for both the interest component of the PI-grid and the factor of power:

- The interest-based approach. Who has an interest in or feels the consequences of the issue around which the problem revolves, or the solutions that are being considered?
- The institutional approach. Who have in the existing policy-making structure a formal position in policymaking?
- The impact approach. Who is impacted by changes in the existing situation?

A.3 Identified actors

In total there are 9 actors identified based on the method for brainstorming as introduced in Appendix A. These 9 actors are outlined below in no particular order. These actors are then positioned within the PI-grid for further analysis.

NS

NS is the largest passenger rail operator in the Netherlands and holds the exclusive concession for the Main Rail Network until 2033, making it the dominant player in Dutch rail transport (Rijksoverheid, 2023). This position gives NS a significant role in managing passenger flows, particularly during peak hours, when overcrowding is a persistent issue on some routes (NS, 2023). One of the major passenger groups contributing to this issue during rush hours is students, making NS highly invested in finding solutions to reduce overcrowding on these services.

NS has outlined providing sufficient transport capacity as one of its key strategic objectives for 2020-2025, reflecting the urgency of addressing this problem. Despite efforts, current capacity is often insufficient. NS itself has identified this challenge as one of its three major future dilemmas, underlining the importance and the potential influence of this overcrowding issue to its operations, customer satisfaction and long-term strategy (NS, 2023).

All in all, NS can be characterised as a key actor in this problem. As a carrier, they face overcrowded trains daily and are frequently held responsible for this by public opinion (Peene, 2022). NS has both formal and informal power. Formally, NS has the ability to propose changes to timetables and implement fare differentiation, pending approval from the Dutch government. Informally, NS could influence through its ability to lobby for changes in government policies, such as adjustments to the current student travel scheme. This high level of both interest and power positions NS as a crucial stakeholder in discussions on managing student travel demand and alleviating overcrowding on trains during peak hours.

ProRail

ProRail is the manager of the Dutch railway network and is responsible for the maintenance, renewal, expansion, and safety of the rail infrastructure (ProRail, 2021). ProRail plays a critical role in ensuring that the railway network operates efficiently and safely, enabling trains to run smoothly across the Netherlands. The organisation's mission focuses on running more trains with fewer disruptions, while maintaining safety and minimizing its impact on the environment and society (ProRail, n.d.).

In the context of this problem, ProRail’s interest is moderate. While ProRail is not directly affected by overcrowded trains, the organisation is indirectly involved as it is responsible for the infrastructure on which these trains run. If overcrowded trains lead to additional delays during boarding, ProRail should anticipate this in their daily train traffic management task. ProRail has a relatively low degree of power, given its responsibility for the rail tracks, but its influence in this specific case is limited. Since rail expansion lays outside the scope of this research, ProRail’s capacity to directly solve the problem of overcrowded trains is restricted. However, ProRail can still play a role in supporting demand management measures and ensuring the infrastructure can handle changes in train frequency or scheduling. If needed and is possible.

Ministry of Education, Culture and Science (OCW)

In the Netherlands, the Ministry of Education, Culture and Science is responsible for creating the framework within Dutch educational institutions has to fit in (Algemene Rekenkamer, 2024). And is responsible for implementing education laws and making them possible by providing financial resources (Parlement.com, 2024). In addition, the ministry is responsible for the promotion of scientific education and science policy and for culture and media policy.

Several (executive) departments and institutions belong to this ministry. The most relevant service in this research is the 'Dienst Uitvoering Onderwijs' (DUO). Which is responsible for the provision of the study financing. DUO is in this research an independent actor, see next actor explanation below.

The laws DUO has to implement come from the government in cooperation with the legislature (first and second chamber), in this case the minister of OCW is responsible on behalf of the Dutch Government. Laws can be initiated by a minister but also in consultation with the House of Representatives or entirely initiated by the second chamber and adopted by the minister (Tweede Kamer der Staten-Generaal, n.d.). Therewith, the Ministry of OCW also introduces the crucial political aspect that goes along with amending laws that may affect student loans and thus the travel expenses scheme. The political aspect is continuously present within this sensitive issue. When the minister introduces legislation that is less favourable to students than the current model, significant opposition may arise within the student community, potentially extending to the parliament. Which may spill over into negative media coverage. Therefore, continuous balancing of interests and caution is needed on this issue as a Ministry of OCW.

All in all, it can be argued that the Ministry of Education, Culture and Science has a relatively large interest as it is responsible for good and accessible education in the Netherlands, of which the study financing scheme is part. So, the Ministry has the formal and institutional options to change the current student schemes. Partly because of the sensitivity of the subject, this actor's interest is accompanied with prudence. Besides interest, it can also be concluded that the Ministry of OCW possesses a large degree of power in the concrete form of a Minister who can introduce adjustments to the current legislation on student schemes. The actor Ministry of OCW is therefore a highly relevant actor within this case.

Dienst Uitvoering Onderwijs (DUO)
As previously mentioned, DUO is an executive agency within the Ministry of Education, Culture, and Science (OCW). These two actors are discussed separately because, while DUO operates under the Ministry, it functions as an independent organisation with a crucial role in administering study financing in the Netherlands (Rijksoverheid, 2022) . In this role, DUO finances and provides information to educational participants and institutions, with the goal of facilitating quality education (Rijksoverheid, 2022). One of its primary responsibilities is the administration of study financing on behalf of the Ministry of OCW, which also includes overseeing the 'student travel card scheme'.

It is important to emphasise DUO's nature as an executive agency, as it does not formulate the laws that govern study funding and, by extension, regulations regarding student travel expenses. Therefore, this actor holds relatively little formal power to directly influence decision-making. Furthermore, it is assumed that DUO, as an executive body, generally acts based on the directives it receives, which means its level of interest in shaping policy is also relatively low. Thus, although DUO may appear to many as a key player in study financing, its limited power and interest are a direct result of its function as an implementing organisation.

Rover (interest group for train passengers)
Rover is a travellers' association that advocates for the interests of public transport users in the Netherlands. The organisation is committed to ensuring accessible and affordable public transport for all. Established in 1971, Rover operates as a membership association, with travellers able to join by paying an annual subscription. Rover's primary role is to advise and lobby. It holds a statutory advisory role, which allows it to engage directly with transport companies and government bodies (such as NS, ProRail, and the Ministry of Infrastructure and Water Management) to represent the voice of travellers according to themself (Rover, n.d.).

Rover call itself the represent of all Dutch public transport travellers, so, including students who rely on trains to commute to educational institutions. At the same time, Rover also advocates for the interests of other passengers, such as other non-student passengers who experience overcrowded trains during peak hours. So, Rover potentially serving two different sets of interests simultaneously.

Rover has the legal right to provide advice, they sit at the table with transport companies and government bodies to ensure that the passenger's perspective is heard in consultations on issues such as timetables, fares and other (Rover, n.d.). Given this statutory advisory role, Rover holds some influence but does not possess formal decision-making authority in this matter. Nevertheless, it has multiple interests in this case. On one hand, Rover seeks to prevent overcrowded trains for passengers, but on the other, it must consider the needs of student travellers, especially if these are affected by new travel demand management measures. These interests could potentially conflict within the same organisation.

