EPIDEMIOLOGY OF INJURED CYCLISTS IN RHÔNE, FRANCE.
A standard crash configuration study to better understand primary safety aspects; determining gender as key factor or explanatory variable.

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BACKGROUND – Cycling is increasingly promoted as an alternative transportation mode, because of the health benefits that can be obtained thanks to active travel. However, it is somehow risky. The French annual incidence rate of cycling injuries is estimated at 70 per 100,000inhabitants [1]. Therefore, to better evaluate risks and benefits of this alternative mobility, cycling safety is a main concern. Most of the existing studies are based on police data and they suffer from a lack ofstatistical significance to enable strong conclusions. In this work, we propose to study cyclist accidents, based on a survey sent to individualsidentified in a medical registry composed of emergencies and hospitalized patients in a French department (Rhône, around Lyon).

OBJECTIVES – As a recent study shows an increased risk of accident for cyclist women compared to men after controlling for the mileage [2], the main objective of this work is toexplore if gender differences in cycling accidents are due to specific cycling practices for men (i.e. sport and commuting)comparing towomen (i.e. leisure ride and utilitarian trips) or if theyare mainly due to differences in socialisation and risk taking. Based on a survey sent to 3500 cyclists injured in 2009-2011, we built a typology of cycling accident configuration, thanks to data mining techniques such as MCA, AHC, and clustering.Halfway between accident mechanisms [3] and accidents factors, configurations aim to take into account random multifactorial aspects without the chronological complexity we can find in sequences analysis of the different situations. We explorefactors by cycling practiceone at a time as well as theaccordance between typology and injuries (severity and area).This typologyallows us to explore the linkages between the key variables of the typology (collision, single crash or avoidance of another road user), the type of bike usage (sport practice, commuting or leisure ride), and also to determine whetherthese risk factors are gender specific or related to the bicycle practice.

METHODOLOGY AND RESULTS –The survey response rate is 43% (N=1,078). Compared to non-respondents, respondents were older, more often womenand more often cycling on urban roads. They were also more often involved in collisions and therefore more seriously injured. One crashout of 5 occurred on a leisure ride, for women as formen,and 38% of crashes happened while practising sport (20% for women and 44% for men). Main differences areobserved on utilitarian trips (18%) and while commuting to/from work or study place (23%) where women haveproportionally more accidents than men riding for utilitarian purpose (25% vs. 15%) or commuting (30% vs. 20%).Most of the accidents happened on main roads (52%) and 30% on a cycling infrastructure. Women havemore often accidents on a dedicated infrastructure than men (43 vs. 28%) but they have less often a crash on a flat surface than men (20% vs. 34%)while cycling on an utilitarian trip (28%). In case of commuting trips, however, there is no longer gender specificities: for both groups 76% of these accidents occurred on a flat road. Some logistic regression models adjusted on sexes and type of practice are proposed and discussed.

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RAINVISION Abstract

The purpose of this study was to scientifically assess the impact of the visibility of different pavement markings in different conditions (night time driving in dry, wet and wet &rainy circumstances), also taking into account different male and female drivers as well as three different age groups (20-40 years, 41-60 years and 61+ years). Therefore, a field experiment was carried out on a specifically prepared test track near the city of Melk, Austria. 88(47 female, 41 male) of 120 subjects have been selected based on psychological pre-testing to ensure a homogenous test sample for three age groups.

Test drives were carried out at night within three different marking conditions (non-reflective, standard reflective material, wetreflective material) on three different test nights under dry, wet and wet & rainy driving conditions with four identical test vehicles. With the help of in-vehicle data loggers, driving performance was measured by means of speed choice, cornering and acceleration behaviour. Additionally, a questionnaire used to measure drivers´ subjective comfort levels after each test run.

Results indicate that that driving comfort as well as clearness and perceptibility of track trajectory was assessed best when advanced reflective material was applied on the track, especially for female drivers.

Regarding driving behaviour by means of speed choice, test subjects of both sexes drove slowest in the non-reflective condition, faster under condition with applied standard reflective marking material, and even slightly faster under the condition with advanced reflective material. This result holds especially true for older persons as an age interaction could be observed within the oldest test subject group (61 years of age or older).

As the lap times can be interpreted as the time needed for solving the driving task, it can be concluded that it takes significantly longer for aged male persons to grasp the driving situation and especially the driving trajectory under adverse conditions when there is no road marking. Within the female test subjects, a statistical trend indicated a similar effect.

With regard to driving behaviour expressed in terms of mean lateral and longitudinal accelerations, no statistically significant differences occurred after controlling for speed.This result indicates that neither male nor female subjects did not follow the track trajectory differently in various conditions by means of different driven radius, e.g. cutting corners.

It could be clearly shown that both reflective marking materials are perceived as more comfortable and guiding compared to the non-reflective marking. Applying reflective marking material has a positive effect on the subjective comfort feeling of drivers independent of sex or age, especially in adverse driving conditions which were simulated in this experiment. Under night-time and rainy driving conditions, the wet retro-reflective material was assessed as clearly guiding the driving path, thus providing anticipatory stimuli of road environment and taking mental workload off both female and male drivers.

From a traffic safety perspective, the main difference in terms of traffic safety lies in the question whether to apply or not to apply reflective marking material at all. If reflective material is applied, the better choice is to use wet reflective material instead of non-reflective material as the benefits (subjective driver comfort and better anticipation of road trajectory) outweigh the disadvantages (slightly higher speed choice) for drivers, independent of sex and/or age.

GENDERED MOBILITY IN MALTA: INFLUENCING FACTORS ON TRAVEL CHOICES

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ABSTRACT

Malta is one of the smallest member states but has also one of the highest rates of motorization in Europe. In 2010, the number of private vehicles per thousand population stood at 555. Seventy-one percent of all trips were carried out by car and only a small percentage of trips (22.6%) were carried out by other means (mainly bus and on foot). Malta's economic development has progressed steadily since joining the European Union in 2004 and the islands have managed to avoid the impact of the global financial crisis, mostly due to island insularity. Heavy car dependence is a cause for concern as it is increasing congestion and pollution, and putting significant strain on infrastructure in an island with limited land and space resources. Gender differences in transport and mobility patterns are high. The 2010 Household Travel Survey reported that whilst 60 per cent of frequent bus users were female, 61 per cent of non-bus-users were male. This gender disparity is also reflected in the population of licensed drivers and the car ownership patterns. The research aims to (i) study the mobility patterns of men and women in the islands and identify the changes that occurred over the 12-year period between 1998 and 2010, (ii) examine the relationships between transport patterns and selected socio-economic characteristics of females and men such as age, status and employment, and (iii) discuss the policy implications for future transport policy. This research uses the data of the 1998 and 2010 Household Travel Surveys to study the mobility patterns of men and women in the islands. In answering the research questions, descriptive statistics, correlations, co-variance and regression will be used. The research will provide a first ever review of gender based transport patterns in Malta and will highlight some of the more pressing concerns supporting future mobility. The study will conclude with a discussion on the policy implications for future transport as well as some interesting avenues for further research.

1. INTRODUCTION

Aspects of society and lifestyles are responsible for the demands placed on our transport systems (*1*). Therefore understanding such aspects and studying their impact might provide useful insights into sustainable future transport policies. One aspect that has gathered interest over the past decades has been the patterns of mobility of men and women within the context of different societies and lifestyle choices. Early studies identified gender differences in travel behaviour (*2; 3*) and female transport disadvantage (*4*; *5*), whilst later studies provided insights into various societal patterns (*6*). In the summary to the 4th International Conference on Women's Issues in Transportation, Hanson et al. (2009) identify the need for more research into the historical evolution of gender and transport relationships (*7*), whilst Murakami et al. (2009) identify the need to study mobility in relation to gender and socio-demographic variables and the implication of such on policy (*8*).

Malta joined the European Union in 2004 and has experienced a steady economic growth, managing to a certain extent to avoid the impact of the global financial crisis, mostly due to island insularity (*9*). The islands have a total area of 318 km^2 and are home to a population of just over 400,000 people and over a million tourists visiting every year, making them some of the most densely populated areas in the world. Malta's public transport system is based on buses, taxis and ferry services. Rail and tram services provided by the British stopped operating in the 1930s, due to the flexibility and service offered by the bus. In 2010 however the rate of motorization stood at 555 passenger cars per 1,000 inhabitants, a relatively high rate when compared to the EU27 2009 estimated average of 473 (*10; 11; 12*). The high car ownership reflects a very car dependent society where 71 per cent of all trips are carried out by car and only a small percentage of trips (22.6%) are carried out by other means (including bus and on foot) (*13*). This car dependence however is not gender equal. The 2010 National Household Travel Survey reported that whilst 60 per cent of frequent bus users were women, 61 per cent of non-bus users were male (*13*). This is mirrored in the statistics for driving licences where 78 per cent of males are licensed drivers but only 49 per cent of females are licensed drivers (*14*), and most probably in the actual car ownership even though this is harder to quantify from official statistics.

This paper reports on the findings from two National Household Travel Surveys carried out in the islands in 1998 and 2010. The research aims to (i) study the mobility patterns of men and women in the islands and identify the changes that occurred over the 12-year period, (ii) examine the relationships between transport patterns and selected socio-economic characteristics of females and men such as age, status and employment, and (iii) discuss the policy implications for future transport policy. As such, Section 2 will review the relevant academic literature. Section 3 will present the case study and discuss the methodology adopted for the research. Section 4 will present the results of three research questions which were formulated to analyse the household travel survey data, and Section 5 will conclude the paper with some suggestions for further research in this area, necessary to assist in policy making.

2. LITERATURE REVIEW

Sustainable futures have been associated with shifts towards less energy and carbon intensive transport modes and often towards less, rather than more mobility (*15; 16; 17*). However literature has pointed towards the need for a better understanding of mobility patterns today and in the past, in order to manage transport demand in the future (*18; 19*). This is particularly true for the need to understand mobility patterns taking into consideration variables such as gender, age, family composition and employment. Frändberg and Vilhelmson (2011) analyse gender and age as determinants of mobility in Sweden (*18*) and

even earlier, Uteng and Cresswell (2008) identify gender differences in activities and travel behaviour (*20*).

More recent studies have also highlighted the role of the women within society, with particular reference to family and employment as having an impact on travel behaviour (*21*; *22*). Whilst others looked in detail at aspects of gendered travel mode, given specific socio-cultural conditions in the households (*23*).

Although many studies concurred in the 'disadvantage' associated with female mobility (*24*; *25*; *4*) and find support in various studies linking differences to, for example, intention of owning and using a car (*26*; *27*), the presence of children in the family (*28*), employment and commuting patterns (*29*), there is also evidence of convergence in some societies between genders (*30*; *31*; *32*; *33*; *34*). Scheiner and Holz-Rau (2012) are cautious in their assessment of gender differences and also find some evidence in their study of convergence (*23*). However it is also noted that in the case of car-deficient households the effect of preference and agreement between partners on who uses the car might be an influencing factor which cannot be extracted from travel data. This might have significant impact on the view of inequality between genders, as portrayed by some (*35*; *5*).

Aspects related to society and lifestyles have also been considered in the literature as affecting transport choices. The changes to the population are a major contributor however increased changes in women's participation in the workforce have been documented as a major determinant. Best and Lanzendorf (2005) note a 23 per cent increase in female employment in Germany between 1975 and 2002 (*22*) whilst in the UK Biggart and O'Brien (2010) report an increase of female employment from 56.4 per cent in 1971 to 69 per cent in 2008 (*36*). This and other factors as highlighted by Lyons et al. (2002) to include amongst others the birth rate, male and female life expectancy, household size and status (married, divorced or single) all contribute directly or indirectly to the future demands for transport (*1*). It is therefore relevant and particularly important for this study to capture that development and project such indicators in the future to direct policy accordingly.

3. CONTEXT AND METHODOLOGY

Malta experienced a dramatic modal shift over a relatively short period of time. Figure 1 shows the changes in modal share between 1989, 1998 and 2010, with the largest shift occurring from bus to car during the 1990s and from walking to more car driving during the first decade of this century. This, similar to trends experienced in many other European countries, counters any efforts by the Government to move towards sustainable mobility and its implications on quality of life and overall sustainable development, an important objective for the European Union.

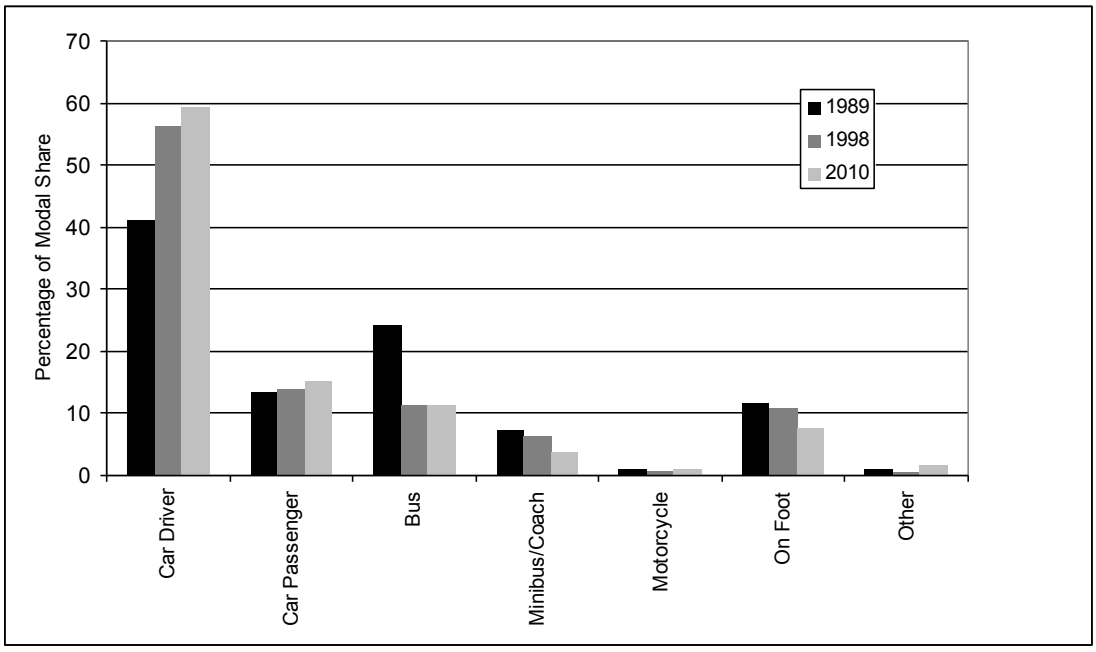

FIGURE 1 The modal share in Malta for 1989, 1998 and 2010 (*13*).

Malta's high car ownership and car dependence stem from a number of factors. Over the past two decades, households have seen an increase in the amount of disposable income, a decline in the number of children and therefore smaller households, a higher rate of female participation in employment (even though still lower than the EU average), declining quality of service in public transport infrastructures coupled with an increase in the status symbol associated with driving a car (as opposed to riding a bus) (*37*; *38*; *39*). Table 1 presents an overview of key indicators between 2000 and 2010.

TABLE 1 Malta socio-demographic and economic indicators 2000-2010 (*40*; *41)*

Description of Indicator	**2000**	**2010**
Total land area (incl. Gozo and Comino)	316 km^2	316 km^2
Percentage of built-up land	23.6%	26.5%
Population	391,415	417,617
Population density per km^2 of built up area	5,275	4,983
Female participation in employment	27%	32%
Crude Birth Rate	11.4	9.6
Average Household Size	2.9 (2005)	2.9
Number of occupied households	119,479 (1995)	139,178 (2005)
Household Disposable Income	€16,549 (2005)	€25,968
Ratio of female to male licensed drivers	1 : 1.8 (2001)	1 : 1.6
Licensed vehicles on the road	246,825	304,705
Percentage private vehicles	75%	76%
Private passenger vehicles per 1000 inhabitants	473	555
Estimated annual vehicle km for private vehicles	9,000 km	9,840 km
Share of car as percentage of all trips	70%	71%
Public transport modes	bus, ferry, taxi	bus, ferry, taxi
Public transport patronage in million passengers	31.2	32

The data in Table 1 reflects aspects of Maltese society and lifestyles. It is evident that over the 10 year period a number of significant changes occurred which in turn have affected

the transport system in the islands. The increase in Household Disposable Income, women's participation in the labour force and the declining birth rate are probably significant. However the increase in the number of vehicles and the increase in the dependence on the car are also worth pointing out. Despite some indicators showing a decline, such as the crude birth rate, the average household size remained unchanged between 2005 and 2010. The slight increase in public transport patronage is due to tourist increases over the years and the booming cruise liner sector with thousands of patrons visiting the islands and touring the islands in a day by bus. These key indicators set the scene for the analysis which this study aims to highlight.

This research is relevant for a number of reasons. Primarily, it is the first such study for the islands of Malta. This research will shed light on the development of travel mobility patterns in a fast developing state in the European Union. Second, it is significant for the policy development in transport and land use development in Malta. The future demographic projections in Malta point towards an increased elderly population with a greater percentage of female elderly citizens (54% of people over the age of 60 in 2025 and 53% in 2060) (*42*) and this study will highlight aspects of gendered mobility, critical for the success of future transport policy and systems. Thirdly, the rapid rise in car dependence experienced in Malta is occurring in other island states across the world and also in similarly sized cities in Europe and beyond. The use of islands as small scale spatial laboratories for more complex politics of larger countries has been highlighted by Enoch and Warren (2008) and earlier King (1993) who used islands as case studies for policies and development studies (*43; 44*).

The data used in this research comes from national household travel surveys conducted by the Malta Environment and Planning Authority and Transport Malta, the government's regulatory authorities for environment and land use planning and transport. National household travel surveys in Malta have been carried out in 1989, 1998 and 2010. This study uses the data from the 1998 and 2010 surveys to compare the last two decades when increased private motorization and car dependence occurred. In both surveys, one day travel diaries were solicited by post from a number of households to collect data on trips carried out on a typical week day. In 1998 the survey was conducted to reflect the travel patterns of Tuesday the 25th of November and in 2010 the survey day was Wednesday the 26th of May. There was a good response rate in both surveys with 7,855 households responding to the survey in 1998 (approximately 6.25% of occupied dwellings) and 6,666 responses received in 2010 (approximately 4.8% of occupied dwellings). In 1998, a total of 21,000 individual travel diaries were collected recording 51,329 trips, whilst in 2010 a total of 16,952 individual travel diaries were collected translating into 41,771 trips (*13; 45*).

Information on trips made on the survey day was collected from all household members aged 11 and over in the form of trip diaries. The diaries included place and time of departure and arrival, mode of transport used and purpose. A questionnaire complemented the trip diaries and included questions about personal and household characteristics including household size, car ownership, public transport use and the socio-demographic attributes of the residents and place of work or education.

In 1998 the sample of households was apportioned directly at local council level. For the 2010 sample, the local council electoral register was used for the selection and was proportioned to a statistically representative number of households at a district level. The data was ultimately compiled into a MS Access Database and made available for this study by Transport Malta and the Malta Environment and Planning Authority's Transport Planning Unit.

In order to fulfill the objectives of this research a number of questions were posed and a series of tests were run on the 1998 and 2010 Household Travel Survey data. Travel patterns were determined through assessing modal choice, trip purpose and travel times. A number of variables were defined as affecting travel behaviour and used in the analysis of

this research. These included gender, age, marital status and employment. A justification for the choice of variables is given in Section 3 below. More specifically, the study sought to answer the following three research questions (RQs) empirically:

RQ1: What mode of transport (car[1], bus, on foot[2]) would travellers use given their gender, age, marital status, employment status and purpose of trip? Does this pattern change over time?

RQ2: Do significant gender differences exist in the proportions of travellers travelling (i) by car, (ii) by bus, and (iii) on foot in 1998 and 2010? If so, do the gender proportions across the three modes of transport change significantly over time?

RQ3: Does travel time vary as a function of gender during (i) shopping trips, (ii) working trips, and (iii) leisure trips, even after statistically controlling for any effects of age, employment and marital status?

To answer RQ1, we used multinomial logistic regression. This statistical technique makes it possible to determine which of the following five independent variables - gender (male/female), marital status (married/other), age (11-17, 18-40, 41-60, 61+), employment status (yes/no), and purpose of trip (shop, work, leisure) – could predict three modes of transport (car, bus, on foot). For RQ2, we used cross-tabulations and z-tests to determine how the proportions of those travelling by car, by bus, and on foot varied by gender (male, female) and across time (1998, 2010). In investigating RQ3, we employed analyses of variance (ANOVAs) to determine whether travel time varied as a function of gender during (i) shopping, (ii) working and (iii) leisure related trips. In the presence of a significant F statistic in ANOVA, we used hierarchical regression analysis to determine whether the gender difference was still statistically significant after controlling for any effects of age, employment and marital status. In the presence of a non-significant F statistic in ANOVA, we used stepwise regression analysis to determine whether age, employment and marital status emerged as significant predictors of travel time. It is worth noting that the since the 2010 Household Travel Survey did not contain information on the marital status of the respondents, marital status was included as a variable only with the 1998 Household Travel Survey data.

4. RESULTS

The data sets for Household Travel Surveys of 1998 and 2010 were analysed and this section outlines the main results and comparisons.

RQ1: What mode of transport (bus, car, on foot) would travellers use, given their gender age, marital status, employment status, and purpose of trip? Does this pattern change over time?

The National Household Travel Survey data set of 1998 was restricted to trips related to shopping, work and leisure. This resulted in 15,915 trips of which 66.1 per cent were work related, 23.6 per cent were for shopping and 10.3 per cent were for leisure. The most popular mode of transport was the car (79.9%), followed by the bus (10.2%) and walking (9.9%). The

1 Car here refers to private passenger car which includes small truck, pick-ups and SUV's if registered for private use.

2 These three modes are the main modes of transport in the island with ferry and cycling recorded insignficant levels in the overall modal choice.

majority of the travellers were male (64.2%), aged 18-40 (49.4%), employed (75.8%) and married (68.0%). After specifying 'car' as the reference category in multinomial logistic regression, the following information was obtained:

- Walking versus using a car was significantly predicted by gender, age, marital status, employment status, and purpose of trip. In fact, travellers who were female, relatively older, not married, not employed and whose purpose of trip was to shop or to work rather than for leisure, were more likely to prefer walking than to use a car. The corollary holds that those who preferred to use a car rather than to walk were more likely to be male, relatively younger, married, employed and who travelled for leisure rather than for work or for shopping.

- Catching a bus versus using a car was significantly predicted by gender, age, marital status, employment status, and purpose of trip. In fact, travellers who were female, relatively older, not married, not employed, and whose purpose of trip was for shopping or for work rather than for leisure, were more likely to prefer using a bus to a car. The corollary holds that those who preferred using a car to a bus were more likely to be male, employed, married, and who travelled for leisure rather than for shopping or for work.

The same analysis was conducted using the National Household Travel Survey of 26th May 2010. In this data set, marital status was not available and so we used four factors (gender, age, employment status, purpose of trip) in an attempt to predict the mode of transport used (car, bus, on foot). After restricting the data set to trips related to work, shopping and leisure, we ended up with 12,201 trips of which 66.9 per cent were work related, 23.0 per cent were for shopping and 15.1 per cent were for leisure. The most popular mode of transport was the car (85.6%), followed by the bus (8.2%) and walking (6.2%). The majority of the travellers were male (55.0%), aged 18-40 (41.3%), and employed (74.7%). Apart from the omission of marital status, the conclusions drawn from the 2010 data set were exactly the same as those reported for 1998. Summaries of multinomial regression output for the 1998 and the 2010 Household Travel Surveys are presented in Tables 2 and 3 respectively.

The increase in both car use and percentage of employed with the sample tallies with the national statistics of increase motorization and female participation in employment. The results from RQ1 show no significant difference in the patterns of use of particular modes of transport over time, taking into consideration socio-demographic variables. This might indicate a threshold for future mobility patterns.

TABLE 2 Multinomial Regression Parameter Estimates (1998)

mode[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
bus	Intercept	-5.018	.168	889.900	1	.000			
	Age	.424	.041	105.973	1	.000	1.529	1.410	1.657
	[gender= female]	.939	.060	245.158	1	.000	2.556	2.273	2.875
	[gender= male]	0[b]	.	.	0	.	.	.	.
	[marital_status= not married]	.941	.061	234.849	1	.000	2.562	2.272	2.890
	[marital_status= married]	0[b]	.	.	0	.	.	.	.
	[employment_status= not employed]	.800	.078	105.888	1	.000	2.225	1.911	2.591
	[employment_status= employed]	0[b]	.	.	0	.	.	.	.
	[purpose= work]	.885	.118	56.621	1	.000	2.422	1.924	3.050
	[purpose= shop]	1.114	.115	93.731	1	.000	3.047	2.432	3.818
	[purpose= leisure]	0[b]	.	.	0	.	.	.	.
on foot	Intercept	-3.885	.150	670.652	1	.000			
	Age	.343	.040	72.352	1	.000	1.410	1.302	1.526
	[gender= female]	.931	.063	220.420	1	.000	2.536	2.243	2.868
	[gender= male]	0[b]	.	.	0	.	.	.	.
	[marital_status= not married]	.451	.065	48.082	1	.000	1.570	1.382	1.783
	[marital_status= married]	0[b]	.	.	0	.	.	.	.
	[employment_status= not employed]	.948	.077	153.081	1	.000	2.581	2.221	2.999
	[employment_status= employed]	0[b]	.	.	0	.	.	.	.
	[purpose= work]	-.236	.097	5.942	1	.015	.790	.654	.955
	[purpose= shop]	.421	.089	22.302	1	.000	1.524	1.279	1.815
	[purpose= leisure]	0[b]	.	.	0	.	.	.	.

a. The reference category is: car; b. This parameter is set to zero because it is redundant

Model $\chi^2(12) = 2210.33$, $p < 0.001$, $R^2 = 0.18$ (Nagelkerke).

TABLE 3 Multinomial Regression Parameter Estimates (2010)

mode[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Bus	Intercept	-6.490	.302	460.714	1	.000			
	Age	.126	.049	6.780	1	.009	1.135	1.032	1.248
	[gender = female]	.869	.075	134.305	1	.000	2.385	2.059	2.762
	[gender = male]	0[b]	.	.	0	.	.	.	.
	[employment_status= not employed]	1.287	.103	156.825	1	.000	3.622	2.961	4.431
	[employment_status= employed]	0[b]	.	.	0	.	.	.	.
	[purpose= work]	3.085	.272	128.424	1	.000	21.878	12.831	37.305
	[purpose= shop]	3.171	.266	142.081	1	.000	23.828	14.147	40.136
	[purpose= leisure]	0[b]	.	.	0	.	.	.	.
on foot	Intercept	-4.957	.209	565.147	1	.000			
	Age	.227	.056	16.671	1	.000	1.254	1.125	1.399
	[gender= female]	.919	.088	108.130	1	.000	2.507	2.108	2.981
	[gender= male]	0[b]	.	.	0	.	.	.	.
	[employment_status= not employed]	1.185	.113	110.556	1	.000	3.270	2.622	4.078
	[employment_status= employed]	0[b]	.	.	0	.	.	.	.
	[purpose= work]	.702	.144	23.746	1	.000	2.019	1.522	2.678
	[purpose= shop]	1.123	.127	77.779	1	.000	3.074	2.395	3.945
	[purpose= leisure]	0[b]	.	.	0	.	.	.	.

a. The reference category is: car; b. This parameter is set to zero because it is redundant.

Model $\chi^2(10) = 1457.77$, $p < 0.001$, $R^2 = 0.18$ (Nagelkerke).

RQ2: Do significant gender differences exist in the proportions of travellers travelling (i) by car, (ii) by bus, and (iii) on foot in 1998 and 2010? If so, do the gender proportions across the three modes of transport change significantly over time?

The question sought to determine how the proportion of those travelling by car, by bus, and on foot varied by gender (male, female) and across time (1998, 2010). A series of cross tabulations and z-tests for two population proportions revealed that:

- a significantly higher proportion of men than women use the car to travel, while a significantly higher proportion of women travel by bus or on foot, with the same pattern emerging in both 1998 and 2010.

- a significantly higher proportion of men and women are using the car in 2010 when compared to 1998, while a significantly lower proportion of men and women are travelling by bus or on foot in 2010 when compared to 1998.

A detailed summary of statistical output is presented in Table 4.

TABLE 4 Comparing population proportions (Summary of Cross tabulation and z-test output)

Gender	Mode of transport								
	Car			Bus			on foot		
	1998	*2010*	*z*	*1998*	*2010*	*z*	*1998*	*2010*	*z*
Women	65.4%	78.6%	-15.46*	17.0%	12.0%	7.63*	17.5%	9.5%	12.44*
Men	88.0%	91.4%	-6.99*	6.3%	5.2%	3.15*	5.7%	3.4%	6.64*
Women	65.4%		-20.08*		17.0%	21.44*	17.5%		23.20*
Men	88.0%				6.3%		5.7%		
Women		78.6%	-34.09*	12.0%		13.57*		9.5%	13.80*
Men		91.4%		5.2%				3.4%	

* Statistically significant at $p < 0.001$

These results might not suggest convergence between the sexes, however the increase in use of the car by females might indicate a greater number of female drivers in the future as socio-economic characteristics within the population change (for example, participation in paid employment).

RQ3: Does travel time vary as a function of gender during (i) shopping trips, (ii) working trips, and (iii) leisure trips, even after statistically controlling for any effects of age, employment and marital status?

The analysis carried out for the 1998 dataset revealed the following results.

Leisure: The average time for leisure related trip was 17.72 minutes (SD = 8.43). Females (M = 18.62, SD = 8.95) travelled longer (on average) during leisure trips than males (M = 17.16, SD = 8.78) and ANOVA revealed that the difference in travel time was statistically significant ($F_{1, 1516} = 9.88$, $p = 0.002$). When age, marital and employment status were entered in the first step of hierarchical logistic regression, only age provided a significant effect on travel time (B = -0.61, SE (B) = 0.29, t = 2. 06, p = 0.039). When gender (B = -1.61, SE (B) = 0.48, t = -3. 36, p = 0.001) was entered in the second step, it provided a significant improvement to the previous model ($F_{4, 1512} = 4.02$, $p < 0.003$). Hence, travellers tend to travel longer in leisure related trips if they are female and relatively older.

Shopping: The average time for a shopping related trip was 18.25 minutes (SD = 10.21), while males (M = 18.26, SD = 9.89) and females (M = 18.24, SD = 10.40) did not differ significantly from each other ($F_{1, 3380} = 0.003$, $p = 0.955$). When gender, age, marital and employment status were entered as predictors of travel time in stepwise multiple regression ($F_{2, 3375} = 10.21$, $p < 0.001$), travel time during shopping trips was significantly predicted by employment status (B = -1.39, SE (B) = 0.36, t = -3.85, $p < 0.001$) and marital status (B = -1.07, SE (B) = 0.41, t = -2.72, p = 0.009). Thus, travellers tend to travel longer during shopping trips if they are not employed and not married.

Work: The average time for a work related trip was 18.52 minutes (SD = 9.61). Females (M = 18.83, SD = 9.95) travelled longer (on average) during work related trips than males (M = 18.40, SD = 9.49) and ANOVA revealed that the difference in travel time was statistically significant ($F_{1, 10471} = 3.86$, $p = 0.023$). When age, marital and employment status were entered in the first step of hierarchical logistic regression ($F_{3, 10448} = 1.64$, $p = 0.177$), they did not produce any significant effect on travel time. Thus, we could conclude that travellers tend to travel longer during work related trips if they are female.

The analysis carried out for the 2010 dataset revealed the following results.

Leisure: The average time for leisure related trip was 15.95 minutes (SD = 8.43). Males (M = 16.60, SD = 8.37) travelled longer (on average) during leisure trips than females (M = 15.54, SD = 8.44) and ANOVA revealed that the difference in travel time was statistically significant ($F_{1, 1781} = 6.70$, $p = 0.01$). However, when age and employment status were entered in the first step of hierarchical logistic regression ($F_{2, 1780} = 9.40$, $p < 0.001$), travel time during leisure trips was significantly predicted by age (B = 1.22, SE (B) = 0.30, t = 3.99, $p < 0.001$) and employment status (B = 0.99, SE (B) = 0.41, t = 2.42, $p = 0.016$) while gender did not provide any significant improvement in explained variance when it was entered in the second step (B = 0.37, SE (B) = 0.46, t = 0. 81, $p = 0.421$). The beta coefficients revealed that travellers tend to travel longer during leisure trips if they are older and employed.

Shopping: The average time for a shopping related trip was 18.26 minutes (SD = 10.22), while females (M = 18.28, SD = 10.15) and males (M = 18.21, SD = 10.34) did not differ significant from each other ($F_{1, 2755} = 0.03$, $p = 0.862$). When gender, age and employment status were entered as predictors of travel time in stepwise multiple regression ($F_{1, 2755} = 19.81$, $p < 0.001$), travel time during shopping trips was significantly predicted by employment status (B = -1.84, SE (B) = 0.41, t = -4.45, $p < 0.001$). Thus, travellers tend to travel longer during shopping trips if they are not employed.

Work: The average time for a work related trip was 20.23 minutes (SD = 10.25). Females (M = 20.60, SD = 10.42) travelled longer (on average) during work related trips than males (M = 20.04, SD = 10.16) and ANOVA revealed that the difference in travel time was statistically significant (F1, 7702 = 5.15, $p = 0.023$). However, when age and employment status were entered in the first step of hierarchical logistic regression (F2, 7701 = 8.58, $p < 0.001$), travel time for work related trips was significantly predicted by age (B = -0.76, SE (B) = 0.19, t = -3.92, $p < 0.001$) but not by employment status (B = 0.36, SE (B) = 0.53, t = 0.68, $p = 0.495$). When gender was entered in the second step, it did not provide any significant improvement in explained variance (B = -0.42, SE (B) = 0.25, t = -1.68, $p < 0.094$). In fact, the beta coefficients revealed that travellers tend to travel longer during work related trips if they are younger.

In the above analysis, the Levene test was used prior to ANOVA to ensure that the equal variances assumptions could be assumed. In fact, in all cases, the F statistic (which ranged from 0.184 to 2.67) was not statistically significant. In multiple regression analysis, the Durbin Watson statistics which ranged from 1.802 to 1.820 were close to 2, indicating that the assumption of independent errors was tenable *(46)*. Additionally, the VIF statistics were all close to 1 (ranged from 1.03 to 1.12) suggesting that the issue of multicollinearity was of no concern here *(46)*.

Differences were only noted in leisure trips over time. More significantly there were no gender differences in travel time for work and shopping trips between 1998 and 2010.

These results do not point towards significant impacts on transport policy, at least looking at the development of mobility over the period 1998 and 2010. The study suggests other socio-demographic factors or maybe household composition as having an influence on the travel patterns of individuals and families (see *35; 36)*.

5. CONCLUSIONS

The analysis of the household travel survey data shows a complex relationship between demographics and transport that changed very little over time. There is evidence of increased car dependence in both female and males, even though some transport "disadvantage" is noted when travel mode is analysed. The higher percentage using walking and public transport are females, and strong relationships are established between mobility choices and particular socio-economic indicators such as employment status and age. This is the first ever study in Malta to highlight such difference. Over the period 1998-2010 there has been some evidence of convergence with females travelling almost as much as males, and use cars as their main mode of transport.