ISO/JOB (Student organisations higher education)

There are currently 14 public universities and 36 public HBO institutions in the Netherlands. In this study, anyone studying at one of the universities (WO-level) or taking a course at an HBO-level institution is the target group. Almost every student at one of these 50 educational institutions is namely entitled to study financing (see Chapter 2.1). With this, this group of students has a major interest and thus a high interest in any changes in the student finance schemes. Students at HBO- and WO-institutions are united in the interest group called ‘Interstedelijk Studenten Overleg’ (ISO), this interest group claims to represent the interests of the students at HBO-level and WO-level (Interstedelijk Studenten Overleg, 2023).

It can be said that this actor has a strong interest, as policy measures will directly impact the interest groups' members. This actor has some power in the form of the possibility of informal power by influencing politics by lobbying for instance. And potentially being able to mobilise constituencies to protest and thus exert possible pressure on the decision-making process. Actual powers to make changes to laws directly are not possible for this actor. The past has already shown that Dutch students are prepared to demonstrate whenever changes are proposed that would reduce study financing, such as in 2018 when they protested against the abolition of the monthly study grant (Het Parool, 2018). More recently, in 2023, there have been large student demonstrations due to plans to increase the interest rate on student loans. (Bajja, 2023). This willingness to demonstrate indicates a high level of interest and may potentially encourage other actors to consider this in their viewpoints.

AOb (Teacher organisation)

Teaching staff are united in the trade union/interest group called ‘Algemene Onderwijsbond (AOb)’. This organisation has more than 83,000 members, making it the largest teaching union in the Netherlands. With potential structural changes to education to reduce the number of students in rush hour, it can be argued that teachers may have an opinion on this. The reason for this is that the assumption is made that measures exist which encourage students to travel outside peak hours, but these may also impact the teaching methods of lecturers (OV Magazine, 2015). For instance, changes to timetables not only affect students but also have implications for the teaching staff. Therefore, it can be concluded that there is an interest among lecturers on certain solutions concerning student travel facilities, for instance when teaching times have to be adjusted to allow the new policies to be implemented. Power is relatively little as an advocate, at most informal contacts or possibly protesting. But compared to students, the interest is significantly smaller.

Educational institutions

In the Netherlands, the 14 public universities are represented in the interest group called Universities of the Netherlands. The 36 public HBO-institutions are represented in The Vereniging Hogescholen. These 2 organisations together can thus be labelled as the interest

representatives of the higher public education institutions of the Netherlands. For this research, the 2 independent advocacy organisations are considered as one actor which stands for the interest of all 50 educational institutions.

As described in the introduction of this research report, overcrowding, according to Preston et al. (2017), can lead to decreased productivity and increased levels of fatigue and stress among individuals. Moreover, this reduced productivity and stress may also carry over into the traveller's workplace (Mahudin et al., 2011), resulting in less productive employees or students in this case.

Once changes are required in new policies that expect commitment from the educational institutions or will bring about changes for these institutions, the interest in the case will be present. Educational institutions can be classified as actors with relatively limited formal power. However, they may leverage their informal networks within the Ministry of Education, Culture, and Science to communicate their preferences and interests.

Hospi housing

In the Netherlands, homeowners can rent out a vacant room under favourable tax conditions, a practice known as *hospitarenting*[6]. This form of renting was highly popular in the 1980s and has been regaining traction due to the severe shortage of student housing nowadays, coupled with an active governmental campaign (Rijksoverheid, 2024). Since late 2022, *hospitarenting* has increasingly been promoted as a potential solution to the student housing crisis, and it has been included in the National Action Plan for Student Housing (Rijksoverheid, 2022). However, the number of such arrangements remains negligible in comparison to the overall housing market. For this reason, the *hospita* interest group is included as an actor in this research.

It can be argued that this actor has a specific interest in the issue at hand. Nonetheless, their formal power is limited. This actor's influence is particularly focused on one of the proposed solutions: reducing congestion on trains by increasing the availability of student accommodation within cities. This actor was added to the analysis following an iteration of this chapter, after the development of Chapter 6.

Potential coalitions and oppositions

As previously discussed, the identified actors may have conflicting interests, but there may also be areas where their interests align. It is therefore essential to identify potential coalitions as well as actors whose interests are likely to clash.

It can be anticipated that NS (Dutch Railways) will seek collaboration with the Ministry of Education, Culture and Science (OCW), as NS requires governmental approval for any major operational adjustments. Simultaneously, it is expected that the Ministry will initiate contact with NS, given NS's central role as the primary rail operator in the Netherlands. Furthermore, NS is likely to engage directly with the Ministry should peak-time congestion, particularly due to student travel, become unmanageable.

A significant potential conflict could arise between the Ministry of OCW and directly affected actors if measures are introduced that negatively impact their interests. For instance, if any policy changes result in the erosion of student rights, it can be expected that students will strongly resist such measures. Similarly, academic staff may also oppose new travel demand management measures, as they would directly experience the consequences.

[6] In Dutch: *hostpitaverhuur*

The executive agency DUO, responsible for the student travel card scheme, could also face conflicts with the Ministry of OCW if proposed changes are overly complex. For example, DUO's IT systems might not be equipped to handle such modifications, or there may be insufficient staff to implement them. However, this study assumes that the Ministry will not introduce measures that DUO cannot feasibly execute.

Moreover, potential internal conflicts could arise within the boards of educational institutions. While these institutions are responsible for providing education to students, they are also dependent on their teaching staff. Therefore, the preferences of students may conflict with those of academic staff when it comes to implementing travel demand management measures. Educational institutions must carefully balance these competing interests and find a compromise.

Appendix B – Interview questionnaire

Chapter 3 provides a brief summary of the development of the questionnaire. In this appendix chapter, a more detailed explanation of the creation is presented, along with the underlying reasoning and key considerations involved in the process.

B.1 Development of interview questionnaire

Target group

During chapter 4 and 5 it became evident that the actor 'student' will be the one most directly affected by nearly all travel demand management measures, which could have both positive and negative consequences. Furthermore, it can be argued that, in addition to students, teachers may also directly experience the effects of these measures. The actor analysis revealed that both groups of actors possess relatively little direct hard power, but they are likely to show significant interest if the new measures interfere with their current ways of working and teaching. No other actors will be interviewed, as including them would make the study too broad, and it is assumed that the impact of the new measures will primarily affect students and teachers directly. Of course, other actors may experience indirect consequences, but these have been deemed less significant. Chapter 6 assumes that the actors required to implement and execute the measures essentially have the necessary resources. The interviews are therefore intended to assess the level of acceptability among the actors most affected by the potential new measures.

The respondents were recruited through various methods. One approach involved utilizing the researcher's personal network. Additionally, a snowballing technique was employed, where after an interview, the interviewee was asked if they knew any fellow students or colleagues who also commuted to the educational institution by train. Furthermore, the researcher found respondents by approaching individuals at educational institutions and asking if they were willing to participate in an interview regarding this research.

Interview questions

The interviews will take the form of semi-structured interviews. Semi-structured interviews are the most frequently used technique in qualitative research due to their demonstrated versatility and flexibility (Kallio et al., 2016). The strength of semi-structured interviews lies in the opportunity for respondents to provide comments and raise points throughout the interview. Additionally, semi-structured interviews allow the interviewer to ask additional questions beyond the predefined ones if deemed necessary during the interview.

Students

In Part A of the interview, the interviewer will provide a brief introduction to the purpose of the interview. This section focuses on gathering general information about the respondent. The primary question for students will be whether they are enrolled at one of the Dutch educational institutions and whether they use the train for commuting. If a respondent answers 'no' to either of these questions, the interview will be stopped after Part A, as this individual would not fall within the target group. For teachers, the only requirement is that they teach at one of the Dutch educational institutions; it is not obligated for them to travel by train to the institution. Furthermore, the basis demographic characteristics collected in Part A will not be used in determining the level of acceptability.

Part B of the interview, 'general problem beliefs/characteristics', aims to assess the left-side of the conceptual model from Chapter 4. The questions in this section are based on the survey questions from Eriksson et al. (2006, 2010), focusing on problem awareness, such as the extent to which the respondent experiences overcrowding during peak times. Additionally, to determine the personal norm, respondents will be asked to what extent they feel morally responsible for adjusting their travel behaviour.

Part C contains the majority of the interview questions. This section centres on discussing the 6 travel demand management measures as identified in Chapter 6. After a brief introduction of a specific measure by the interviewer, using the cards that can be seen in Figure 14 below, the respondent will be presented with several statements related to one of the acceptability factors from the conceptual model. The respondent will be asked to indicate on a 5-point Likert scale how much they agree with each statement, along with a brief explanation. The design of these questions also partially draws from the survey questions of Eriksson et al. (2006). In the interview with teachers, only measures 1, 2, 4 and 5 will be discussed in Part C, as the other two measures are assumed to have negligible impact on the current working methods and habits of teachers.

Part D is the final section and can be considered as the conclusion. It includes various closing questions aimed at giving the respondent opportunity to mention any important points that have not yet been covered but are considered significant by them. This part of the interview has a debriefing character and serves as the formal conclusion of the interview.

Teachers
There are differences between the interview questions for students and teachers. The questionnaire for interviews with teachers is shorter than that for students, as it can be assumed in advance that some measures have negligible significant impact on the current working methods of teachers and therefore there will be no interest and value in discussing these measures.

The primary objective of the teacher interviews is not to assess acceptability using the same framework applied to students, as outlined in Chapter 4. The circumstances of teachers differ considerably from those of students, making direct comparison or substitution impractical and more important of no value. Because the framework is especially designed for students in combination with acceptability. However, as discussed in the actor analysis in Chapter 5, teachers will be directly affected by the proposed measures, and their opposition cannot be ruled out. Therefore, the interviews aim to explore how teachers perceive these measures, particularly those that may alter their teaching methods. The central questions focus on whether teachers believe the measures will impact their work practices and, crucially, whether they think these changes will harm the educational quality. The interviews also seek to measure the level of resistance teachers may have towards the various measures that potentially will affect them. More importantly, the findings will allow for a comparison between the impact of these measures on teachers and the level of acceptance among students, leading to valuable insights and conclusions.

B.2 Interview questionnaire students

A. Introduction questions.
   a. What is your age?
   b. At which educational institution do you study, and in which city is it located?
   c. Do you take the train to travel to your educational institution?
   d. What type of student OV-card do you currently have?
   e. In which location do you board the train?
   f. On average, how many days per week do you usually go to your educational institution?

B. General problem belief questions.
   i. If you take the train:
      1. What is the average duration of your train trip?
      2. To what extent do you experience crowding during these train trips?
      3. To what extent do you agree with the following statements on a scale from 1 to 5:
         Statement: “During peak hours, the trains I need to take are overcrowded, and I experience this as a significant problem”
         Statement: “I feel morally responsible to change my travel behaviour to reduce crowding in trains during peak hours”
         Statement: “I am willing to change my behaviour to reduce the negative effects of overcrowding’

C. Policy Specific Beliefs questions (core of the interview),

Context

Nowadays, trains are crowded during peak hours. A significant portion of these peak-hour travellers are students (25-30%). This group is entitled to a free student OV card (public transport pass) in almost all cases, which means they do not directly pay the cost of their train journeys.

In the Netherlands, the railway system has reached its capacity limit, making it currently impossible to deploy more trains to alleviate the crowding. Likewise, capacity expansion is not feasible in the short term. This makes it necessary to consider alternative measures to reduce train crowding during peak hours.

Another possible option to address this issue is the implementation of travel demand management measures. These measures aim to influence travel behaviour.

The following questions will focus on various travel demand management measures. Each measure will be briefly explained by the interviewer. Subsequently, you will be presented with several statements and asked to indicate, on a 5-point scale, to what extent you agree or disagree with them. It is essential to think aloud and provide an explanation for your choices.

   a. **Pricing 1.** As interviewer: explain what fare differentiation as a measure means; So, introducing the new model á 50% discount during rush hour and 100% discount during other times.
      i. Will this measure encourage you to avoid traveling during peak hours? Please explain why or why not?
      ii. On a scale from 1 to 5, to what extent do you agree with the following statement:
         1. “This measure will definitely ensure that I take the train less often during peak hours.”
         2. “I consider this measure to be fair.”
         3. “I consider this measure to be affordable.”

b. **Non-pricing 1.** As the interviewer: explain what exactly the measure ‘adjusting schedules’ means and the possible complications.
    i. Will this measure encourage you to avoid traveling during peak hours? Please explain why or why not?
    ii. On a scale from 1 to 5, to what extent do you agree with the following statement:
        1. “This measure will definitely ensure that I take the train less often during peak hours.”
        2. “I consider this measure to be fair.”

c. **Non-pricing 2.** As the interviewer: explain what exactly the measure ‘adjusting schedules in combination with reservation system’ means including an example.
    i. Will this measure encourage you to avoid traveling during peak hours? Please explain why or why not?
    ii. On a scale from 1 to 5, to what extent do you agree with the following statement:
        1. “This measure will definitely ensure that I take the train less often during peak hours.”
        2. “I consider this measure to be fair.”

d. **Non-pricing 3.** As the interviewer: explain what exactly the measure ‘compressed workweeks/consolidation’ means including an example.
    i. Will this measure encourage you to avoid traveling during peak hours? Please explain why or why not?
    ii. On a scale from 1 to 5, to what extent do you agree with the following statement:
        1. “This measure will definitely ensure that I take the train less often during peak hours.”
        2. “I consider this measure to be fair.”

e. **Non-pricing 4.** As the interviewer: explain what exactly the measure ‘Hybrid/online classes’ means including an example.
    i. Will this measure encourage you to avoid traveling during peak hours? Please explain why or why not?
    ii. On a scale from 1 to 5, to what extent do you agree with the following statement:
        1. “This measure will definitely ensure that I take the train less often during peak hours.”
        2. “I consider this measure to be fair.”

f. **Non-pricing 5**. As the interviewer: explain what is meant by the measure ‘more student housing’ by this and what complications this may have, including an example.
    i. Will this measure encourage you to avoid traveling during peak hours? Please explain why or why not?
    ii. On a scale from 1 to 5, to what extent do you agree with the following statement:
        1. “This measure will definitely ensure that I take the train less often during peak hours.”
        2. “I consider this measure to be fair.”

D. <u>Closure questions.</u>

a. Could you rank the five discussed measures in order of your top 5, with the measure you perceive as most effective ranked at number 1?
b. Could you rank the five discusses measures in order of your top 5, with the measure you perceive as having the highest acceptability ranked at 1?
c. Are there any measures, in your opinion, that have not yet been mentioned but could contribute to reducing the number of students during peak hours?
d. Space for general ideas or suggestions from students.
e. If you were in my position, what question would you have expected me to ask but that I did not?

Words of thanks.