Malta's steady economic development and rapid motorization during the 90s has had significant impact on the travel patterns of the population. It is evident from the results of this study that the use of the car is pervasive and popular among all sectors of the population and for a variety of purposes. This poses challenges to future policy making in terms of infrastructure provision and cost, accessibility and social inclusion, equity, and environmental and public health. A reversal of trends witnessed during the last decade is necessary to shift the population to more environmentally friendly modes of transport as well as to relieve the current pressures on the limited transport infrastructure on the island, which as reported in the local press, is increasingly becoming congested throughout the whole day *(47)*.

The results of this study highlight that demographics alone will not have any significant impact on the desired modal shift. Other more restrictive measures will have to be adopted in order to reverse the process of car dependence and growth in private mobility.

This study has also raised interesting questions for future research in this area such as investigating the potential impact of land use distribution on travel time, and to what extent are residential and work location choices affecting behaviour. It has also raised significant questions with respect to other variables that might influence travel patterns, apart from those identified in this study. Further investigations into the role of children in the household for example (similar to *35*; *36*), are necessary to explain further specific patterns of travel behaviour observed in this study and in lieu of Malta's declining birth rate.

Malta's case study analysis has shown how, despite being an island, it displays patterns of mobility and car dependence similar to other cities in Europe and beyond. And therefore using such statistical analysis to understand the role played by various socio-demographic and economic indicators in the future is important, as will be their impact on transport policy.

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Stranded…And a Long Way From Home: Women, Transport, and Displacement

Much has been written women's gender roles since 1989 when Hochschild described the "second shift" that working women engage in at home. That is, when women engage in labor outside the home, the first "shift" of work, they face a second work shift—cooking, cleaning, laundry, shopping, dependent care—within or for the household. Hochschild and others also have written about a third shift of "relational maintenance and repair work." This poster explores how displacement due to planned relocations and extreme events—natural disasters or anthropogenic actions—may exacerbate the second and third shifts or create even a fourth shift by imposing new or unfamiliar transportation constraints on women's access and mobility. That is, due to gender roles, women's mobility needs may differ from men's when displacement occurs.

I draw on research conducted by me and colleagues among public housing residents relocated in Tampa and persons who experienced hurricane evacuations and tornados in Hillsborough County, Florida. The poster also presents findings from interviews of women who have lived in Syria and visited refugee camps and internally displaced persons. I also draw on the research findings of others who have written about displacements, most recently the floods in Northern India. As planned relocations and extreme events continue, consideration of women's travel needs as related to personal safety, security, modes, etc., becomes increasingly important in the sustainability pillars—economic, societal, and environmental considerations. That is, how will sustainable transportation infrastructure, systems, and modes meet women's mobility needs in the case of displacement? For women who work outside the home, displacement may limit access to employment, decrease access to goods and services, and so forth. Societal impacts may include disruption of supporting networks, e.g., daycare, healthcare providers, etc. The poster also includes suggestions for future research, particularly regarding women's experiences in refugee encampments and their attempts to conduct first, second, and third shift work.

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Paper Draft 2
11.5.2013

Gender, Income, and the Case of the Company Bus: A look into the Mode Choices of Employees of Bangalore's IT Sector

Note to reviewers: This paper is now significantly different from my original paper because I now have a substantial data set to work off. The data comes from my field research done July-September 2013. Unfortunately, I'm still in my analysis stage so I was unable to completely update the paper in time for the November 5th deadline. My expected completion date for this paper is 20.12.2013 (paper due to my department on this date) and so I'm hoping I would be able to resubmit to WiiT at this time. Please let me know if this is possible.

Abstract: This paper takes Bangalore's Information Technology sector as the starting point for a discussion on gender and transportation mobility in the city. The original motivation behind this research was to better understand how women's concern for personal security in Bangalore affects her transportation mode choices. It was predicted that women with the financial means to use private transportation, such as a car or two-wheeler, would chose such modes over public transportation in order to avoid the common occurrence of gender-based harassment in public transportation. The decision to focus on women (and men) employed in the IT sector stemmed from the logic that a) Bangalore's IT population is highly mobile both in regards to interregional migration (people moving between Indian states to IT hubs) and intercontinental migration. b) the incomes of men and women employed in the IT sector are higher than the city's median income, affording this population of workers more modal choice than other socio-economic sectors. The general findings reveal that although security is the most significant factor in determining this population of women's transportation mode, it does not inherently lead her to choose private over public transportation modes.

Introduction

Women and men often have different commuting patterns. Some of the most salient evidence for this comes from gender-based differences in the division of labor (Peters, 2002; Litman, 2006; GTZ, 2007). Across the globe, in countries categorized as developing and developed, women's mobility is influenced by unpaid, domestic labor tasks such as gathering wood for cooking, driving to the grocery store, taking children to and from school. Collectively, these *reproductive* tasks mean that women move around their urban, suburban, and rural environments and are described as having more *mobility* than men. However, women also experience

more barriers to their mobility, which is why women are often described as having less transportation *accessibility* than men. The most common barriers women universally face to accessing transportation includes: cost (women make proportionally less than men. This means a greater share of their income is spent on transportation), time (women are described as being more time poor than men due to the expectation of engaging in reproductive and care giving tasks) women), and security (women are more likely to experience gender-based harassment or violence while using transportation[1] than men).

Literature on transportation and social equity (see Vasconcellos, 2001; Mohan 2000; Srinivsan, 2008) illustrates that as one's socio-economic status improves, so also does one's transportation mobility. Middle to high-income households spend more on transportation, but transportation costs make up a greater proportion of a low-income household's spending (Vasconcellos, 2001). Put simply, the greater one's income, the greater transportation mobility one feasibly has, and, the greater one's transportation mobility, the greater one's access to job markets. A comprehensive review on the subject of gender and transportation mobility in lesser-developed countries (such as India) reveals a significant body of work dedicated to low-income, often rural women (Njoh, 1999; Peters, 2001; Tanzarn, 2008; Wekerke, 2005; Malmberg-Calvo, 1994; Lawson, 2007). This research, often taking the shape of policy reports, emphasizes the connection between gender differences in transportation accessibility and how this connects to larger questions around the role of gender in the (country's) development process. A focus on middle-to-high income earning women in these the countries is often absent from

[1] The assumption is that this is public transportation, but this is not always the case. See Raina's article in the New York Times: In Delhi, Even My Own Car is No Refuge From Harassment, April 12, 2013.

such literature, as a result, questions around the relationship between gender, income, and one's feeling of personal security [while using transportation] largely remain unexplored. How does income affect a women's concern or feeling toward her personal security? Does being a middle-income earner (to be defined at a later time) or growing up 'middle class' and having access to private transport (e.g. a car) acclimatize women in such a way that gender-based security issues fall off her radar? Or, does a middle-income woman's decision to access private transport stem from a fundamental concern over gender-based security? Although these are presented as either/or questions, answers are to be found somewhere in the middle. The challenge for gender and transportation mobility researchers is to highlight differences between men and women, between different socio-economic and cultural groups while simultaneously avoiding generalizations about any particular 'category.' My focus on middle income, female earners in Bangalore's IT sector is an attempt to find the various intersection at which binaries such as male/female, high income/low income, global/local, private/public come together and disrupt such seemingly oppositional relationships.

Bangalore

Home to India's Information Technology (IT) economy, Bangalore is often referred to as 'the new India'. Men and women working in the IT sector are earning incomes comparable to those in the 'developed' world (NASSCOM, 2008) and there is evidence to suggest that their socio-cultural norms are quickly 'developing' into consumer tastes and habits that mimic North America and Western Europe. As

incomes rise, it is predicted that individuals will choose personal over public transportation because the efficiency of personal transportation becomes more valued than the higher monetary cost to use it (Sabapathy, 2012). Higher incomes are also correlated with longer commuting distances between home and work (Blumenberg, 2004). Evidence of both exists in Bangalore where the growth of the international IT sector has led to a rise in individual incomes and contributed to a unique spatial distribution that locates most high income jobs on the periphery of the city. The result is a "'many-to-many' travel pattern"(World Bank, 2005, 53) with "software workers morning commute to work…tak[ing] up to two hours"(Ibid, 1), two points which I will elaborate upon further.

In a city like Bangalore, patterns of socio-spatial segregation were seen in the colonial era, today it is particularly pronounced in the gated IT office parks or an area of South Bangalore known as Electronics City.[2] Developing Bangalore's IT sector in the southern periphery—more than 15 kilometers outside of what is commonly accepted as Bangalore's Central was premeditated. The Bruhat Bangalore Mahanagara Palike (BBMP) or governing body in charge of land use has historically enforced low floor area ratios[3] (FAR) in the most central areas of the city (World Bank, 2005). Lower FAR ratios meant higher land prices, making it too expensive for IT businesses to purchase and redevelop into the large, often campus style office layout that was considered synonymous with the image of Silicon Valley. Furthermore, this area of the city was connected to Bangalore's past as a textile and manufacturing city (Nair, 2005). To truly become the 'Silicon Valley' of India would require developing a space in which the "self

[2] At present, the IT sector is also expanding to other areas of the city, such as the West and North.
[3] In this instance, the amount of building footage to the actual lot is low, meaning there is less floor space available to rent to prospective tenants

image [was]… far removed from any concept of a laboring self, emphasizing work as a lifestyle whose goal is enhanced consumption,"(Nair, 2005, 87). However, and here is where we return to our discussion on transportation, the decision to locate on city's periphery, even outside of the city's boundary, meant getting the desired work force to and from their place of employment would be quite a challenge.

The Land Use Transportation Link

Urban economic models predict relationships between economic activity and land productivity; how land markets respond to changes in relative accessibility (Noland, 2012). Transportation is an important variable in modeling land productivity and value because it is generally assumed that land that is accessible to markets is more valuable than land that is not (ibid). In other words, transport such as roads and rail lines affects land use and development and land use, in turn, affects transport development. Historically, Bangalore has always focused on road over rail transport and one consequence of this is that land development determines the city's transportation network as opposed to the other way around. This became an acute problem in the late 70s when land and population growth occurred at a much faster rate than the city's transport development. Between 1970 and the late 1990s, the city's built up area increased by 194 percent (Bhat, 2010) and from 1981 to 1990, Bangalore's population grew by 50 percent (Reddy, 2005). The number of kilometers traveled during this period increased by 68 percent but the number of public buses per million people only increased from 266 to 280 percent (Ibid). "That is why," Sudhakara Reddy concludes in his case study of Bangalore's transportation sector, "private vehicle population increased by 300 percent,"

(1995, 163).[4] The World Bank's 2005 report on Bangalore makes the observation that Bangalore Metropolitan Transport Corporation (BMTC) routes have became increasingly diffused in an attempt to connect and increasing numbers of destinations. As the bus network spreads wider, the frequency of service goes down (World Bank, 2005). Although statistics regarding the breakdown of vehicle usage in Bangalore are weak and no comprehensive household travel survey exists, numbers from a 2003 Bangalore Mass Rapid Transit Ltd. report suggested that by 2011 there would be 4.2 million motorized vehicles on the road, of which 3.56 million would be two-wheelers and cars.[5]

Private sector responds

When the Bangalore Agenda Task Force (BATF) was established in 1999, one of its first initiatives was a public poll asking Bangalorians to rank their top five concerns (about what?/what was the subject). Road conditions ranked number one (Nair, 2005). According to BATF Chairperson and Infosys Technology[6] CEO Nandan Nilekani, the purpose of BATF was "to showcase Bangalore as the gateway to world class city (sic) and to strengthen its position as an engine for Karnataka[7]'s robust growth,"(qtd in Ditrich, 2010, 244). The BATF was the city's first attempt at city governance through public private partnerships; roads are not inherently private, they are a public space that, in India is shared by a diverse range of modalities. Although the condition of the roads was the primary concern of the public, BATF responded by building a series of *private toll roads*, aimed particularly at improving connectivity between select residential areas

[4] Must check if this includes private bus fleets.
[5] (statistics come from World Bank, 2005 report, page 55-6).
[6] Bangalore's leading Software Company. The company headquarters is in Bangalore with offices across the globe.
[7] Karnataka is the Indian state in which Bangalore is located.

and Electronics City. We might conclude that improved road conditions came at the favor of those with access to private, motorized transit.

Commuting patterns by sector and income

Motivated by the observations of Sassen (2001) regarding the 'social polarization' of a global city due to economic factors, researchers Sabapathy et al. collected data from a total 436 Bangalore employees and used a weighted multinomial regression analysis to measure and compare the commuting patterns between employees of a large IT employer located in the southern periphery of the city and a manufacturing-oriented public sector unit (PSU) in a more centrally located part of the city. The authors' had two major hypotheses: that increases in income would correspond with an increased expenditure on transportation and that employees of the IT economy would have broader differences of commuting patterns than those in the traditional public sector unit.

> It was expected that higher income employees would be more likely to afford better quality homes at more distant locations leading to greater commute distances…with the limited supply of good quality housing in central areas and newer residential development taking place at the edges of the city, it would be more likely that higher income employees would be willing to locate further away from their work place in exchange for better housing. This would encourage greater spatial distance between work and home for higher income groups. Lower income groups, on the other hand, would locate closer to work places in less expensive poor quality housing (2012, 156).

In addition to both hypotheses being true, the authors concluded: "transformations in work travel patterns in the globalizing city of Bangalore have resulted in greater inequalities,"(Ibid, 165). Although gender is not explicitly addressed in the report, Sabapathy et al. did note that less than 1 percent of the PSU employees sampled were women (Ibid, 159) while 19.5 percent of the IT employees were female. Furthermore,

among married employees, 97 percent of spouses in the PSU sector were not employed while 41.3 percent of those in the IT sector were.

The effect of the IT industry on women's formal labor participation

There is empirical (back this statement up) evidence that the number of women entering India's formal labor economy is increasing, particularly in (and a result of) the IT and BPO industries. As of 2011, women constituted 36 percent of the IT sector (The Times of India, Sept 3rd, 2011). A 2008 NASSCOM study found that among Indians, the IT and BPO industries are perceived as 'safe' and 'acceptable' careers for women and "The idea of a working spouse is more widely accepted," (NASSCOM, 2008, 9). This is seen in Sabapathy et al.'s breakdown of men and women in each employment sector as well as the significant difference in households with dual-career spouses between the IT sector and the more traditional public unit sector.

The last point of interest from Sabapathy et al. was in their linear regression on daily work trip distances for the IT firm; females had a negative relationship to the dependent variable suggesting that women were more likely to have longer commutes than their male counter parts. Whether this was due to mode choice, actual distance to work, or other factors such as trip chaining adds another layer to the finding that higher-income earning employees of the IT economy have more complex commuting patterns than those employed in a lower-income earning public sector unit.

Research Methodology

Qualitative and quantitative data on the subject of commuting patterns of men and women employed by one of Bangalore's largest and oldest IT company's was collected in the summer of 2013.[8] The data came in the form of a comprehensive survey, individual interviews, and a handful of focus groups. The company was chosen for many reasons. First, it is one of the oldest and most successful Indian IT companies; the decision of the eight founders to locate the company headquarters in Bangalore is what laid the groundwork for the Bangalore-as-Silicon-Valley image. Second, they were first company in Electronics City to offer company buses for employees (a point to be discussed further). Lastly, the company has historically been proactive in gender inclusive employment, winning numerous awards for women friendly policies.

A link to a comprehensive transportation survey was sent via email to approximately half of all full-time, Bangalore-based employees[9] with a company email ID.[10] The survey was divided into sections asking about work commutes, non-work commutes, security, and demographics and made available to employees for a three-week duration. When the survey closed, 2151 individuals had completed the survey for an estimated sample population of 15,000 company employees. In the introduction to the survey, individuals were invited to contact the researcher if they wished to be interviewed on the same subject. Individuals were also recruited for interview and focus group through colleague word of mouth and an email sent out to target populations (e.g. women) viz a viz the company's sustainability unit. A total of 30 interviews were conducted.

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[8] Must follow up with company and figure out if they want their name publicized or if I need to create pseudo name.

[9] The company has multiple campuses throughout India. Bangalore however, is the company headquarters.

[10] The researcher did not have control over how the survey was administered or exactly whom it was administered to. …

Mode choice to work

Far more women than men use some form of bus transport to commute to work. 64 percent of women surveyed used the company bus and 15 percent used the BMTC city buses. Slightly less than half of the men surveyed used the company bus (49 percent); the second most common transportation mode among men was the BMTC city bus (14 percent) and the two-wheeler (13 percent). Although two wheeler and car were the third most popular mode choices among women, these constituted only 4 percent.

Self-Perception of career prospects of women in shipping: Some evidence from a pilot survey among the shore personnel of traditional maritime countries

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ABSTRACT

The paper aims at measuring the perception of career prospects that working women have in relation to shipping careers ashore. The authors distinguish between the personnel working in shipping and shipping management companies and the personnel working in auxiliary businesses related to inputs to shipping, which range from spares and parts to shipping finance. The analysis is based on the results obtained through an online questionnaire survey aiming at identifying the self-perception career prospects by women working in large clusters of shipping and shipping related companies internationally.
The survey focuses on the self-perception of career prospects by introducing additional variables - beyond pay-gaps, promotion procedures etc. – such as job satisfaction and its contribution to happiness. The main survey results are derived from completed questionnaires in – but not exclusively – European traditional maritime countries, especially from the largest shipowning community currently, i.e Greece.
The introduction is followed by a section on the existing literature on career satisfaction. In Section 3 the authors focus on the nature of work in shipping and on its requirements which may be of research interest for job satisfaction or for gender issues and present the context within which a shipping related career ashore evolves. Section 4 discusses the survey methodology and the results of the completed questionnaires. The paper concludes with suggestions on further research on a topic which has attracted little academic interest while having direct implications for the industry through the recent focus on staff turn-over among charterers and the shift to quality management.