Measure cards

During the interviews, printed measure cards were used by physical interviews to introduce each measure individually. Durin online interviews the measure cards were showed using PowerPoint and screen sharing Microsoft Teams. These measure cards provided explanations and, at times, context regarding the specific measure. See Figure 14 below for an impression.

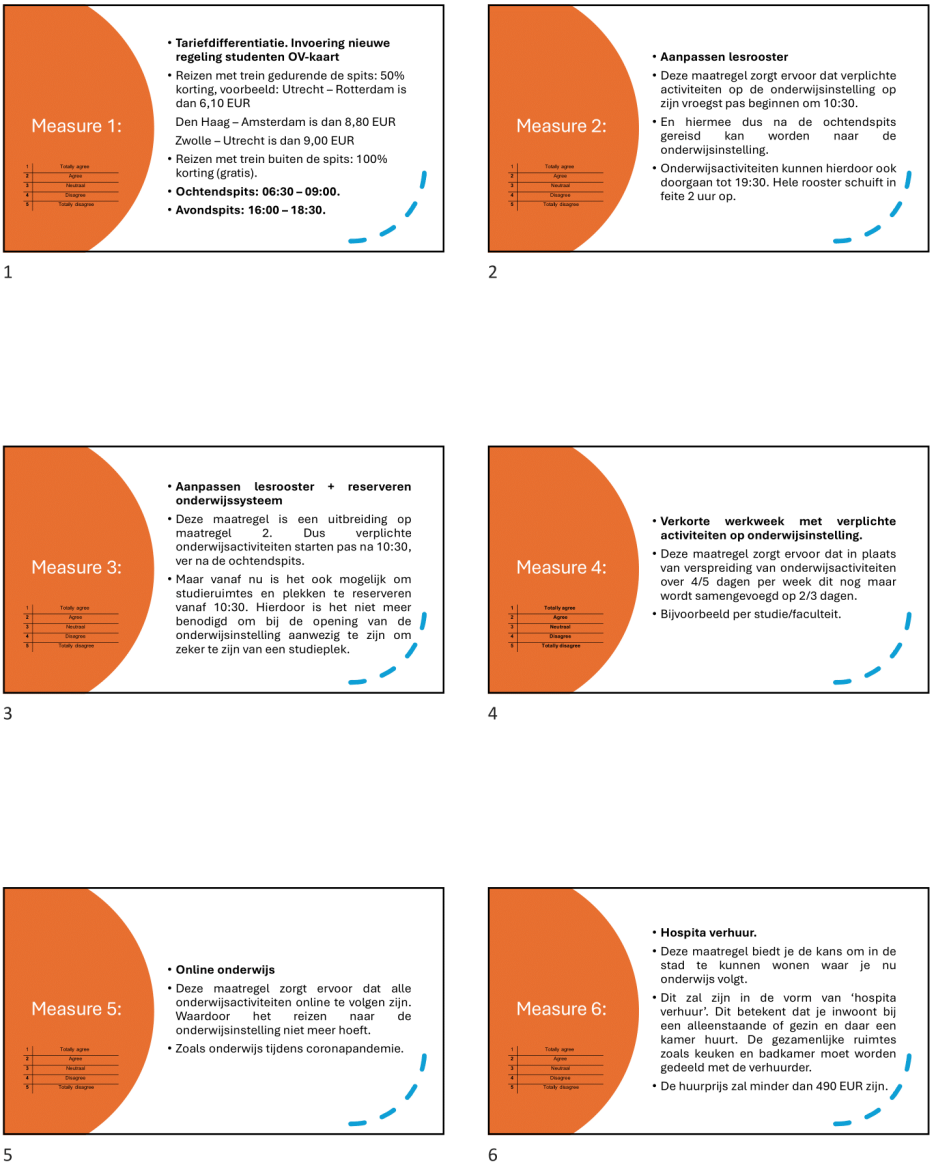

Figure 14, measure cards for during interviews.

B.3 Interview questionnaire teaching staff

A. Introduction questions.
   a. At which educational institution do you teach, and in which city is it located?
   b. Do you take the train to travel to your educational institution?
      i. If yes, where do you board the train?
      ii. If yes, on average, how many days per week do you go to the educational institution?

B. General problem belief questions.
      i. If you take the train:
         1. What is the average duration of your train trip?
         2. To what extent do you experience crowding during these train trips?
         3. To what extent do you agree with the following statements on a scale from 1 to 5:
            Statement: "During peak hours, the trains I have to take are overcrowded, and I experience this as a major issue."
            Statement: "Students should adjust their travel behavior to reduce overcrowding on the trains during peak hours."

C. Policy Specific Beliefs questions (core of the interview).

Context

Same text as the context of the student interview questionnaire.

   a. **Pricing 1.** As interviewer: explain what fare differentiation as a measure means; So, introducing the new model á 50% discount during rush hour and 100% discount during other times.
      i. On a scale of 1 to 5, how much do you agree with the following statement:
         1. "This measure will definitely ensure that fewer students will come to the educational institution."
         2. "This measure will benefit the quality of education."
         3. "This measure affects my current way of teaching/working."
         4. "I would object to this measure."
   b. **Non-pricing 1.** As the interviewer: explain what exactly the measure ‘adjusting schedules’ means and the possible complications.
      i. On a scale from 1 to 5, to what extent do you agree with the following statement:
         1. "This measure will definitely ensure that fewer students will come to the educational institution."
         2. "This measure will benefit the quality of education."
         3. "This measure affects my current way of teaching/working."
         4. "I would object to this measure."
   c. **Non-pricing 3.** As the interviewer: explain what exactly the measure ‘compressed workweeks/consolidation’ means including an example.
      i. On a scale from 1 to 5, to what extent do you agree with the following statement:
         1. "This measure will definitely ensure that fewer students will come to the educational institution."
         2. "This measure will benefit the quality of education."
         3. "This measure affects my current way of teaching/working."
         4. "I would object to this measure."
   d. **Non-pricing 4.** As the interviewer: explain what exactly the measure ‘Hybrid/online classes’ means including an example.

i. On a scale from 1 to 5, to what extent do you agree with the following statement:
    1. "This measure will definitely ensure that fewer students will come to the educational institution."
    2. "This measure will benefit the quality of education."
    3. "This measure affects my current way of teaching/working."
    4. "I would object to this measure."

D. <u>Closure questions.</u>
    a. Are there any measures, in your opinion, that have not yet been mentioned but could contribute to reducing the number of students during peak hours?
    b. Space for general ideas or suggestions from students.
    c. If you were in my position, what question would you have expected me to ask but that I did not?

Words of thanks.

Appendix C – Transcript student interview

Below, one randomly selected, fully transcribed student interview has been included as an appendix to this main report. In this case, it concerns the interview with student 3. The remaining 11 transcribed interviews of students, as described in Chapter 3.2, can be requested from the researcher of this study or the first supervisor associated with this research at TU Delft.

The underlined text in the transcription of the interview below are questions from the interviewer to the interviewee during the interview.

Transcription:

A. Introductie
    a. Wat is uw leeftijd?
        i. 24
    b. Aan welke onderwijsinstelling volgt u onderwijs + stad?
        i. TU Delft is de onderwijsinstelling, maar ga al geruime tijd naar Amsterdam voor stage.
    c. Neemt u voor het bezoeken van de onderwijsinstelling de trein?
        i. Ja, ten alle tijden.
    d. Wat voor huidig studenten OV-kaart abonnement heeft u?
        i. Week OV kaart.
    e. Vanaf welke plek stapt u op de trein?
        i. Rotterdam centraal – Delft (onderwijsinstelling)
        ii. Rotterdam centraal – Amsterdam Zuid (stage)
    f. Hoeveel dagen per week gaat u gemiddeld naar de onderwijsinstelling? |
        i. 4 dagen gemiddeld per week.

B. General problem belief (based on Eriksson et al. (2006)). (Eriksson, Garvill, & Nordlund, 2006),

Indien trein wordt genomen:

1. Wat is de gemiddelde duur van uw trip in de trein?
    a. 35/40 minuten
2. In hoeverre ervaart u drukte gedurende deze treinritten?
    a. Enorm veel. Zowel op de heen als terugweg ervaar ik grote drukte. Ik reis momenteel zo goed als altijd in de spits.
    Hoe uit zich de drukte? Vaak staan, 75% van de tijd staan, de gehele rit. Dit is praktisch 100% van de tijd als er nieuwe intercity's rijden vanwege de zeer beperkte zitplaatsen überhaupt. Verder vallen er op traject Amsterdam – Rotterdam in de spits ook nog wel eens treinen uit en dan is het helemaal niet meer normaal. Om als voorbeeld te geven van de ervaarde drukte, vandaag zat ik bijvoorbeeld zelfs op de terugweg (traject Amsterdam – Rotterdam) in het bagagerek van de eerste klas omdat er gewoon nergens anders meer plek was.
3. In hoeverre bent u het eens met de volgende stelling op een schaal van 1 tot 5.
    Stelling: "gedurende de spitsuren is het overvol in de trein(en) die ik moet nemen en dit ervaar ik als een groot probleem"
    Ik zou een 2 antwoorden. Leg uit waarom geen 1 of 3?
    Het is een probleem, een groot probleem namelijk.
    Hoe zou u het probleem omschrijven? De reiservaring is totaal niet fijn als je heel erg op elkaar staat, dit komt

momenteel ook vaak door vertraging of uitval. Dus 2 treinen die als het ware praktisch in 1 trein moet. Probleem is dus dat je totaal niet ontspannen naar je studie/werk gaat, dat je eigenlijk al gefrustreerd naar je werk gaat en dit de hele dag door werkt. Maar waarom dan geen 1: omdat de treinvervoerder er deels ook weer niets aan kan doen dat het zo druk is. Hoezo niet, al die andere mensen zouden toch niet kunnen reizen? Vind ik lastig te zeggen, maar ze zouden als vervoerder natuurlijk wel meer treinen kunnen inzetten. Dat er momenteel bijvoorbeeld 1 trein per 15/20 minuten naar Amsterdam vertrekt, dit zou ik naar eens per 10 minuten doen tijdens de spits als NS. Maakt het voor u nog iets uit met beantwoording van deze vraag dat u zelf de reis niet betaalt? Stel je voor je zou deze rit zelf hebben betaald iedere dag, zou je dan anders hebben geantwoord op deze vraag? Denk het wel, dan zou ik überhaupt ook veel minder gaan reizen. Dan zou ik mijn antwoord aanpassen naar een 1 (dus sterk eens met stelling). Maar het probleem is toch hetzelfde, geen comfortabele reis? Waarom dan ineens een 1? Klopt het probleem is nog hetzelfde. Maar als ik het vanuit mijn eigen portemonnee moet betalen, vind ik het een groter probleem. Maar het probleem is toch hetzelfde? Maar dan betaal ik er voor en is het mijn eigen keuze, nu is het eigenlijk een vrijstelling. Maar het is toch nog steeds uw eigen keuze? Wat is er aan het probleem verandert? Verandert de perceptie wellicht? Of kom je bijvoorbeeld gefrustreerder aan als je zou weten dat je voor de reis hebt betaald? Ja dat is het, ik zou gefrustreerder aankomen. Ik verwacht meer van de treinreis als ik er zelf 100% voor zou moeten betalen. Met andere woorden, nu strijk ik over het hart want dit is een gratis manier om te kunnen reizen.

ii. Ik voel mij moreel verantwoordelijk om mijn reisgedrag te veranderen om de drukte in de treinen tijdens de spits te verminderen?

a. Ik zou een 4 antwoorden. Dus niet zo heel erg. Als ik ergens zou moeten zijn om bijvoorbeeld 09:00, dan doe ik de opdracht die ik krijg. Als men verwacht dat ik daar ben op dat tijdstip, dan ben ik daar. Als het een vrije keuze is, is het anders. Maar voor mijn gevoel houdt nog steeds 90% van werkend Nederland zich aan de starttijden van kantoor, dus ik ook. Ik voel geen directe morele verantwoordelijkheid dat ik mij moet aanpassen. U vindt het daarvoor wellicht ook geen (te) groot probleem? Stelt u zich voor dat u het probleem van de drukte als ondragelijk zou bestempelen, zou u uw reisgedrag dan aanpassen? Op dit moment heb ik nog niet echt ervaren dat het zo ‘groot’ probleem is, omdat ik eigenlijk altijd mijn eindbestemming haal. Maar mocht het vaker voorkomen dat ik door de drukte mijn bestemming niet meer zal halen, dan zal ik waarschijnlijk mijn reisgedrag aanpassen.

iii. Ik ben bereid mijn reisgedrag te veranderen om de negatieve effecten van overcrowding te verminderen?

a. Bereid op de terugweg wel, ik zou daar een 2 antwoorden. Dus bereid om aan te passen.
b. Op de heenreis ben ik minder bereid om mijzelf aan te passen. Voor de heenreis zou ik een 4 antwoorden. Want dan zou ik eventueel alleen later willen beginnen, niet eerder. In principe sta ik voor dingen open.

C. Policy Specific Beliefs (core),
   a. **Pricing 1.** Uitleggen wat tariefdifferentiatie betekent inclusief uitleg wat casus in dit geval is. Dus invoering van het nieuwe model á 50% korting gedurende de spits en 100% korting gedurende de overige momenten.
      i. Zult u door deze maatregel reizen gedurende de spits vermijden, leg uit waarom wel of niet?
         1. Ja. Voor 90% wel is mijn eerste reactie. Natuurlijk zullen er situaties zijn van overmacht waardoor ik wel moet reizen tijdens de spits en dus moet betalen ineens.
            Mijn betalingsbereidheid om naar huis te gaan na een volle dag op de universiteit zal groter zijn dan om in de ochtend naar de universiteit te gaan. Speelt mee dat veel zaken niet verplicht zijn voor mij, dus ik vooral in de ochtend hem zal vermijden. Stelt u zich voor, je ochtendactiviteit is wel verplicht. Zou u dan om 0655 vertrekken of gewoon tijdens de spits en dus betalen? Ligt erg aan de kosten en hoe vaak dit per week het geval zou zijn. Als dit meerdere keren per week zou zijn, grote kans dat ik af en toe voor de spits zal inchecken.
      ii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
         1. “Deze maatregel zal er zeker voor zorgen dat ik minder de trein zal nemen gedurende de spitsuren”
            a. Dan zou ik 1 antwoorden. Zie toelichting vraag hierboven.
      iii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
         1. “Deze maatregel beschouw ik als eerlijk”
            a. Dan zou ik een 2 antwoorden. Ik vind het redelijk omdat studenten erg vrij zijn in hun doen en laten. Op dit moment missen ze ook vaak colleges. En als je als student hiervoor terugkrijgt dat je de hele week gratis kunt reizen buiten de spits, dan zou ik dat bestempelen als eerlijk.
            b. Ik zou meer ‘disagree’ antwoorden als ik veel verplicht op de universiteit zou moeten zijn om 09:00 en daarmee dus eigenlijk ook ‘verplicht’ wordt om tijdens de spits de trein te nemen. En het is oneerlijker voor mensen die van ver moeten komen.
      iv. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
         1. “Deze maatregel beschouw ik als affordable”
            a. Dan zou ik een 3 antwoorden. Ik zou het wel gaan ‘voelen’. Maar ik ga er niet failliet van, ook omdat je je gedrag erop zal aanpassen. Als ik mijn gedrag niet zou aanpassen, dan zou het 4/4,5 zijn. Verder weet ik dat er een vangnet zal zijn vanuit mijn ouders mocht ik het echt niet kunnen bekostigen.
   b. **Non-pricing 1.** Uitleggen wat exact de maatregel ‘adjusting schedules’ betekent en de mogelijke complicaties.
      i. Zult u door deze maatregel reizen gedurende de spits vermijden, leg uit waarom wel of niet?