Key words: women, job satisfaction, happiness, shipping, shore personnel.

1. INTRODUCTION

Despite the economic crisis, more evident in the developed economies which included until the start of this century the leading traditional maritime countries and a global job crisis evident worldwide, career satisfaction remains an issue both for industry and research. This is especially valid for skilled personnel in demanding industries such as this of shipping and can be a preoccupation for employers even in this era of apparently excessive labor supply. The lack of a satisfying pool of seafaring personnel for instance, has been highlighted repeatedly by relevant industry organizations and has led to a substantial number of research publications. A quantitative and qualitative shortage of seafarers was anticipated by studies of major maritime organizations *(1)* even before the impressive almost doubling of the world fleet in the present century *(2).* Despite the presence of significant economies of scale in shipping management and in many of the shipping related activities, this development emphasizes the value of retaining shore personnel including women who have acquired a significant presence in maritime professions over the past decades.

Career satisfaction is closely related to staff retention. In an industry like shipping, staff retention is deemed of importance not only- as would be expected by employers -but also from buyers by shipping services. Staff retention is for instance one of the KPIs which are included in the voluntary, but well by now customary, TMSA code. The code is used by the oil industry and its chartering side to assess the quality of prospective suppliers of tanker shipping services who undergo a company self-evaluation process calculating the degree of effectiveness of their provision of services through the level of attaining the highest percentage of KPIs possible *(3);* these KPIs reflect the – currently admitted - as goal standards in the process of continuous improvement of the company *(4).* Staff turnover is among the key areas which need to be addressed through such self-evaluation and self-improvement processes as any low rate of retention indicates loss of experience, predicts lack of coordination and ultimately may reveal an inherent weakness in the overall management of a company.

The issue is not merely one of interest from the employers' side or from an academic angle. Through backward and forward linkages shipping creates a multitude of employment posts adding to GDP growth, often most substantially, as in the case of Greece and other maritime countries which participated in the survey. Career satisfaction is directly related to staff retention, with the latter being anymore a key factor of competitiveness in a highly competitive environment such as this of world shipping and related industries which are practically all fully globalized.

The paper is divided in five sections. After a short introduction the authors review, the literature on women in shipping's shore personnel. In Section 3, the authors focus on the nature of work in shipping and requirements which may be of research interest for job satisfaction or for gender issues and present the methodology on which the survey was based with a focus on the enhanced perception of career and career satisfaction The fourth section discusses in length the results of the responses received through the questionnaire. Finally the paper concludes with a summary of the survey limitations and related suggestions for further research on women's satisfaction in the wider transport sector.

2. STATE OF THE ART

2.1 Job Satisfaction

Management along with policy makers should be taking into account issues related to subjective well-being when making decisions on organizational, corporate and governmental matters. This is especially significant due to the importance that shipping may have in a national economy. According to the data published by the NSSG *(5)* concerning the second quarter of 2013 the active workforce in Greece (4.982.619,00 people) represents 42.5% of the total population. The labor force is composed by 59.66% men and 40.34% women. Salary-related data from all sectors of Greek economy show that women are paid an average 16.5% less than men for the same work. More specifically, the average salary for men

amounts to 1415 Euros whereas the equivalent for women is barely above the1181 Euro benchmark. The number of workers in the shipping industry is around 200.000.

Well-being does not relate only to pleasant life conditions but is also beneficial to the national and corporate environment *(6).*Since the beginning of the 20th century, social scientists' and psychologists have made efforts to answer questions such as "What is happiness? Can it be measured? What causes happiness?" *(7).* Up to the present the research on the theoretical frameworks and the methodology for quantifying subjective well-being (SWB) has considerably increased *(8).* Amongst the most widely applied methods to measure subjective well being are the Experience Sampling Method (ESM) also known as time sampling or beeper studies, the Ecological Momentary Assessment *(7)* and the Day Reconstruction Method (DRM), which according to *(9)* seems to be the most practical method.

According to *(10)* job satisfaction is one of the domain satisfactions among others such as health, financial, housing, leisure, environmental, social life, marriage,, etc. Regression type models were developed using data from houdehold surveys for Germany and England and compared the results. Job Satisfaction was modeled as a function among others of age, income, working hours, children and number of adults in the household.

The literature includes many causes of a person's subjective well-being/ satisfaction in a job-environment such as workload *(11),* good management and supervision *(12)* and level to which the job fits the personality of the individual *(13).* Furthermore *(14)* proved that the level of control someone has over the work conditions is related with greater well-being. *(15)* reviewed the literature on the characteristics of the rewarding jobs, identifying ten key job features that are associated with employee well-being: opportunity for personal control, opportunity for skill use, externally generated goals, variety, environmental clarity, availability of money, physical security, supportive supervision, opportunity for interpersonal contact and valued social position. Higher job-feature values are accompanied by greater job-specific well-being. *(16)* highlighted the importance of non-economic factors in order to increase satisfaction in the workplace and boost employee productivity and company profitability. In addition, happier people seem to earn higher incomes and to perform better at work than unhappier ones.

2.1.1 Women's Perceptions regarding Work

Earlier work for the Pythagoras project *(17, 18)* focused on identifying the job-related satisfaction and activities of Greek working women. The data collection methodology involved 200 questionnaires collected via personal interviews. The sample was diversified as to the place of respondents provenance in order to assure the highest representativeness of the population possible (16% of the respondents came from the Greek Islands, 75% from the Attica region and 9% from the mainland).Approximately 60% of the currently employed women worked in the private sector, while 19% in the public sector. Their contracts were in the majority of cases full-time ones; in fact only a 21% worked part time. The results show that only 9% of the companies encourage their employees to take up teleworking, indicating the fact that teleworking is far from being widely known or understood by the business world. It is hardly surprising then, that a meagre 3% of the sample teleworks. In addition, almost 10% of the sample's working women admitted to working extra hours from their homes, usually after the end of their official working day, for an average 30 minutes to 1 hour per day. In the same context, women stated that their average working day consists of 8.3 hours/day, while 11% are working overtime. The research investigated the satisfaction with salaries. 40% of women were more or less dissatisfied with their salaries, whereas only 9% totally satisfied by it; 34% tends to disagree with the statement that "Women receive equal wages with men", while 38% to agree with it. The respondents also replied to seven questions from which can be inferred the degree of influence their circle of relatives and relations has over them and their career related decisions. The majority of women stated that they made all decisions regarding their career on their own, however, there seems to be a clearly marked tendency to consult others before deciding about anything of great importance, while the fathers' opinion is more influential than the mother's or other relatives.

A few number of EU projects have dealt with the Employees in the shipping industry. The most relevant project, which included a large scale survey regarding job satisfaction of workers in the shipping industry, was SLIM-VRT *(19, 20).* The main objective of the SLIM-VRT "Self Learning Integrated Methodology – Virtual Reality Tool project" was to provide an integrated maritime training, onboard and ashore, using interactive multimedia and virtual reality technology. One of the main purposes of SLIM-VRT was the identification of gaps in supply and demand for job positions and skill qualifications. Work involved data collection and analysis of employees including skills, qualifications, job description, satisfaction with work, training needs, learning styles and career development prospects in the shipping industry. The methodology relied on the development of two major types of questionnaires addressed to employees and employers. The data collection was based on questionnaires that were distributed to 5000 employees (1.195 responded) and 200 shipping related companies (62 responded). The sample is composed by 710 employees, with the following nationalities 710 Greek, 115 British, 85 Spanish, 160 Philippinos, 45 Cypriots, 10 Norwegian, 18 Polish, 25 Ukraine and the other are from many non-European Countries (a fairly representative sample). The seafaring profession remains a difficult job for women, as the 95% of the personnel is male. From this sample: 64% are single, 34% married and the rest 2% divorced. With regards to the future career objectives of the employees, 59% wants to get a promotion, 15% wants to change career and the rest (26%) wants to stay in their current position. The results of the seafarers show that a very small percentage answered that they are completely satisfied with their wage while the higher percentage declared that they were partially satisfied. Particularly, 5% of the respondents denoted fully satisfied, 22% somewhat satisfied, 52% indifferent, 12% somewhat dissatisfied and 9% denoted not satisfied at all. With regards to the question regarding the overall satisfaction concerning the seafaring career, almost 32% answered that they are satisfied, 23% answered that they are not satisfied and the rest (45%) was indifferent. These results in a cross tabulation with the respective job position shows that the higher ranks are well satisfied while others are not. Examining also the salary scale, it may be concluded that there is a big difference between the captain's or chief engineer's salary and the rest. Obviously, the duties and the responsibilities vary a lot according to the position in a demanding industry such as shipping.

3. WORKING IN THE SHIPPING INDUSTRY: SETTING THE PILOT SURVEY CONTEXT

Employees in the shipping industry must adapt and perform successfully in a continuously changing organizational, business, and employment environment. Common career paths in the shipping industry may require alternate career changes and job rotation such as acquisition of different positions onboard, work on different types of ships, and employment, at an office position related with the shipping and port operations management *(19).* In the shipping sector ashore, the management of ships is done on a 365/24/7 basis across the entire globe, as the case is for ocean going ships which constitute the largest part of the world tonnage, without physical access to the production site of shipping services, often difficult communications and in an international context.

In addition the shipping industry is a multicultural environment where employees are asked to constantly interact with customers (authorities, agents, traders, etc) and co-workers of varied locations operating themselves often in equally demanding environments and different contexts. Women must therefore posses a number of soft skills if they want to built a career in the shipping industry. Such soft skills are divided into two categories: 1) The first category includes friendliness, teamwork, ability to fit in, spoken communication skills, and appearance and attire; and 2) The second category is called motivation, taking in characteristics such as enthusiasm, positive work attitude, commitment, dependability, and willingness to learn *(20).* The development and cultivation of such skills can be promoted by appropriate human resource management; however, no management techniques can totally alter the subjective perception of employees with regard to their career prospects which are reflected to the level of job satisfaction and happiness in general which they enjoy through their work. This is especially true for managerial positions where the nature of tasks and demands from employees may

differ considerably due to the nature of the industry itself. Length and patterns of working hours and level of time-pressure, along with the possibility for flexibility in daily work and commuting obligations are obvious, but not exhaustive *(11)* factors influencing career satisfaction and happiness.

Shipping is a highly demanding business which operates across time-zones, within constantly changing external conditions be these those of the economy or of natural elements. In the era of modern shipping quality provision of maritime services is translated into market rewards, whether this relates to the basic characteristics of the "hardware" of shipping, i.e. the ships *(21)*, or whether this is associated with what can be termed the software of shipping which includes strategy and procedures *(22)* as well as the human element. Quality of service is not defined only by the timely transport for A to B but also by the absence of claims *(23)* which can arise not only through failures in technical equipment but through, related or unrelated human errors and omissions. Such mishaps, which can severely affect not only the reputation but the finances of a shipping company, can be avoided through retaining experienced personnel as the intricacies of shipping, through the number of factors intervening in most types of its daily transactions is such that experience is essential, on an equal par with education and basic skills.

3.1 Conducting the survey

The research of this study consisted of two main phases: (1) the development of an on-line survey; (2) data collection and descriptive analysis.

The main objectives for the development of this survey include, on the one hand, the aim to identify the main factors that influence the career choice of women in the shipping industry and their working conditions, and, on the other hand, the investigation of eventual discrimination issues between male and female shore personnel. Furthermore, the authors aimed to measure the stated level of satisfaction of respondents in relation to general aspects of their everyday life, their commuting habits and their teleworking activities.

The data collection took place from March 2013 until June 2013. The research team was facilitated in conducting the survey by the Greek branch of the Women's International Shipping & Trade Association (WISTA), i.e. WISTA (Hellas). Through this network organization whose parent one has branches in most of the maritime countries the authors contacted a number of WISTA national associations, in order to obtain a representative sample for the women shore personnel in the international shipping industry. The questionnaire was available in web format. The first step of the research was to initially circulate the questionnaire to all members WISTA in Greece in March 2013. As the response rate was too low a second reminder was sent to the WISTA Hellas, Denmark, UK, USA, and Norway associations after two months, on the 13th of May 2013. An effort was made at the same time to circulate the questionnaire via social virtual networks such as Facebook.

In total, 147 respondents attempted to complete the survey. From those only a rather small number, thirty-two respondents completed the questionnaire fully. A high share, 78% of the initial respondents, abandoned the questionnaire on the first question. This is not perhaps unrelated with the nature, working times and the pressure which characterize the business of shipping.

4. ANALYSIS OF THE FINDINGS OF THE SURVEY

Table 1 summarizes some of the respondent's general characteristics. It appears that the majority of the respondents hold managerial positions (45%). In addition the larger percentage, works in the sales and purchase department (18%) and as Marine Lawyer and in Ship Management Company (12% each). The average work experience of the respondents is around 6,76 years. The vast majority of the respondents have a full time contract and no sea service. According to the country of residence of the respondents, all but two work in Europe. Greece is the most represented country, with a total of 52% respondents of the overall entries, followed by 24% of responses from the UK and the Netherlands with 15% of the total entries. The majority of the sample are aged between 35-44 years old. With respect to tele-working, 73% of the respondents work from their home for 5.31 hours on average and state that they save 1.5 days per

week from going to work. Only 21% of the respondents, however, seem to work in companies promoting teleworking

TABLE 1 Respondent's Characteristics

Questions	Levels	Frequencies	Percentage
Current Position	Owner	5	15%
	Top Managerial	6	18%
	Managerial	15	45%
	Below Managerial	7	21%
Job Title	Sales and Purchase department	6	18%
	Marine Lawyer	4	12%
	Ship Management company	4	12%
	Ship Broker	3	9%
	Public Sector	3	9%
	Other	13	40%
Years in the current position	Mean Standard Deviation	Not Available	6,76 6,72
Contract type	Full time	30	90%
	Other	3	10%
Sea Service	Yes	29	88%
	No	4	12%
4G Phone	Yes	13	40%
	No	20	60%
Driving license	Yes	32	97%
	No	1	3%
iPad	Yes	17	51%
	No	16	49%
Children	Yes	13	40%
	No	20	60%
Age	25-34	9	27%
	35-44	13	40%
	45-54	7	21%
	54-64	4	12%
Country of residence	Greece	17	52%
	UK	8	24%
	Netherlands	5	15%
	USA	2	6%
	Norway	1	3%
Tele-work	Yes	24	73%
	No	9	27%
Hours tele-work	Mean Standard Deviation	Not Available	5,31 hours 5,04 hours
Days save from tele-work	Mean Standard Deviation	Not Available	1,46 days 2,73 days
Company promotes tele-work	Yes	7	21%
	No	26	79%

Table 2 presents travel characteristics of the women who participated in the survey. Considering vehicle ownership, each respondent's household owns 2 cars and 2 bikes. The respondents that use car travel commute faster (20, 43min) while commuting to work by bus takes them 41.71 min on average. The standard deviation of travelling times presents high values from around 19min to 24min.

TABLE 2 Respondents Travel Characteristics

Characteristics		Value
Nr of vehicles- Cars	Mean	2
Nr of vehicles- Motorcycles	Mean	0
Nr of vehicles- Bikes	Mean	2
Time to reach work- Bus	Mean Standard Deviation	41,71 min 23 min
Time to reach work- Car	Mean Standard Deviation	20,43 min 18,56 min
Time to reach work- Bike	Mean Standard Deviation	35,33 min 23,19 min
Time to reach work- Walking	Mean Standard Deviation	32 min 18,56 min

Figure 1 presents the job position of respondents per country of residence. As shown, 9 respondents from Greece hold managerial positions and 3 are owners of their own companies. The women who work in the Netherlands hold either managerial or below managerial positions. From UK, respondents from each job position group have participated. The higher participation of women lower job positions can be explained by the fact that they may have more time available.

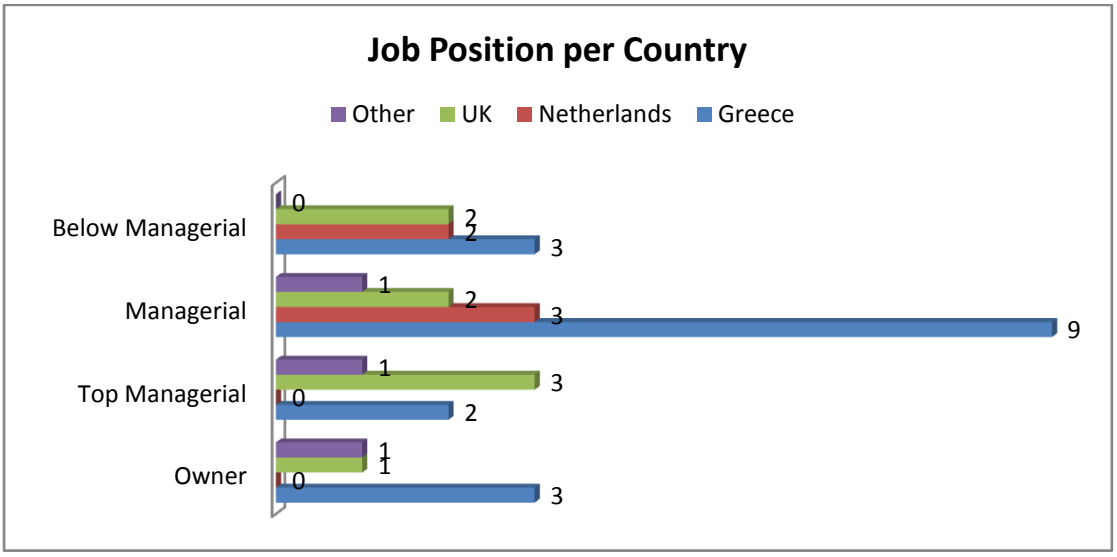

FIGURE 1 Job Position per country

Women that work in the sales and purchase department in Greece present higher participation in the survey which is not unrelated to the S&P strategy that has been identified as a strategy at the basis of the

survival and success of the Greek-owned fleet in recent decades *(24)*, with a number of larger companies including separate S&P divisions *(25)*.