1. Ja ik zal zeker de spits vermijden. Want er is voor mij geen directe reden om tijdens de spits te gaan.

ii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
1. “Deze maatregel zal er zeker voor zorgen dat ik minder de trein zal nemen gedurende de spitsuren”
a. Ik zou een 1 antwoorden. Want, vaak ga je pas naar de universiteit toe wanneer je je eerste verplichting hebt. Een enkele keer ga je daarvoor om te studeren, dit zou dan ook eventueel thuis kunnen.
b. Enkel voor groepsverband zou ik eerder naar uni kunnen gaan dan 10:30, bijvoorbeeld bij deadlines. Maar dit komt niet vaak voor.
c. <u>En als u denkt aan 2 weken voor de tentamens?</u> Over het algemeen doe ik veel aan thuisstudie.

iii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
1. “Deze maatregel beschouw ik als eerlijk”
a. Ik zou een 2 antwoorden. <u>Waarom geen 1 of juist 3?</u> Je moet wel je avondprogramma kunnen omzetten, want daar is vrije tijd en sport nu altijd mogelijk, want maximaal om 1730 klaar momenteel. Dus je moet je week opnieuw herinrichten, vraag is hoe eerlijk dat is dat studenten dat moeten doen om de drukte te verminderen. Een vrije avond is ineens niet meer vanzelfsprekend dus.

c. **Non-pricing 2.** Uitleggen wat exact de maatregel ‘adjusting schedules in combination with reservation system’ betekent inclusief een voorbeeld.

i. Zult u door deze maatregel reizen gedurende de spits vermijden, leg uit waarom wel of niet?
1. Ik zou hier hetzelfde antwoorden als hierboven. Voor mij heeft dit weinig verschil met maatregel hierboven. Aangezien ik sowieso zou kiezen om thuis te studeren voorafgaand aan eventuele verplichte activiteiten.

ii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
1. “Deze maatregel zal er zeker voor zorgen dat ik minder de trein zal nemen gedurende de spitsuren”
a. Lees hierboven.

iii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
1. “Deze maatregel beschouw ik als eerlijk”
a. Dan zou ik zeker 1 antwoorden t.o.v. maatregel zonder reserveringsmogelijkheid. Aangezien deze toevoeging het eerlijker maakt voor studenten onderling. Maakt verschil tussen studenten die in de studentenstad wonen en er buiten (bij ouders) kleiner/eerlijker.

d. **Non-pricing 3.** Uitleggen wat exact de maatregel ‘compressed workweeks/consolidation’ betekent inclusief een voorbeeld.

i. Zult u door deze maatregel reizen gedurende de spits vermijden, leg uit waarom wel of niet?
1. Zeker. Ik zou het vermijden want er zijn voor mijn minder dagen dat ik naar de universiteit zal gaan.

ii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
1. “Deze maatregel zal er zeker voor zorgen dat ik minder de trein zal nemen gedurende de spitsuren”
a. Dan zou ik een 2 antwoorden. Deze maatregel zal daar zeker voor zorgen dus. Buiten de 2 (verplichte) dagen voel ik me minder geroepen om de universiteit te bezoeken, zeker tijdens de spits.

iii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
    1. “Deze maatregel beschouw ik als eerlijk”
        a. Qua studie gaat het niet goed zijn in mijn ogen. Omdat als je alles in 2 of 3 dagen gaat proppen, krijg je die hele lange dagen. De hersenen van studenten gaan vol zitten in mijn ogen, je krijgt dan van die enorm lange dagen voor studenten. Het relaxed aan student zijn, het samen koffiedrinken, de lange gesprekken na college en/of het samen lang lunchen zal verdwijnen. Dit komt in mijn ogen niet ten goede aan het studentenwelzijn.
        b. Ik zou dus een 4 antwoorden. Dan moeten dus studenten hun rooster aanpassen, zij gaan veel langere dagen maken. Waarom moeten de studenten dit doen en niet werklui, die zouden ook 16 uur kunnen werken en daardoor maar 3 dagen moeten reizen i.p.v. 5.

e. **Non-pricing 4.** Uitleggen wat exact de maatregel ‘Online classes’ betekent inclusief een voorbeeld.
    i. Zult u door deze maatregel reizen gedurende de spits vermijden, leg uit waarom wel of niet?
        1. Ja dat zal het geval zijn. Ik zal dan de colleges thuis bekijken.
    ii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
        1. “Deze maatregel zal er zeker voor zorgen dat ik minder de trein zal nemen gedurende de spitsuren”
            a. Ik zou een 2 antwoorden. Hierbij afhankelijk of het überhaupt nog wel mogelijk is om heen te kunnen of dat het enkel alleen online te volgen is. Ik zou dan voor hoorcolleges thuis blijven of af en toe alsnog heengaan. Voor groepswerk en werkcolleges zal ik per definitie heengaan. Daarnaast zou ik af en toe heen willen gaan voor het sociale component, afspreken met groepsgenoten en vrienden.
    iii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
        1. “Deze maatregel beschouw ik als eerlijk”
            a. Stellig zou ik een 5 antwoorden. Helemaal niet eerlijk. Er moet een keuze zijn tussen fysiek of online (note interviewer, de geïnterviewde werd voorgehouden dat fysiek bijwonen van colleges niet meer tot de mogelijkheden behoorde). Wat mij betreft moet er altijd een keuze zijn tussen fysiek en online, net als dat er een keuze moet blijven tussen vegetarisch en niet vegetarisch eten. Waarom bent u zo stellig hierin?
            b. Verder krijg je weer scheefgroei tussen andere treinreizigers en studenten. Waarom mogen wij geen sociale contacten meer hebben om de drukte te verminderen. We moeten voorkomen dat mensen weer geïsoleerd worden zoals corona met alle gevolgen van dien.
            c. Mocht het hybride zijn zou ik het eerlijker vinden.

f. **Non-pricing 5**. Heel concreet toelichten wat wordt bedoeld met de measure ‘more student housing’ hiermee wordt bedoeld en welke complicaties dit kan hebben.
    i. Zult u door deze maatregel reizen gedurende de spits vermijden, leg uit waarom wel of niet?
        1. Ja sowieso. Ik zou sowieso dit doen dan. Dit zal er voor zorgen dat ik minder met tijdens de spits zal reizen. Zal enkel

maandagochtend en vrijdagmiddag zijn (want in het weekend ga ik graag terug naar mijn ouders).

ii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
    1. “Deze maatregel zal er zeker voor zorgen dat ik minder de trein zal nemen gedurende de spitsuren”
        a. Ja ik zou een 2 antwoorden. Hooguit dat ik tijdens een stageperiode nog vaker dan maandagochtend en vrijdagmiddag reizen. Ik zie deze optie een beetje als wat ik in mijn eerste jaar heb gedaan, toen sliep ik ook bij een boer op een kamer boven een schuur en mocht ik zelfs überhaupt in het weekend niet aanwezig zijn.

iii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
    1. “Deze maatregel beschouw ik als eerlijk”
        a. Ik zou een 2 antwoorden hierop. Als dit een alternatief is dat op korte termijn kan worden ingevoerd. Je doet hier niemand kwaad mee. Maar eigenlijk zouden er natuurlijk gewoon meer studentenhuizen/kamers moeten komen überhaupt.
        b. Dit weegt op tegen iedere dag in de spits reizen voor mij. Had u geen andere studententijd in gedachte dan hospitahuren? Nee niet direct, want je zou ook een hele andere studententijd hebben als je bij je ouders zou blijven wonen en iedere dag 3 uur moet reizen in de drukte.

D. Closure
    a. Kunt u de 5 besproken measures rangschikken in volgorde van uw top 5, met op 1 de measure die in uw perceptie de meeste effectiviteit zal hebben?
        i. 5
        ii. 6 (note geïnterviewde, ik denk dat dit alleen op grote schaal geen invloed heeft, lijkt me niet dat er ineens gigantisch aanbod is).
        iii. 3
        iv. 1
        v. 2
        vi. 4
    b. Kunt u de 5 besproken measures rangschikken in volgorde van uw top 5, met op 1 de measure die in uw perceptie de hoogste acceptability heeft? (die door u het meest wordt geaccepteerd).
        i. 3
        ii. 2
        iii. 6
        iv. 4
        v. 1
        vi. 5
    c. Bestaan er volgens u measures die niet zijn genoemd maar in uw ogen wel een bijdrage kunnen leveren aan het verminderen van het aantal studenten in de spits?
        i. Meer investeren en promoten van alternatief direct vervoer. Bijvoorbeeld doortrekken metro, dan zou ik de trein niet hoeven nemen. Of een tramverbinding.
        ii. Reserveringssysteem voor trein. Met dan sancties als je niet komt opdagen.
        iii. Je zou ook iets kunnen bedenken t.a.v. regelingen voor mensen die van ver komen. Dus dat zij enkel tijdens de spits mogen of iets dergelijks. Zo zijn er kantoren waarbij je enkel de auto dichtbij kantoor kunt parkeren als je minimaal X kilometer van kantoor woont.

d. Ruimte voor ideeën/suggesties student.
    i. Geen.
e. Als u in mijn schoenen zou staan, welke vraag had u verwacht dat ik zou stellen maar niet heb gesteld?
    i. Moet er niet een aparte cabine komen voor studenten?, onder behoud van het principe vol = vol. Naarmate de populatie. Dus als x% student zijn tijdens de spits dan mogen er Y aantal studenten door de poortjes. Wie eerst komt, wie eerst maalt.

Appendix D – Transcript teacher interview

Below, one randomly selected, fully transcribed interview of a teacher has been included as an appendix to this main report. In this case, it concerns the interview with teacher 2. The remaining 11 transcribed interviews of students, as described in Chapter 3.2, can be requested from the researcher of this study or the first supervisor associated with this research at TU Delft.

The underlined text in the transcriptions of the interviews are questions from the interviewer to the interviewee.

Transcription:

A. Introductie
    a. Aan welke onderwijsinstelling geeft uw onderwijs + stad?
        i. Hogeschool van Rotterdam, Rotterdam.
    b. Neemt u voor het bezoeken van de onderwijsinstelling de trein?
        i. Nee. Ik ga op de fiets.
    c. Zo ja, in welke plek stapt u op de trein?
        i. N.v.t.
    d. Hoeveel dagen per week gaat u gemiddeld naar de onderwijsinstelling?
        i. Gemiddeld 4x per week. Andere dag thuis.

B. General problem belief
        i. Persoon neemt niet de trein zelf.

C. Policy Specific Beliefs (core),
    a. **Pricing 1.** Uitleggen wat tariefdifferentiatie betekent inclusief uitleg wat casus in dit geval is. Dus invoering van het nieuwe model á 50% korting gedurende de spits en 100% korting gedurende de overige momenten.
        i. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
            1. “Deze maatregel zal er zeker voor zorgen dat er minder studenten naar de onderwijsinstelling zullen komen”
                a. Dan komen er nog minder. Want dan moeten ze ook nog eens betalen voor de les. Ik denk dat het als maatregel zeker effect zal sorteren. Alleen dat het effect dat deze maatregel zal hebben alleen voor de NS gewenst zal zijn. Ik denk dat het voor de hogeschool ongewenst effecten zal hebben.
        ii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
            1. “Deze maatregel komt de onderwijskwaliteit ten goede”
                a. Oneens, een 4 zou ik dan antwoorden. Waarom? Nou kijk, de lessen draaien ook gewoon door en als zij dan ineens moeten betalen voor die lessen dan komen ze echt pas na 09:00. Wat ik ook probeer te vertellen aan de studenten, ze krijgen in deze maatregel nog steeds 50% korting vanuit de overheid. Hoe kijkt u daar dan naar? Eens. Maar met deze maatregel zou je lessen niet voor 10:00 – 10:30 kunnen laten beginnen en moet je ook weer op tijd stoppen om ze uit de spits te houden. Want mensen worden nu dus gewoon gedwongen om te betalen, studenten hebben geen keus. Dat klopt niet helemaal toch. Studenten kunnen toch ook voor de spits reizen en in de avondspits erna? En deze tijd dan opvullen met zelfstudie bijvoorbeeld. Hoe kijkt u

hiernaar? Ja klopt deze keus is er. Maar zullen heel weinig studenten doen denk ik.

iii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
    1. “Deze maatregel tast mijn huidige manier van onderwijs geven/werken aan”
        a. Ik verwacht wel dat het effect zal hebben. Bij studenten merk ik sowieso geconditioneerd gedrag. Kunt u dat nader toelichten? Nou dat studenten denken: ik begin een uurtje later dat scheelt me ook weer 8 EUR. Dus dat ze de eerste les zullen vermijden. U lessen zijn niet verplicht? Nee bij onze opleiding niet. Aanwezigheid is geen plicht. Wij zijn output gestuurd. Maar het is helder dat u denkt dat de onderwijskwaliteit er niet door op voor uit zal gaan, maar gaat u ook anders les geven? Bijvoorbeeld meer videoclips voor missende studenten, om maar wat te noemen. Nee. Ik gebruik sowieso een mix altijd. Maar ik zou hierdoor bijvoorbeeld niet ineens online onderwijs gaan geven.
        b. Ik zou de heffing omkeren. Dus je krijgt een bonus van 8 EUR als je buiten de spits gaat reizen en er alsnog om 09:00 bent, dus wel eerder gaat dan start spits.