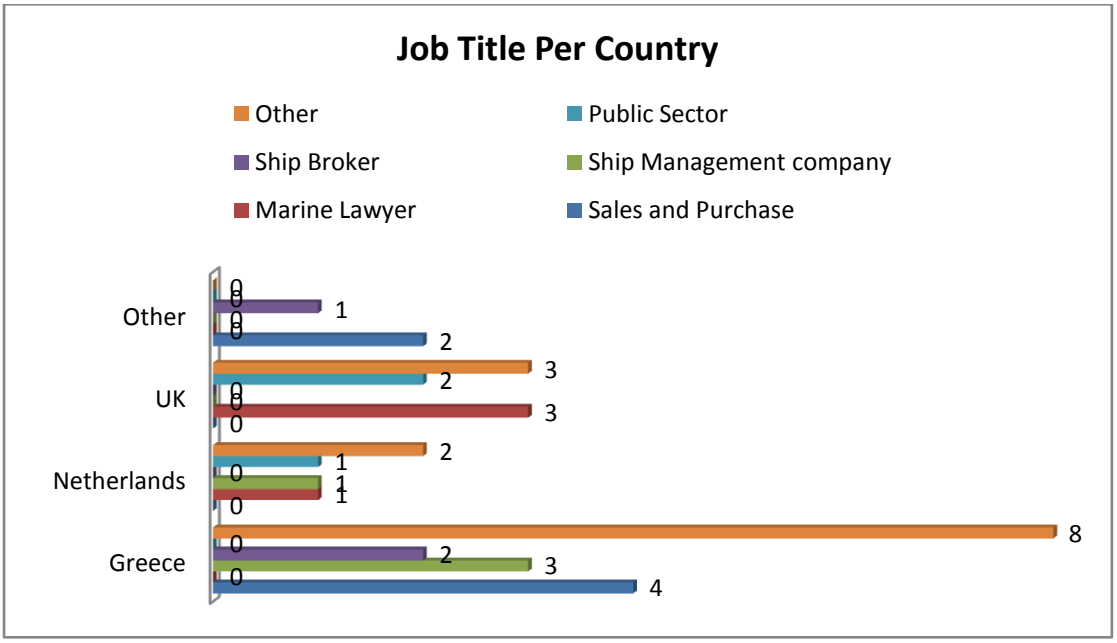

FIGURE 2 Job Title per Country

The respondents were asked seven questions concerning the degree influence their relatives and friends had over their career related decisions. Their related answers are presented in Table 3. A seven-point Likert scale, ranking from "Strongly Disagree" to "Strongly Agree", was used to indicate the level of agreement. The majority of women stated that they made their career decisions on their own; however, there seems to be a tendency to consult their father, their siblings and their friends before making important career choices.

TABLE 3 Career related decisions

Factors affecting the career related decisions (1= strongly disagree, ... 7= strongly agree)	Average	Standard deviation
1. The opinion of my mother influenced my career choice	1.6	1.6
2.The opinion of my father influenced my career choice	2.6	2.1
3. The opinion of husband influenced my career choice	1.8	1.6
4. The opinion of my siblings influenced my career choice	2.1	2.1
5. The opinion of my other relatives influenced my career choice	1.6	1.6
6. The opinion of my friends influenced my career choice	2.1	2.0
7. I made all my career decisions on my own	6.2	6.2

Respondents were asked to state their degree of agreement with the statements presented in Table 4, in a similar scale of 1 to 7 where 1 corresponds to "totally disagree and 7 to "totally disagree. On average they agree that they can influence the conditions of their work and they seem to disagree that they face problems at work caused by their colleagues. They are neutral that their salary corresponds to their work effort. With regard to the availability of free time for their personal life and hobbies, their agreement level is around Level 4. The overall standard deviation for these three statements is around 1.6. As for the

statements regarding the discrimination between the two sexes, the stated agreement of the respondents is around level 4. Finally, (Statement 12) they do not seem to look for a better job.

TABLE 4 Factors Representing my Career Choice

(1= strongly disagree, ... 7= strongly agree)	Average	Standard deviation
1. Frequently there are problems at work caused by colleagues.	3.2	2.0
2. I can influence the conditions of my work.	5.0	1.7
3. My work gives me the opportunity to evolve personally and professionally	5.6	1.5
4. My salary corresponds to my work effort.	4.4	1.9
5. Because of my job obligations I do not have enough free time for my personal life.	4.6	1.7
6. Because of my job obligations I do not have enough free time for my hobbies	4.6	1.6
7. Overall during my career I had the same recognition as my male colleagues.	4.5	2.1
8. Overall during my career I had the same pay as my male colleagues of the same level.	4.0	2.0
9. Overall during my career I was offered the same promotion opportunities as my male colleagues.	4.3	2.1
10. Overall during my career I had the same fringe benefits as my male colleagues.	4.3	2.1
11. Overall during my career I had more recognition compared to my male colleagues.	3.4	1.9
12. I am looking for a better job.	3.4	2.5

Table 5 shows the average rank on stated happiness in different life domains. The lower value of satisfaction concerns the respondents social life; the working pace and hours in shipping related careers may eventually be the underlying reason for this. Women feel satisfied with their career and their career prospects (Level 5). Overall, respondents feel satisfied with their lives (Level 5). The standard deviation observed in this group of questions is around 1.8, in which statements and statement 1 the higher and the lower deviation, respectively.

TABLE 5 Satisfaction/Happiness level

Satisfaction/Happiness level (1= very unhappy, ... 7= very happy)	Average	Standard deviation
1. Yourself in an overall perspective.	5.0	1.5
2. Yourself with your family life.	5.2	1.8
3. Yourself with your social life.	2.1	1.6
4. Yourself with respect to your financial situation.	4.6	1.8
5. Yourself with respect to your career.	5.1	1.6
6. Yourself with your career prospects.	5.2	1.6

An interesting finding from the satisfaction and happiness related questions show that the level of happiness varies significantly by country as shown by the Figure3. Overall, the respondents from the Netherlands are the happiest. The women living in the UK are the most satisfied with their carrier prospects and their career in general. On the other hand, the respondents from Greece, due eventually to the economic situation, are the most dissatisfied with their economic situation. Finally, compared to the rest of the sample, women from the UK seem to enjoy more their social life but are unhappier with their personal life.

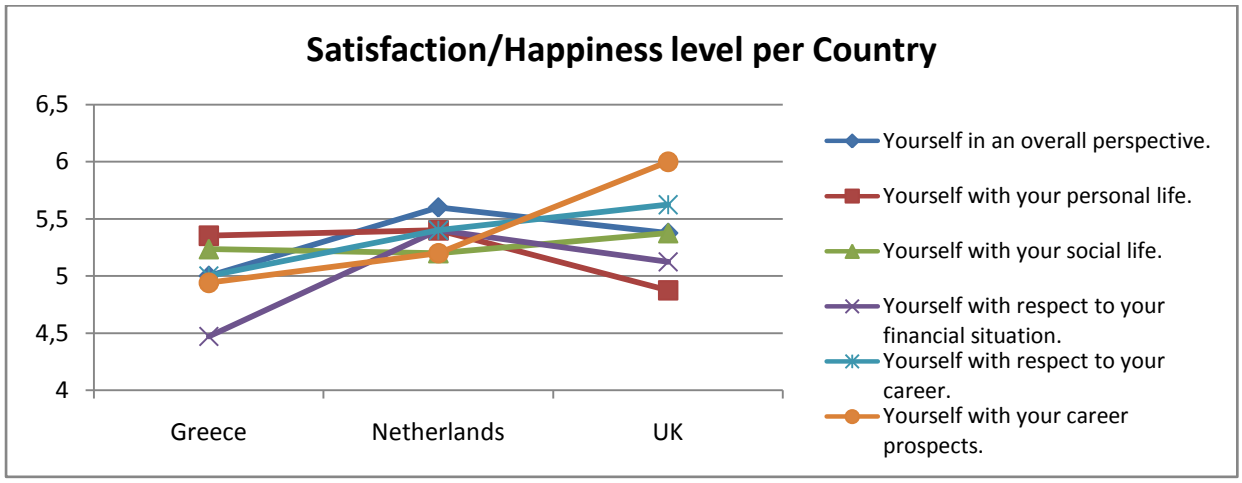

FIGURE 3 Satisfaction/Happiness level per Country

Women working in Greece state that they face more problems caused by their colleagues and feel underpaid compare to women working in the rest of Europe. In addition, they all agree that they can influence the conditions of their work (Level between 5 and 6). Finally, in spite of the unemployment in Greece, respondents residing in Greece are searching for a better job.

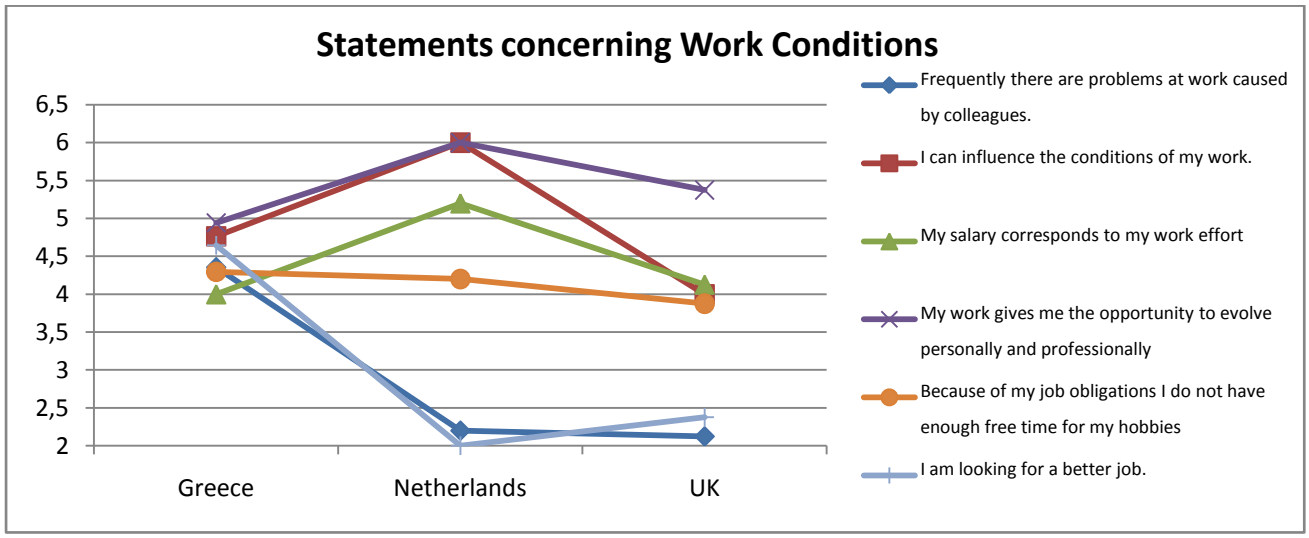

FIGURE 4 Statements Concerning Work Conditions

Figure 5 represents the level of agreement of respondents concerning gender discrimination in the work environment. It appears women working in the Netherlands feel that they are treated the same with their male colleagues. Respondents in Greece believe that they are not paid as well as men for the same job. On the other hand, they all admitted to have less recognition than their male colleagues.

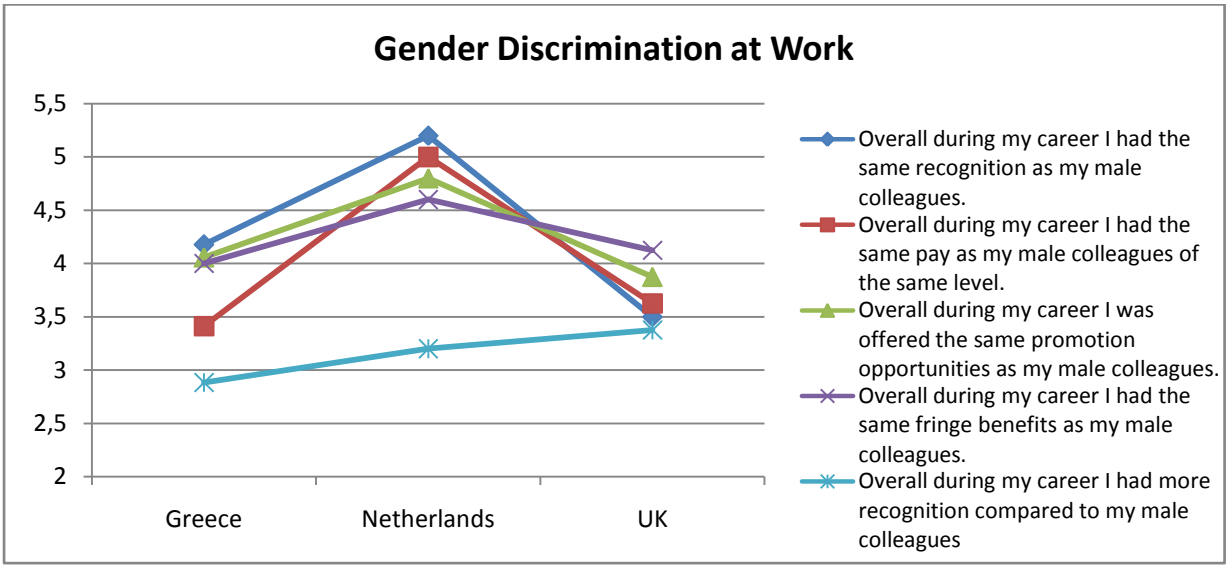

FIGURE 5 Gender Discrimination at Work

Figure 0-7 compares the factors affecting work related choices. Overall, the respondents from Greece are clearly less influenced by their family and relations when they have to make important decisions regarding their career choices. Although women working in the Netherlands strongly agree that they make their career decisions alone, they present a higher tendency to consult others before deciding anything of great importance. On the contrary , respondents working in the UK seem to consult more their husband regarding their career decisions.

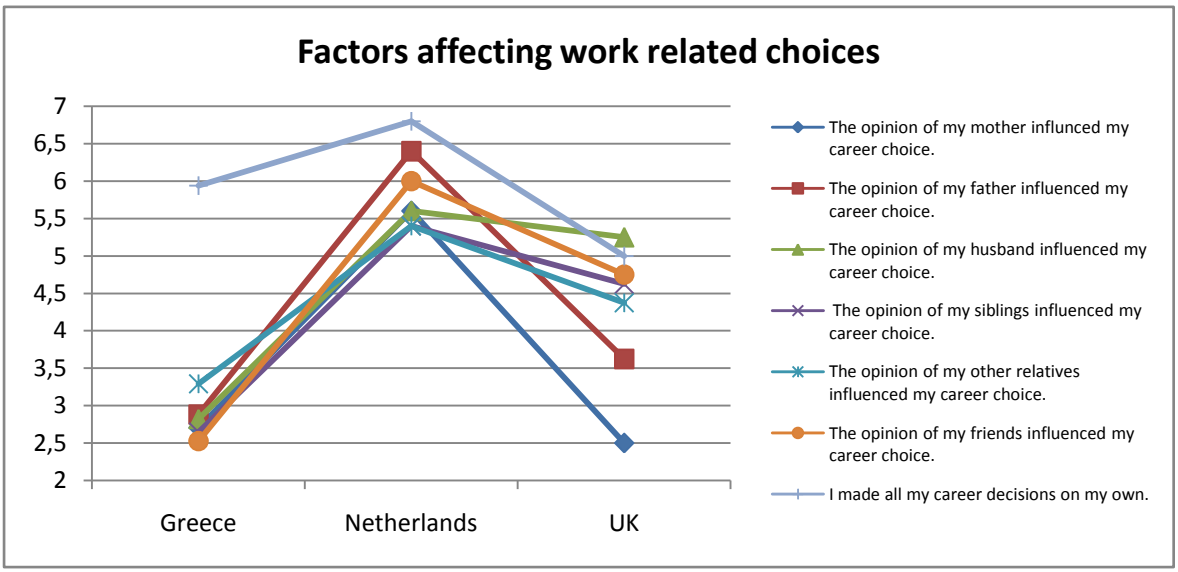

FIGURE 6 Factors Affecting Work Related Decisions

5. CONCLUSIONS AND FURTHER RESEARCH

As suggested by the results of questionnaire surveys among women seafarers in the past, an impressive share of women seafarers were committed to pursuing their careers despite the recorded problems associated with employers' attitude and crew attitude which were not insignificant. The results of the present survey indicate a similar attitude in the international – small as it may be –sample surveyed through the electronic questionnaire among women in shipping related careers.

Policies promoting the well-being of women in the work-environment are crucial as it has been proven that companies with satisfied employees have more satisfied customers. Happier employees are more productive in their working environments and in the very competitive maritime environment, preserving an important resource - in the form of experienced personnel - has been acknowledged recently as a competitive strength as the emphasis of many buyers of shipping services has shifted, be that belatedly into the human element. Monitoring and devising strategies for improving career satisfaction, and, furthermore, identifying any gender issues which must be taken into account will require further research with larger samples in order to confirm the indications provided in this pilot survey.

Prelimary linear regression and ordered probit models which show a relationship between age, salary, etc. have been developed but due to the lack of data the researchers were not confident with the model coefficients. Future research will concern more data collection from various countries overtime in order to:

(1) Estimate time series ordered probit models of perceived job satisfaction

(2) Develop advanced econometric models to quantify the impact of job satisfaction on the overall happiness of female workers in the shipping industry (see for example *(17)* for similar applications).

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WOMEN IN TRANSPORTATION ARE MOVING THE WORLD,
IS THE WORLD MOVING TOWARD THEM?

Lillian Miller

Introduction

More women are needed in the transportation industry to meet the growing demands of commerce. According to American Trucking Associations there is a shortage of 20,000 truck drivers. Airlines will need nearly half a million new commercial pilots worldwide by 2032. It goes unnoticed every day women bus and train drivers take us to work. Women drive our children to school; women deliver our mail and other goods. They fly us to our destinations. They move the world, but is the world moving toward them?

While both the aviation and trucking industries are dominated by men, women in the aviation careers are provided hotel rooms every night, women truckers are not provided clean showers in the male-dominated truck stops. In both industries, unloading heavy cargo, caring luggage from flight to flight can be difficult. It is hard enough for any mother, with an office job, to keep in contact with children and this is harder for someone on the road or at 30, 000 feet.

I spent my early professional years in trucking industry and later in the aviation industry. During my pilot training in flight schools, I realized that even simple things are not designed for women. For example, the seat in Cessna 172SP was too far away from the controls for me as a petite woman. As a result, I had to carry special booster chair in order to reach breaks. Sometimes, I needed help to push the plane in the perfect parking spot.

While the participation of women in transportation is on the rise, meeting their needs is stagnating. What can the transportation industry do to better attract and sustain women labor into their work force?

Abstract

The purpose of this study is to describe major obstacles facing women in transportation in the United States. Furthermore, the study explores the steps that private companies and various organizations in the United States are taking to minimize these obstacle and the benefits by encouraging employment of women in transportation. The research findings are intended to help put together recommendations for shrinking the deficit of commercial drivers and pilots by attracting women to the industries. This study uses qualitative method of analysis. In addition to secondary sources, the study has used primary data in the form of personal interviews with a number of sources knowledgeable on the subject matter.

The purpose of this research is twofold: to identify major obstacles facing women in transportation and to formulate recommendations that will assist in overcoming these obstacles. To answer these questions the following sub-questions were addressed:

1. What and how difficult are these obstacles for women?
2. What steps are being taken in order to overcome or minimize these obstacles?
3. What are the benefits to the commerce?

This study is significant because it recognizes the need of transportation industry to understand the difficulties women face. This study helps identify obstacles women facing in transportation careers. Next, this study focuses on the importance of minimizing obstacles. Therefore, it fills the gap in the literature.

Research Design and Methodology

This study used the qualitative method design. The primary sources of data were taken from interviews with women drivers, pilots, associations and panel discussion. Secondary sources used were: international publications, journals, and transportation associations' publications; such as data were collected from teleconference interviews, e-mails, and one-to-one meetings,

Organization of the Study

Chapter One introduces the purpose of this study. This chapter states the statement of the problem with research sub-questions, explains the research methodology, and lists interviews with the authors' names and dates of the interviews. Also, it gives the panel discussions with the place and date of events.

Chapter Two is review of research sources and literature. This chapter presents opinions of the subject experts and scholars. Lists interviews with trucking association, various multinational companies, US foods, US express, Frito Lays, Truck Stops, Airlines, Airports and governmental agencies.

Chapter Three lists the main obstacles and analyzes the difficulties minimizing them. It gives the background of the issues. It explains why transportation career is difficult for women. It analyzes women drivers and pilots as a sub culture of transportation.

Chapter Four discusses the actions taken overcoming these obstacles. It examines actions taken to minimize obstacles. This chapter also portrays action taken by various organizations. This chapter illustrates possible technology that may help. It points out technology used to simplify life on the road. Furthermore, it lists best practices of American companies, as wells as trucks stops and airports. It explores creative ideas. It analyzes the improvements in United States so far and describes the areas that need further improvements.

Chapter Five deals with the sub-question: What are the major benefits to companies and commerce? This chapter answers that question by providing the details of the economical benefit. It justifies encouragement.

Chapter Six summarizes the findings and conclusions of the study. This chapter summarizes the major and minor obstacles, states recommendations, and suggests further research.

Truck Cab Design: Perceptions of Women Truck Drivers

WIiT Paris 2014: Women's Issues in Transportation

5th International Conference on Women's Issues in Transportation- Bridging the Gap
April 14-16, 2014 Paris – Marne-la-Vallee (France)

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Abstract

The trucking industry is a major force behind the United States (US) economy with approximately 750,000 interstate motor carriers. Trucks deliver 70% of all freight tonnage while 80% of U.S. communities receive goods exclusively by truck. The motor carrier industry provides jobs, generating significant income and tax revenue, representing approximately 5% of U.S. Gross Domestic Product (GDP). Despite one of every 13 people employed in a trucking-related job, there is a significant driver shortage. The American Trucking Associations (ATA) currently projects a shortage of 20,000 to 25,000 drivers in the for-hire truckload market (ATA, 2012).

Women are well positioned to address this shortage. In 2011 women represented 7% of total employment in the U.S. trucking industry (Bureau of Labor Statistics, 2011). The purpose of this study was to identify truck design needs for women truck drivers. This research is significant due to limited data sources about truck design needs for women drivers. This study also contributes to the body of knowledge about women in the trucking industry. In response, a 33 question survey was developed using Qualtrics™ survey software. In April 2012, an electronic survey was distributed to 663 Women in Trucking Association members over a two week period with a response rate of 18%.

Results were separated into quantitative and qualitative data and analyzed accordingly. Adjustability was a central issue facing women truck drivers. Recommendations for seat design, side mirrors, steps, handrails, hydraulic hood lifters, and steering consoles will be presented. Limitations of the study and recommendations for future research will be discussed.

Keywords: truck cab design, women truck drivers, trucking industry, needs assessment

Introduction

The trucking industry is a major force behind the United States (US) economy with approximately 750,000 interstate motor carriers. Trucks deliver 70% of all freight tonnage while 80% of U.S. communities receive goods exclusively by truck. The motor carrier industry provides jobs, generating significant income and tax revenue, collecting more than $650 billion in revenue. This represents approximately 5% of U.S. Gross Domestic Product (GDP). Despite one of every 13 people employed in a trucking-related job, there continues to be a significant driver shortage.

A 2012 report by American Trucking Associations (ATA) currently projects a shortage of 20,000 to 25,000 of drivers in the for-hire truckload market in the U.S.A. (ATA, 2012). Deregulation of the motor carrier industry dating from the 1980s has been credited for increased growth of the industry and a demand for drivers (Beilock, 2005). According to the published literature, at least one fifth of all long-haul drivers are age 55 and older and it is expected that a larger percentage of long haul heavy duty truck drivers in the transportation industry will be older with within the next decade resulting in an increase in retirements (Bunn, Yu, Slavova, & Bathke, 2009).

The beneficial aspects of being a truck driver involve several aspects: independence, ability to make decisions, operation of new and better trucks, high income potential, and ability to explore and travel to different parts of the country (Johnson, Bristol, McClure, & Schneider, 2011). In terms of income potential for women truck drivers, the average starting median income can be upwards of $30,000 annually USD (E. Voie, personal communication, February, 25, 2014). However, a review of the literature reveals wide variability regarding annual median incomes reported in the United States for women drivers as well as their male counterparts. A study by Stephenson and Fox, (1996) reported the average median income of drivers was approximately $40,000 per year USD, while a study by Valway, Jenison, Keller, Vega-Hernandez, and McCree published regarding truck drivers (N=652) in New Mexico that the annual median income for women drivers was approximately $50,000 per year USD versus $61,000 per year USD for male drivers. The Bureau of Labor Statistics in 2012 reported the annual median income of women drivers was approximately $ 27,924 per year USD with the annual median income of male drivers reported at approximately $38,272 per year USD (BLS, 2012). Factors that may influence the reporting of annual median income data in the literature may be related to the hours or service regulation rules, anti-discrimination laws in the United States, and low reporting (V. Walker, personal communication, February 25, 2014).

Although these are attractions to the industry, truck drivers spend long hours behind the wheel, working an average of 41.5 hours per week (BLS, 2009a). Long hours, driver shortages, and challenging working conditions are related to the high turnover rates in the trucking industry compared with the overall labor force considered in its entirety (Stephenson & Fox, 1996; Beilock, 2005). Truck drivers are subject to hours of service regulations (HOS) by the Department of Transportation (DOT). These rules limit drivers to 60 hours of work time in 7 days and require an 8 hour break after 10 hours of driving and 15 hours of total work time (Belman & Monaco, 2001, p. 504). Such limitations impact the median income of drivers and may be a contributing factor regarding the wide range of variability in reported annual median income data among the truck driver population in the United States.

Although the research recommends the industry focus on scheduling greater home time, increasing pay and benefit packages, technology assistance with government paperwork requirements, driver skill and safety, as well as decreasing driver stress, there has been limited focus on the truck cab design needs for the trucking industry specifically focused on women (Johnson, Bristow, McClure, & Schneider, 2001). A well-designed truck cab not only makes a significant difference in the working conditions for a truck driver but also affects the safety of truck drivers and other road users. If the design of the truck cab is poorly fitted to the size and dimensions of the driver, the road may be less visible, driving controls may be more difficult to reach, and seat belts may be less comfortable and less likely to be used—all of which increase the risk of injury to the driver and other road users.

In 2011 women represented 7% of total employment in the U.S. trucking industry (Bureau of Labor Statistics, 2011). This new demographic reality necessitates an updating of the data used for the design of truck cabs because of the link to various demographic characteristics (Bradtmiller, Ratnaparkhi, & Tebbetts, 1985; Gordon, Bradtmiller, & Ratnaparkhi, 1986; International Organization for Standardization [ISO], 2006). Given the previous discussion regarding the continued driver shortage, there is a pressing need to enhance ergonomic cab designs for safe and efficient over-the-road operation, especially for women drivers. A 2012 study by Jinhua; Hongwei; Bradtmiller; Tsui-Ying; Reed; Jahns; Loczi; Hardee; and Piamonte, found that although male truck drivers were shorter in stature, female truck drivers were not different from the U.S. general population. Demographic evidence suggests that the population is changing, with a greater representation of racial and ethnic minorities, especially the Hispanic ethnic group. In 1983, the combined category of truck drivers (heavy and light) and driver-sales workers included 11.7% African Americans, 5.6% Hispanics, and 3.5% females (BLS, 1983). In 2009, the category of driver-sales workers and truck drivers included 13.4% African Americans, 18.7% Hispanics, and 5.2% females (BLS, 2009c). Improvements in the quality of the driver working environment, comfort, and driver experience are recommended to attract, retain, and enhance profitability for the industry (Stephenson & Fox, 1996). This study focuses on eliciting the perceptions of women truck drivers regarding the design and equipment needs and recommendations for Class 8 trucks. This study seeks to inform and add to this body of literature.

Methods

The study sample consisted of 663 female truck drivers who were members of the Women in Trucking (WIT) Organization, located in Plover, Wisconsin, U.S.A. Survey questions were designed based on available information from the literature, interviews with Ellen Voie, President for Women in Trucking, and an experiential assessment exercise evaluating a new 2012 Class 8 Model Truck and a used Class 8 Model Truck at a local dealership in March 2012. The survey was a component of an applied learning project for a graduate level course and was developed as an online survey using Qualtrics ™ survey software. Data were collected were states across the continental United States. The survey used convenience sampling methods and was distributed to WIT members for a two week period in April 2012. Only those with a valid Class A Commercial Vehicle Driver's License (CDL) were measured.

Results

A survey was developed using a 4 point Likert scale rating with an open ended question text boxes following each question option. Survey question design resulted from an experiential learning exercise with students in March 2012 using 1 new class 8 truck and 1 used class 8 truck as exhibits. Survey questions were formulated, edited, and reviewed by the President of Women in Trucking (WIT), course professor, and the students. The population sample was a convenience sample of the membership from the Women in Trucking (WIT) organization in a 2 week time frame in April 2012. The electronic survey was developed in Qualtrics and e-mailed to 633 WIT members with a resulting response rate of 122 or 18%. Questions 1 through 6 of this survey provide the demographics of the sample representing the quantitative portion of this study. The remaining questions and results of the survey are qualitative in nature and reported in terms of frequency with central themes and subthemes derived from the qualitative analysis with recommendations for truck cab improvement (Miles & Huberman, 1994). Limitations for future survey design and distribution will be discussed in the recommendations section.

Quantitative results

Table 1

What type of truck do you usually drive?

#	Answer	Response	Frequency %	Statistic	Value
1	Heavy Duty (Class 8)	101	89%	Min Value	1

2	Medium Duty	10	9%	Max Value	3
3	Light Duty	2	2%	Mean	1.12
				Variance	0.15
				Standard Deviation	0.38
	Total	113	100%	Total Responses	113

Table 2

How long have you been driving this truck?

#	Answer	Response	Frequency %	Statistic	Value
1	Less than 6 months	8	7%	Min Value	1
2	6 months to less than 1 year	7	6%	Max Value	5
3	1 year to less than 3 years	18	16%	Mean	4.04
4	3 years to less than 5 years	20	18%	Variance	1.59
5	5 years or more	60	53%	Standard Deviation	1.26
	Total	113	100%	Total Responses	113

Table 3

How many hours/day do you spend driving this truck?

#	Answer	Response	Frequency %	Statistic	Value
1	1-5 hours	6	5%	Min Value	1
2	6-10 hours	33	29%	Max Value	3
3	>11 hours	74	65%	Mean	2.60
				Variance	0.035
				Standard Deviation	0.059
	Total	113	100%	Total Responses	113

Table 4

The cab of this truck is comfortable for your body type.

#	Answer	Response	Frequency %	Statistic	Value
1	Yes	85	76%	Min Value	1
2	No	27	24%	Max Value	2
				Mean	1.24
				Variance	0.18
				Standard Deviation	0.43
	Total	112	100%	Total Responses	112

Table 5

Do you feel safe when driving the truck?

#	Answer	Response	Frequency %	Statistic	Value
1	Yes	105	92%	Min Value	1
2	No	9	8%	Max Value	2
		114		Mean	1.08
				Variance	0.07
				Standard Deviation	0.27
	Total		100%	Total Responses	114

Table 6

Are you satisfied with how your truck handles while driving?

#	Answer	Response	Frequency %	Statistic	Value
1	Yes	100	90%	Min Value	1
2	No	11	10%	Max Value	2
				Mean	1.1
				Variance	0.09
				Standard Deviation	0.3
	Total	111	100%	Total Responses	111

Quantitative item analysis. Tables 1-6 represented the quantitative results for this study. Of this sample, 88% or survey participants represented driving Class 8 (Heavy Duty) trucks with 10% driving Medium Duty trucks. Participants indicated they had been driving for 5 years or greater. Twenty nine percent of participants reported driving 6 to 10 hours per day while 65% indicated driving greater than 11 hours per day, representing a sum total of 94%. Seventy-five percent of respondents reported they were satisfied with their current truck and 92% of participants replied feeling safe while driving their truck on the highways, interstates, and byways.

Qualitative results

The remaining survey questions focused on the qualitative items of the survey by eliciting feedback about the issues that women face in terms of truck cab design of Class 8 Trucks. The questions were designed as open ended with a response section for recommendations for improvement in these areas. Central themes and subthemes were analyzed using qualitative coding methods to explicate frequency of these themes and subthemes (Miles & Huberman, 1994).

Table 7

What could be improved in terms of safety of the truck?

Central Theme	Frequency (%)	Subtheme	Recommendation
Seat belt adjustability	80%	Seat restraint systems built for women	Make seat belt adjustable
		Uncomfortable seats	Change the seat design
		Less flexibility in seat position	

Airbags	Airbags not available	Addition of airbags

Qualitative item analysis, Table 7. The qualitative analysis for Table 7 identified the central theme of safety. Eight percent of respondents reported that safety was a concern when driving the truck. The subthemes identified were lack of truck seats designed for women both from an anthropometric and ergonomic design standpoint resulting in uncomfortable and lack of adjustability of the seat mechanism to meet the needs of women truck drivers. In addition, survey respondents also indicated that the lack of airbags in the Class 8 trucks they drove did not include airbags. The subtheme of airbags was aligned with the central theme of safety.

Table 8

Are you satisfied with how your truck handles while driving?

Central Theme	Frequency (%)	Subtheme	Recommendation
Not satisfied	9%	Suspension	Air ride
Not satisfied	9%	Handling	More wind resistance

Qualitative item analysis, Table 8. Table 8 inquired about satisfaction of truck handling of the Class 8 trucks driven by survey respondents. The analysis revealed that survey respondents were equally divided in terms of dissatisfaction. Feedback of respondents identified issues in the areas of suspension and truck handling as opportunities for improvement related to overall truck design.

Table 9

Which of the following components of your truck seat are you not satisfied with in terms of design?

Central Theme	Frequency (%)	Subtheme	Recommendation
Adjustable Lumbar Support	81%	Adjustability	Better position for women
Seat Comfort	61%	Cushioning	Softer seat Better absorption Softer ride
Seat Belt	45%	Adjustability Positioning	Upright position of seatbelt Reduce neck irritation due to placement

Qualitative item analysis, Table 9. Table 9, attempted to explore satisfaction in more detail as to results in Table 7. In regard to the central theme of suspension, adjustable lumbar support (81 %) was perceived by respondents as a primary need for improvement. This was followed by seat comfort (61%) and adjustability of seat belts (45%) respectively. Study participants who responded to this question recommended greater adjustability and comfort in the design of these features for Class 8 trucks.

Table 10

Which of the following components of your truck steering wheel are you satisfied with in terms of design?