iv. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
    1. “Tegen deze maatregel zou ik bezwaar maken”
        a. Ik zou wel bezwaar tegen hebben. Geld is belangrijke drijfveer voor deze doelgroep waardoor men zijn gedrag hiernaar zal aanpassen. Ik vind hier wel wat van. Ik zou hier wel bezwaar tegen hebben als ik hier invloed op zou hebben. Worden geleid door agenda NS met deze maatregel in mijn ogen. Je krijgt een waterbed effect, want dit is onderwijs technisch niet voor elkaar te krijgen. Want dan moeten wij straks alle lessen tussen 10:00 en 15:00 doen om studenten niet te hoeven te laten betalen.

b. **Non-pricing 1.** Uitleggen wat exact de maatregel ‘adjusting schedules’ betekent en de mogelijke complicaties.

i. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
    1. “Deze maatregel zal er zeker voor zorgen dat er minder studenten naar de onderwijsinstelling zullen komen”
        a. Ik denk dat de aanwezigheid tijdens de late lessen significant lager zal zijn. U bedoelt de lessen van bijvoorbeeld 17:30 tot en met 19:30? Ja precies. De eerste ochtend les zal zeer goed gevuld zijn denk ik, aanwezigheid zal toenemen.

ii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
    1. “Deze maatregel beschouw komt de onderwijskwaliteit ten goede”
        a. Verschillend. De vraag is hoe het zit met de concentratie, specifiek begin van de avond. Maar denkt u andersom ook, dat het de eerste les qua onderwijskwaliteit ten goede kan komen? Er zijn onderzoeken gedaan naar op welk moment studenten de meeste concentratie hebben, volgensmij was dat ergens tussen 10:00 – 11:00. Daarom plannen wij bij onze opleiding de tentamens in om 10:00 omdat je dan naar de piek van de concentratie gaat.

iii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:

1. “Deze maatregel tast mijn huidige manier van onderwijs geven/werken aan”
    a. Uiteraard tast het mijn leven wat aan. Een praktisch voorbeeld: mijn zoon begint in de ochtend bijvoorbeeld om 06:00 met werken. Dus als ik pas om 19:30 klaar ben met de laatste les en we willen samen met gezin avondeten, dan houdt mijn zoon dat nooit vol. Dus absoluut impact.
    b. Maar in alle eerlijkheid denk ik dat we met zijn allen flexibiliteit moeten opzoeken. Bedoelt u daarmee te zeggen, als het 1 á 2 keer per week zou voorkomen bij iedereen, dan kan ik daar ook wel mee leven? Ja. Ik ben voor meer flexibiliteit in het algemeen, dus als dat betekent dat je ook een keer eerder weg kan bijvoorbeeld.

iv. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
1. “Tegen deze maatregel zou ik bezwaar maken”
    a. Als ze het goed verkopen dan zou ik geen bezwaar maken. Als ze de flexibiliteit blijven geven is er geen probleem. We moeten met zijn allen flexibiliteit opzoeken.

c. **Non-pricing 3.** Uitleggen wat exact de maatregel ‘compressed workweeks/consolidation’ betekent inclusief een voorbeeld.
i. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
1. “Deze maatregel zal er zeker voor zorgen dat er minder studenten naar de onderwijsinstelling zullen komen”
    a. Dat wordt te krap qua stof. Ik denk niet dat dit haalbaar is. Er is een bepaalde mate van stof die behandelt moet worden en ook voorbereidingstijd nodig heeft. Dus ik denk dat dat overbrengen in 2 dagen praktisch niet haalbaar is. Het terugbrengen naar 3 dagen zou je over kunnen discussiëren of dat haalbaar is.
    b. Maar stelt u zich voor dat het wel naar 2 dagen zou kunnen, wat denkt u dan? Ja, qua efficiëntie is dit natuurlijk een leuk gevonden optie. Qua leervermogen en concentratie onhaalbaar denk ik.

ii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
1. “Deze maatregel komt de onderwijskwaliteit ten goede”
    a. Komt zeker niet ten goede. Onmogelijk qua leervermogen en concentratie. (Zie voor rest antwoord stelling hierboven).

iii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
1. “Deze maatregel tast mijn huidige manier van onderwijs geven/werken aan”
    a. Zeker. Zoals hierboven besproken. Is onhaalbaar.

iv. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
1. “Tegen deze maatregel zou ik bezwaar maken”
    a. Ja, zeker. Het is een fulltime studie. Onhaalbaar naar 2 dagen.

d. **Non-pricing 4.** Uitleggen wat exact de maatregel ‘Hybrid/online classes’ betekent inclusief een voorbeeld.
i. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
1. “Deze maatregel zal er zeker voor zorgen dat er minder studenten naar de onderwijsinstelling zullen komen”

a. Ja absoluut. Als we allemaal online gaan werken, kunnen we heel de NS opheffen.
b. We hebben bijzondere ervaring gehad.
c. Grote voordeel was de efficiëntie. Er is geen binding. Mensen worden volledig
d. Fysiek component onderwijs.

ii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
1. “Deze maatregel komt de onderwijskwaliteit ten goede”
a. Komt de onderwijskwaliteit niet ten goede. We hebben een knauw gehad met COVID. We hebben toen de voor- en nadelen kunnen zien van online onderwijs.
b. Grote voordeel was inderdaad de efficiëntie.
c. Grote nadeel was dat er geen binding was, slechtere prestaties en een lagere kwaliteit van onderwijs. Mensen werden er doodongelukkig van. Past niet bij onze onderwijsvorm, gebleken is dat fysieke component onmisbaar is.

iii. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
1. “Deze maatregel tast mijn huidige manier van onderwijs geven/werken aan”
a. Ja zeker. Dan zou alles online moeten.

iv. Op een schaal van 1 tot 5 bent u het eens met de volgende stelling:
1. “Tegen deze maatregel zou ik bezwaar maken”
a. Ja zeker. Tast het ook u plezier aan in het geven van onderwijs? Ja, na anderhalf jaar meegemaakt te hebben tijdens corona, ben ik er nu wel klaar mee. Hoe kijkt u naar een mix, fysiek/online? In de mix kan het natuurlijk wel. Blended onderwijs zie ik wel potentie in, doen we nu nog niet. Bij deze opleiding is namelijk gekozen alles fysiek.

D. Closure
a. Bestaan er volgens u measures die niet zijn genoemd maar in uw ogen wel een bijdrage kunnen leveren aan het verminderen van het aantal studenten in de spits?
i. Combinatie van dingen misschien.
ii. Beloon in plaats straffen.
iii. Bij de sportschool heb ik een app waarop je de drukte kan zien op dat moment. Je zou daar in de trein misschien ook op kunnen managen. Dus dat je bijvoorbeeld een beloning krijgt als je net voor het drukke moment gaat en een kleine toelage/straf als je precies in de spits gaat. Dus beloning laten afhangen van de drukte. Vandaag de dag is alles gamen, dus wellicht met gamificatie elementen.
b. Ruimte voor ideeën docenten in algemeen.
i. Ik denk niet dat je dit probleem van de NS niet geïsoleerd moet zien. Het is een combinatie van dingen. Waarom reizen mensen/studenten, omdat ze ver weg wonen. En waarom wonen mensen ver weg, vanwege weinig beschikbaarheid en het erg kostbaar is. Kuddegedrag van mensen.
ii. Ook vind ik dat overheid wil iedereen uit de auto en dan wil je nu mensen weer uit de trein. Ik vind ook dat we op hoger niveau keuzes moeten maken.
c. Als u in mijn schoenen zou staan, welke vraag had u verwacht dat ik zou stellen maar niet heb gesteld?
i. Goede vraag, maar nee. Ik ging er zonder verwachtingen in.