Central Theme	Frequency (%)	Subtheme	Recommendation
Positioning	58%	Obstructed view of dashboard Uncomfortable	Tilt steering Height adjustability
Dimensions	52%	Too Small	Steering wheel sized

			to the driver
Rotation	47%	Difficult to turn	Power steering standard for all trucks

Qualitative item analysis, Table 10. Analysis of the results in Table 10 focused on the design and position of the steering wheel of the Class 8 truck. Analysis this question identified 3 central themes in the areas of: position, dimensions, and rotation concerning the steering wheel mechanism. In regard to steering wheel position, 58% of survey respondents identified the steering wheel design as uncomfortable and/or obstruction for viewing the truck dashboard. Fifty-two percent of respondents reported that the steering wheel design was too small with a recommendation of design sized with the driver. Rotation of the steering wheel was the third most common theme (47%). Respondents reported that the steering wheel mechanism was difficult to turn while driving.

Table 11

Which of the following components of your truck pedals are you not satisfied with in terms of design?

Central Theme	Frequency (%)	Subtheme	Recommendation
Adjustable Pedals	77%	Material	Non slip material
		Design	(design)
		Adjustability	Wider pedals
			Adjustment for short and long legged people
		Positioning	
			Placement of clutch
			Wider pedal area

Qualitative item analysis, Table 11. Table 11 focused on the adjustability of the foot pedals for Class 8 truck. Adjustability of foot pedals was a central theme and concern of study participants (77%). Subthemes identified were: adjustability, materials used for foot pedal design, position, and overall design of the pedal were problematic for women drivers. Study participants recommended opportunities for improvement in areas of: non slip materials, wider design, pedal adjustability, and overall design regarding clutch placement.

Table 12

Which of the following components of your truck's cabin facilities are you not satisfied with in terms of design?

Central Theme	Frequency (%)	Subtheme	Recommendation
Mattress and cabin Space	60%	Better mattresses	Higher quality mattresses, Bigger and comfortable
Bunk	42%	Quality	Bunk versatility
			Increased cabin storage Space
			Better carpet
			Softer cushions
			A larger bunk
Storage Facilities	36%	Lack of space for equipment	Microwave placement
			More storage space
			Drawers that pull out

Qualitative item analysis, Table 12. Table 12 focused on the perceptions of women drivers in terms of the cabin facilities of Class 8 trucks. Survey respondents identified the following central themes related to satisfaction levels: mattress and cabin space (60%), bunk design (42%), and storage facilities (36%). Survey respondents recommended opportunities for improvement in the areas of: mattress quality, increased and adjustable storage space, versatility, comfort, and other amenities**.**

Table 13

Which of the following components of your truck's transmission are you satisfied with in terms of design?

Central theme	Frequency (%)	Subtheme	Recommendation
Ease of Use	86%	Exactness of shifting	Easier and smoother gear transition
Location	42%	Location of gear shifter	Automatic Transmission Adjustability
Clutch	35%	Reachability	Better location of clutch Adjustability

Qualitative item analysis, Table 13. Table 13 focused on the perception of women truck drivers in terms of Class 8 transmission design. Central themes identified were: ease of use (86%), location (42%), and clutch (35%). Analysis of qualitative responses yielded the following subthemes: exactness of shifting capability, location of gear shifter, and the reachability of the clutch. Opportunities for design improvements that were associated with these themes and subthemes were: easier and smoother shifting and gear transition, options for ordering automatic transmissions and/or having manufacturers make automatic transmissions standard design features, and adjustability of the gear shifter. Survey participants recommended better locations for clutch placement and adjustability to better meet the design needs of women truck drivers.

Table 14

Which of the following components of your truck's instrument console are you satisfied with in terms of design?

Central theme	Frequency (%)	Subtheme	Recommendation
Dashboard	69%	Reachability	Slanted and contoured dash design
Lighting	59%	Lighting	More Lights on and in dash Back Lighting Better light on top of cabinets
Cabinets	39%	Reachability	Cabinets doors instead of Stretched mesh material

Qualitative item analysis, Table 14. Table 14 focused on the perception of women truck drivers related to truck instrument console design. Central themes identified were related to: dashboard (69%), lighting (59%), and cabinets (39%). Reachability was the primary subtheme for respondents for dashboard and cabinetry. Survey respondents recommended opportunities for improvement for instrument console design in the areas of dash design, improved lighting options, and the availability and reachability of cabinet doors that open and close, rather than the industry standard of stretchable mesh materials.

Table 15

Which of the following components of your truck's engine accessibility are you satisfied with in terms of design?

Central theme	Frequency (%)	Subtheme	Recommendation
Fuel tank accessibility	74%	Pump handle jumping Fuel spills	Ergonomic dash design
Ease of lifting hood	50%	Weight of hood (heavy) Hood latches (difficult)	Top of the dash too slanted
Ease of closing hood	43%	Visibility Weight of hood (heavy) Hood latches (difficult)	More lights in dash Back lighting Better light top cabinets

Qualitative item analysis, Table 15. Table 15 focused on women truck drivers in regard to perceptions about accessibility to the Class 8 engine compartment. Central themes identified were related to: access to the fuel tank (74%), ability of lifting the truck hood (50%), and ease in closing the truck hood (43%). Subthemes identified were: the jumping of the pump handle when fueling which precipitated the potential for fuel spills, heavy weight of the truck hoods, difficulty in closing truck hood latches, and reduced visibility. Analysis of recommendations for improvement related to truck design were: develop a more ergonomic dash design, additional lighting to improve visibility, and materials to address the weight and difficulty in the opening and closing of the truck hood.

Table 16

Which of the following components of your truck's side mirror are you not satisfied with in terms of design?

Central theme	Frequency (%)	Subtheme	Recommendation
Side mirror size	31%	Difficulty to get the complete view Too narrow to see the tail of the trailer	Design-longer and wider (e.g. West Coast mirror design)
Side mirror adjustability	28%	Limited adjustability	Electrical adjustment

Qualitative item analysis, Table 16. Table 16 depicted the feedback from survey respondents regarding side mirrors. Size mirror size and adjustability were the central themes identified. Survey respondents reported that size mirrors were too small, narrow, and/or lacked adjustability. Opportunities for improvement included designing longer and wider mirrors including the ability of electrical adjustment, similar to standard passenger vehicles.

Table 17

Which of the following components of your truck's accessibility are you not satisfied with in terms of design?

Central theme	Frequency (%)	Subtheme	Recommendation
Step spacing	37%	Difficult to reach the cab floor due to spacing	Have one more step
			Steps made close together
Step width	48%	Steps too narrow	Wider steps-especially top step
Handrail location	44%	Slippery handrail material	Return to Century design for more accessibility
		Safety concerns due to loss of grip while climbing	Handrail inside the truck
Handrail availability	50%	Difficulty getting into the truck due to lack of handrail(s)	Increase the number of handrails

Qualitative item analysis, Table 17. Table 17 explicated the perceptions of survey respondents regarding accessibility to the truck cab. Step spacing (37%) and step width (48%) revealed challenges women truck drivers face on a consistent basis. Subthemes identified spacing between steps in general and for entrance into the truck cab were too wide of a distance for women drivers. The second subtheme indicated that steps were too narrow for proper foot placement. In addition, the topic of handrail availability and location were prominent central themes for participants in this study. Respondents recommended the additions of steps and handrails. Wider steps and availability of the number of handrails and inclusion of handrails within the truck cab were also recommended as opportunities for improvement.

Discussion and Recommendations

In this study, no differences were found in survey answers between drivers taller than 5’ 6” and drivers shorter. Therefore, height of participants was not a limiting factor. For the most part, survey participants in this study were satisfied with their trucks. This study focused on eliciting the perceptions of women truck drivers regarding the design and equipment needs and recommendations for Class 8 trucks. This study sought to add to this body of literature. The analysis tells us that most of the design issues could be remedied if various aspects of Class 8 trucks were made to be more adjustable.

As a result of this pilot study, the following recommendations regarding specific design aspects of Class 8 trucks. These are based on items that were repeatedly identified by the study participants, who were truck drivers and members of the Women in Trucking (WIT) organization.

1. *Seat adjustability.* Participants in this study recommended increasing the adjustability of the seat style and mechanism for the Class 8 truck. General recommendations by survey participants were in the categories of: adjustability, increased lumbar support, shock absorption of the truck seat to accommodate bumps and road conditions. Specific recommendations in terms of adjustability included designing seatbelts that are adjustable to fit all body types, changing the seat design for positioning to fit women drivers, and increase leg capacity and space under the steering column. Lastly, study participants recommended manufacturers include airbags as a standard design feature.

2. *Adjustable steering wheels*. Study participants recommended that adjustable steering wheels be included in the overall design or as an option for purchase when selecting a Class 8 truck. In addition, increasing the current adjustability features of the steering wheel were also a primary recommendation. Study participants consistently reported positive comments about the tilt steering wheels in the current trucks driven by participants in this survey. Study participants in this survey suggested the involvement of women truck drivers in the design phase of steering wheels at the time of manufacture. In addition, participants recommended truck manufacturers and distributors allowing greater decision making and choices in terms of size and placement of the steering wheel during the purchasing process.

3. *Adjustable foot pedals.* Participants in this study recommended a review of the adjustability of the pedal mechanisms. Study participants also recommended manufacturers review the raw materials used during the manufacturing process and select materials to make the pedals less slippery in times of inclement weather. Suggestions were also made to widen the space between pedals, specifically the clutch mechanism.

3. *Increased truck cab lighting and comfort.* Study participants recommended improvements in the areas of lighting, storage facilities, and comfort. Recommendations included but were not limited to the following: 1) increasing the number and types of lights in the truck cab and sleeper compartments; 2) increasing the storage and accessibility of storage; and 3) improving the quality, comfort and size of the mattresses in the sleeper compartments.

4. *Easy access engine compartments.* Accessibility of the engine compartment was a design priority for women truck drivers in this study. The weight of the truck hood and difficulty closing hood latches were specific concerns identified in this study. Study participants recommended accommodations in the ergonomic design of the hood and engine compartments. The recommendations included: 1) attempts to decrease the overall weight of the hood in the manufacturing process considering lighter materials without compromising quality and durability; and 2) use of hydraulic lifters for easier opening and closing which would accommodate all body types; and 3) increased lighting within the engine compartment area. Study participants also recommended manufacturers consider automatic transmissions as a standard design option for Class 8 trucks.

5. *Adjustable side mirrors*. Survey participants recommended increase adjustability of the side mirrors for the Class 8 truck design. Increased adjustability of side mirrors is recommended for good sight lines toward the rear of the truck. This would improve the safety for the driver in handling the truck during normal operations. In addition, longer and wider mirrors to view the end of the tractor trailer would improve safety and handling of the truck and also increase efficiency and maneuverability by truck drivers.

6. *Step spacing and width.* Study participants provided recommendations in terms of the design and width of the steps exiting the truck compartment. Specific recommendations for manufacturers based on this study included: 1) widening the top step for exiting the truck cab compartment to provide a wider platform base and improve safety for drivers exiting the compartment. 2) Decreasing the width between steps to accommodate operators of shorter stature and stride capacity. This would reduce safety risks and fall potential.

7. *Handrails*. Study participants also suggested the availability of handrails externally. Participants stated that handrails were not standard equipment for some Class 8 trucks. Including handrails inside the truck cab were also recommended to avoid slipperiness in times of inclement weather. Survey participants also suggested increasing handrails in areas where climbing may be a necessity.

Conclusions

This study found that there were no differences in the responses from people above 5’ 6” tall and those that are below 5’6” in height. Adjustability was the primary theme and recommendation from the WIT respondents. While study participants were primary female in terms of gender, the common themes of this study apply to all gender types. Study participants indicated issues with the placement, adjustability, and size of at least

one or two items in their trucks. A positive qualitative finding of the survey participants was the overwhelming response to tilt steering. This furthers the study's assertion that flexibility and adjustability are necessities for women truck drivers regarding the design of Class 8 trucks. Including truck drivers in cab compartment design at the manufacturer level would be beneficial for the potential driver, brand loyalty, manufacturers, and the trucking industry in general. Allowing choices regarding adjustability and providing options for accessories for prospective truck drivers at the time of lease or purchase is also recommended.

Limitations of the study

This study experienced limitations in terms of study design and duration. This study was limited in terms of time and experience level of researchers. This study was part of an applied learning project as a component of a graduate course at a University in the Midwest (United States). Therefore, challenges were experienced due to the nature of this learning environment. There was a noted design error in question design and formatting which was discovered after initial survey distribution. This resulted in a delay in survey deployment, limited responses, and delayed data collection. Although the student researchers corrected the survey design error, this impacted the overall duration of survey availability to study participants which limited the number of responses and resulted in an 18% response rate. In addition, the survey was deployed in April 2012 at the time of a readily observed holiday. Data analysis was impacted due to end of semester deadlines for course work in the university setting.

Recommendations for further study

Despite the limitations of this pilot study, significant and relevant information was obtained that provide the foundation for further study and future research. The following suggestions are recommended for future consideration.

1. Redesign the survey to include more detailed survey logic and deploy the survey over a longer duration of time.

2. Include a larger sample for analysis. This study had 122 responses with some questions reporting 113 responses out of a total of 663 surveys distributed. Distributing the survey over a longer duration and/or multiple replications of this survey would yield more reliable data for analysis.

3. Include survey constructs and questions that collect a wider demographic data set, such as: age, gender, medium income, etc. to allow for increased analysis against industry trends and BLS data.

4. Partner with National Institute of Safety and Health (NIOSH), truck manufacturers, and representatives in the trucking industry to create a validated survey construct. It is recommended that focus groups and additional survey measures be considered to validate survey questions to improve the reliability and validity of this survey instrument.

5. As a result of recommendation item 4, revision and redistribution of the survey to a pilot group or other transportation organizations is recommended prior to wider distribution of the survey.

6. Include questions specifically focused on the topic of recruitment of women into the truck driving industry as well as questions designed to elicit feedback on retention of women in the trucking industry would be beneficial for further study.

7. Continued partnership with the Women in Trucking (WIT) organization regarding the presentation and distribution of the results of this study to inform truck manufacturers and carriers about the cab design challenges women drivers experience.

8. Continued partnership with Women in Trucking (WIT) and the University of Wisconsin-Stout to develop a user guide for equipment purchasing specifically focused on women truck drivers.

9. The Women in Trucking (WIT) organization will offer member companies and sponsors of the Women in Trucking organization the results of this study in an effort to assist in redesigning the specifications of new trucks and retrofitting of existing trucks with a focus to align with the results, findings, and recommendations of this study.

Women are an untapped resource to consider in addressing the current driver shortage in the industry. Improvements in the quality of the truck driver environment are recommended to be a high priority for every trucking company for the recruitment and retention of women truck drivers. There is a pressing need to enhance ergonomic cab designs for safe and efficient over-the-road operation for women truck drivers. In addition, there has been limited focus on the truck cab design needs for the trucking industry specifically focused on women. This study seeks to inform the body of literature regarding the truck cab design needs based on the feedback and perceptions of women truck driver members of the WIT organization. At the time of this publication, Ryder System, Inc. ™ has expressed interest in the results of this pilot study.

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Urban transport driver: a male occupation?

The difficult change in the professional gender identity

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Summary

This research aims to explore how a company's strategic turnaround can affect identities construction and the ideal employee model. It is drawn on Ely and Padavic's research agenda, according to which the organisations' structures shape its members' professional gender identity and on Bellini's work on calibration processes. Research is carried out in a bus company located in France. It shows that although the company's strategic re-orientation leads to a feminization of the driving occupation, neither the management nor the drivers seem ready to fully integrate the female new recruits.

Gender identity – strategic turnaround – driving occupation – resistance

Most research into gender equality in the professional sphere agrees that organisations are gendered and that gendering moulds individual identities and influences women's integration and advancement (Angeloff and Laufer, 2007; Halford, 2007). However, fewer works have documented the gendering process when building employees' identities in a period of strategic change. Accordingly, this article aims at examining these links with an answer to two questions: how a change in a company's strategy affects gender identities and the ideal employee model? And what effects will this process have on individuals?

To do this, on the one hand, we used the Ely and Padavic (2007) research agenda, according to which the organisations' structures shape its members' professional gender identities, by creating a model of an ideal employee; on the other hand, on Bellini's work (2010) which shows how the model of the ideal employee becomes the standard to compare, promote or exclude individuals at work.

We decided to work with Transco (a pseudonym), a French bus company, at the time of a major change in its strategy, challenging the masculine culture which historically is the characteristic of the transport sector and particularly the driving occupation.

Our research shows that driver's predominantly male identity was historically formed around the statistical over-representation of men and the masculine portrayal of occupation. Secondly, it stresses that the strategic re-orientation the management set up introduced new expectations for the drivers, requiring mentalities considered to be more feminine, and making women a priority target for recruitment. Finally, our study shows that women's integration and advancement are slowed down by male resistance and the management's hesitation on insisting on new excellence criteria.

IDENTITY, GENDER AND POWER IN THE LABOUR ORGANISATIONS

In social science, the works of Goffman (1963) and Berger (1974) made the concept of "identity" popular. It then became widespread, including in the public sphere (Brubaker and Junqua, 2001). Identity is a practical category in the sense that it is used by individuals to take a close look at themselves and their activities, their common points and their differences with others (Brubaker and Junqua, 2001). It is also an analytic category, used by researchers to understand how individuals make sense of themselves in relation to others. In *gender studies* the concept of identity has enabled to shed lights on the gendered social practices and the construction of the distinction between male and female (Malbois, 2011). In particular, it was used to show that belonging to one gender category was not only dependent on the biological sex but was linked to all the normative elements contained in an individual's affective, cultural and social environment (Goffman, 1977). As Mondada says (1998: 261), the gendered identity is not an "evidence given in principle that would only speak out or emerge, but a categorisation which is achieved in and through social activities".

By adapting this analysis to labour organisations, Ely and Padavic (2007) suggested that building professional gender identities formation occurs in the interplay between two forces. Power operates externally through the organisational structure which contains gender presuppositions and in part shapes their professional and gendered identity. These structures determine both gender roles and professional roles, in other words, socially shared expectations on the attitudes and individual characteristics of each gender and each professional category (Eagly and Karau, 2002). In addition, the masculine role personified by most men coincides with the most valued professional roles, such as leadership and management. The support and assistance roles, less valued and less well paid, on the other hand, are presumed to be more suitable to women. In this way, the gender identity is doubly interwoven with the notion of power. On the first level, for

each gender, the normative environment determines the viable and suitable gender identity associated with it. On the second level, the gender itself is a power relationship since it separates and creates gender hierarchies in favour of men and masculinity and since it produces minimised and stigmatised identities (Bereni, 2012). Nevertheless, Ely and Padavic (2007) explain that professional gender roles may sometimes run counter to the gendered roles in society disrupting the binary gender system. Furthermore, the identities are not entirely shaped by pressure from the environment. They also result from choices made by individuals, who can decide, more or less consciously, to conform or to resist against the organisational gendered standards and rules. This "internal power" enables them to re-interpret and change the model of the ideal employee, the gendered social rules and even the significance of the sex categories.

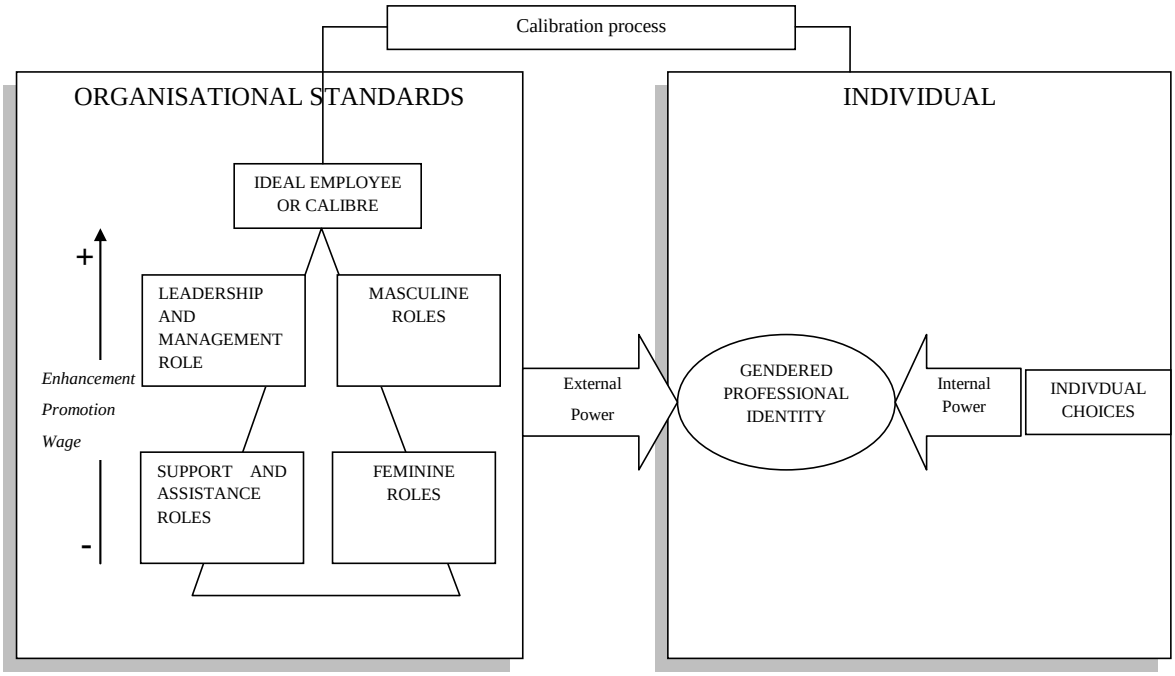
Ely and Padavic's work (2007) may be usefully supplements by the calibration theory of Bellini (2010). The calibration is an implicit mechanism of comparison between an individual and the model of the ideal employee called, in its work, the "calibre" at the time of deciding to recruit, to train, to promote or to exclude him/her from the organisation. If this individual comes close to the calibre used as a benchmark, he/she will be valued; otherwise he/she will be discarded on the grounds that he/she does not meet the legitimate and rational requirements of the working world (Bellini, 2010).

The calibration process generates stereotypes both in the group of employees close to the standard and on the others: some will be presumed to hold naturally the characteristics required for labour organisations to work; others will be considered as less suitable. The calibration also leads to focusing the analysis on individuals and neglects the relation between the individuals and the organisation. For example, men are generally seen as having the qualities of the ideal manager while femininity associated with women is viewed as less congruent with managerial position and women are thought to be less interested in those holding positions. But the organisation context in which men and women evolve is under-estimated in this analysis. Companies' role in organising working hours or career paths is neglected, as well as the lack of work-family supports. The

calibration process also implies that certain criteria are over-estimated in the explanation of the professional social phenomena. Bellini (2010) takes the example of the age criterion systematically used as the main variable for explaining professional burn-out or resistance to change. Similarly, the sex criterion is often brought up to understand phenomena as complex as forms of management and leadership or decision-making. This gives the illusion that men and women are two different groups and respectively uniform. Finally, as Bellini (2010) emphasises, calibration is a self-feeding process. Similarly to a self-fulfilling prophesy, individuals accept the stereotypes provided to build their professional identity and act as expected of them.

We are now proposing to study the case of Transco, using the two theoretical frameworks we set out on the building of gendered professional identities and the model of the ideal employee.

Research in chart form



METHODOLOGY

Introduction to the company

Transco is a subsidiary of an international bus company. The holding has a proactive policy of feminization and professional equality, certified by a *Label Egalité* [1] since 2010. Its objective is to implement the certification process in the subsidiaries including Transco. Transco employs 656 employees, of which 492 are drivers. Less than 20% of the drivers are women and 6.67% are group management staff, responsible for supervising the drivers. The occupation of driver consists in doing regular rounds in the city and nearby suburbs to take passengers from one stop to another. At Transco, from time to time, on a voluntary basis, drivers may also supervise new recruits as a tutor for one week or alternate their duty periods several half-days per month with assignments to check tickets or to intervene and settle disputes (AIR – intervention and settlement officer).

The aim of our intervention in the company was to provide support for drawing up, then negotiating an equality agreement. Transco had not yet specifically dealt with the subject of male-female equality before our intervention even though recently it had been leaning towards including women among its drivers, as we will see later.

Qualitative methodology

The information used in this contribution was part of the work for a thesis on the integration of women in a male-oriented company with a comparison between the levels of commitment in the subsidiaries and the end results. They were collected by means of a series of 21 interviews, including 20 drivers and 1 group supervisor, 12 women and 9 men. The interviews were all held in the same room, which allowed the discussion to be kept confidential. A broad interview guide was used during the series of interviews and was made up of three topics:

1. Daily life and the characteristics of the occupation of driver: tasks, current assignment, how the working day is organised, the organisation's expectations, how bonuses work, internal services and competitions.

2. Changes in the company concerning the external environment, the internal atmosphere, the rules, working tempo and the arrival of women into driving.

3. Relations between men and women in the company.

Our interviews were conducted during a turbulent period when the contract was being renewed and roadworks were slowing up the traffic on the network. This context had a marginal influence on the drivers' answers. Our arrival also inevitably disrupted the organisation. However, we took care to minimise these effects and we think another researcher would have indeed obtained the same results.

Notes were taken during the interviews and they were recorded. Significant facts provided by the interviewees were transcribed word for word and two additional analysis were made on them (Gavard-Perret and Helme-Guizon, 2012): the vertical analysis enabled us to realise the individual logic in the development of the interviewee's professional identity then a horizontal analysis made it easier to pinpoint common elements among the interviewees to understand the regularities in the identity of the occupation of driver. Our information was supplemented by a research journal containing field notes capturing comments made during the presentation of the results to the management committee, then to the health and safety committee, as well as off-the-record comments and ad hoc conversations during lunches or meetings. We also had access to the company's comparison situation report and to the drivers' job description sheets and those of the group managers.

RESULTS

1. Bus driver, a male occupation

The term "male occupation" is commonly used to describe an activity socially built as masculine or being more suitable for men (Zolesio, 2009). This construction is based on a statistical record of men's over-representation in an occupation and a historic record of women's exclusion (Zolesio, 2009). It also stems from a more subjective portrayal consisting in considering that the attributes and qualities required for such an occupation are naturally held by men. Such is the case with the occupation of bus driver (Scheller, 2009).

1.1. Men's over-representation in the occupation

Historically, in the majority of cases, the occupation of driver was carried on by men. According to the national transport council, 97% of drivers were men in 1983, taking all types of transport into account (Blatter, 2002). Twelve years afterwards, in 1998, more than 9 drivers out of 10 were men. In urban passenger transport, less than 10% of the workforce were women in the 1990s (CTUE, 2004). Despite the slow integration of women into transport companies, the occupation of driver today is still mostly carried on by men. In Transco, less than 20% of the drivers are women and this proportion has not increased since 2008. This gendered distribution of the workforce creates expectations on individuals' preferences depending on their gender (Eagly and Karau, 2002). Men's numerical superiority in the occupation of driver gives the impression that men are more interested in and have a greater ability than women for driving.

> *"There are occupations that attract men more than women […] I do not see myself as a secretary, on the other hand it doesn't bother me to drive."*
> *Philippe, driver-conductor and AIR*

For a long time, Transco reinforced men's over-representation in driving: for convenience, it targeted male candidates from the army, either after their military service, or when reconverting after a military career because they already had a passenger transport driving licence. This was the case of several drivers interviewed.

> *"I was lucky to get all my licences in the army. […] So, initially, I was ready for an army career but I decided to leave and I found myself a civilian […] and of course as I had all the licences, I looked for a job in transport."*
> *Guy, driver and ticket inspector*

The arrival of the first women into this world over-represented by men was very difficult and was seen as an intrusion. To become integrated, the pioneering women drivers tried to "neutralise their femininity", according to Laufer' expression (1982).

> *"When I arrived, there were a lot of older drivers and, yes, the male/female sector was well established because, there, there were remarks such as 'women have no place here'[…] And I kept quiet so that I would not be overwhelmed. One must be serious, one must have charisma all the same to say 'you're not going to give me trouble otherwise I'll give it up'. And afterwards, it's true that nobody gave me any trouble but I wear a mask all the same, immediately. […] I've managed to break into it; they're a bit afraid of me. But there, I was forced to do that to make them accept me."*
> *Sylvie, driver*

1.2. The harsh working conditions at the core of the male portrayal of the occupation

The occupation of bus driver historically required characteristics that were socially seen as masculine: physical strength, coping with flexible working hours and acceptance of the risk of attack.

The need to be physically strong stems directly from the size and the bulk of buses difficult to manoeuvre. As in other physical occupations (in the building trade for instance), strength has become an ability rooted in employees' identity and body (Gallioz, 2009). The "female" social

category, on the other hand, is historically and socially seen as weaker (Gallioz, 2009). As a result, for a long time women were kept out of driving on the physical strength criterion.

> *"The large steering wheel with the driver behind it is still the image, for me it's a man's job. It is true that when we women are together or even with men, we admit that it's a man's job, that's clear."*
> *Aurore, driver*

Passengers and road users contributed to reinforcing this association of men and driving large vehicles also had an influence on developing the occupation of driver as being more suitable for men. Women drivers also told us of passengers' comments, surprised to see women at the wheel of the bus.

> *"In the buses, you are a woman, you are young, so, customers are surprised because it's more a man's world. Car drivers also look at you a lot because you are at the wheel of an 18-metres bus and you are young."*
> *Virginie, group leader, former driver*

The occupation of driver is also characterised by the difficulty of the working hours (Scheller, 2009). Drivers work over wide-ranging times and their shifts change from one week to another. All drivers, regardless of their age and seniority in the company, are subject to these atypical working shifts. At Transco, drivers can work during the day or night, for 5 days or 4 days. But regardless of their choice, their working hours are always variable and flexible. This system has an effect on their physiological equilibrium and compels them to adapt their private life to their job (Scheller, 2010). Historically, this working pattern was a constitutive reference in the occupation incorporated into their identity (Scheller, 1996). The difficulty in the working hours makes a distinction between those who can withstand it and the others, pushing out the women suspected of not being able to keep to the pace due to their family and domestic obligations. The older drivers have maintained this argument.

"The women come in and after a while they don't want to drive anymore because it is too hard for them. At the beginning, the company shortened their shifts. And then it proposed them to go into the offices."
Marie-Céline, driver and AIR

Finally, the drivers have always had to endure the risk of being attacked and manage incident occurring during their tour of duty. These incidents may be more or less violent. They include decompressing the doors, getting in without a ticket, theft, getting in drunk, damaging the vehicle, threats, verbal attacks, spitting or again throwing objects. The risk of conflict creates a stressful and potentially dangerous working environment. Working areas recognised as such have been more or less taken over by the men, who see in them an opportunity of making themselves seem virile and infallible (Ely and Meyerson, 2006).

"I have never been attacked. I have been shouted at sometimes but that's all. […] But now, it passes over me, or I say it to myself. I'm growing old. When I was 23, it was not the same, I was more hot-headed then but now, I don't have the physique anymore."
Philippe, driver and AIR

Projecting the occupation of bus driver as a masculine role makes it more difficult to insert women into this occupation. Women can see a threat to their gendered identity there as the definition of the qualities required by the occupation contradict the traditional "femininity" markers (Cayado et Almudever, 2011). Furthermore, the older women drivers have often adopted masculine attitudes, language and behaviour to fit into the working group.

2. A strategic turnaround which is forced on the employees

2.1. The company's strategic turnaround

Transco is developing in a strongly competitive context in which the profit margins are low in comparison to the contractual risks taken with the transport organising authority (Allain, 2007).

Furthermore, it has to prove to its institutional customer that, in addition to its technical know-how, it is a socially and ecologically responsible partner. Moreover, Transco has to meet the needs of its other customers, the passengers, the majority of whom are women. Similarly to other transport companies, in devising its proposals, for a long time Transco had concealed the specific features of female mobility while, on average, women made up two-third of the passengers (Duchène, 2011). For instance, the itineraries were determined in accordance with the population's home/work routes without taking the shops into account, in this way making the women's journeys longer and more complex and constrain non-working women's journeys. Transco is also subject to internal constraints. It has a particularly unbalanced age pyramid with an ageing workforce and great difficulty in recruiting drivers.

To cope with these challenges, the company has initiated a strategic re-orientation. To attract more young people, Transco is increasing its external communications, offering career prospects for drivers and paying high salaries. It is also trying to diversify its recruitments particularly by recruiting more women and by fostering the insertion of people at a distance from work. The company has also set itself the object of increasing security on the network, by tackling the issue of anti-social behaviour on the one hand, and by improving the signage and lighting at bus stops on the other. About five years ago, Transco also created a new position: intervention and settlement officer, whose role is to travel around the network assisting and informing drivers of changes in routes. The official also intervenes when there are incidents on the bus or to calm down a confrontational situation; which provides better security for the drivers and considerably reduces the occupation's hazardous aspect. With regard to its transport service, Transco has increased the number of vehicles in circulation, spread its services over longer times and optimised the runs. The company has also extended its transport mode by adding self-drive car-sharing, bicycles and a tram to the buses. More recently, Transco has started another project aimed at improving relations between the drivers and the passengers, training them to be polite, diplomatic and ready to listen.

This strategic re-orientation gives rise to a new definition of the occupation of driver, the attitudes he needs and the persons targeted for the job.

2.2. Women: new recruitment targets

In feminising the occupation of driver, the management sees opportunities to rapidly implement the stakes in its strategy while responding to its institutional customer's expectations. First of all, women are a large pool of potential candidates to meet its labour needs. Furthermore, recruiting them can be seen as an enhancing action in favour of gender mixing asserting the company's role as a socially responsible actor and as a provider of jobs in its activity area. The management moreover wishes to modernise the company and sees in the gender mix an effective way of overturning the conservatism which characterises the business and the sector (Scheller, 2009). By recruiting more women, it also hopes to improve the quality of service, suggesting that woman naturally have communications and relational skills. Finally, by having more women among the drivers, it intends to cope with the increased insecurity in transport. Women are seen as ‘pacifying elements' according to Gallioz' expression (2009), in the sense that we feel they personify a mediation role in confrontational situations and, by their sole presence, they bring peace wherever they may be.

As Ely and Padavic (2007) or again Bellini (2010) have explained, these stereotypes on women's role, have performance-related effects: they were seized on and internalised by the women drivers in their own affirmation. They often see themselves as nicer than their male colleagues and assert that they have a more flexible and more economical way of driving. Some of them also feel that they are more concerned about passengers' comfort than the men and that they are more skilful at managing conflicts. These portrayals are passed on in reports on the feminisation of public passenger transport and shared by the Transco management, the drivers and the customers.

"Women are gentler, more flexible when they drive, and the customers say so."

Sylvie, driver

"A woman may be needed in the group as she expresses herself more quietly. So she can calm down situations."
Guy, driver and ticket inspector

Women's arrival can also be envisaged because the traditional obstacles to the occupation were removed when the equipment became modern, with power steering in the vehicles, smaller steering wheels and the installation of GPS in the vehicles, which enables drivers to contact the radio control station when they encounter the least difficulty during their tour of duty.

2.3. The role of the new recruits

The women recruited influence the renegotiation of the identity of the occupation of driver. As they do not automatically take the traditional identity, they change the way in which the driver's assignments are carried out, particularly in the interaction with the passengers. Their arrival in the company also led to questions being asked about the strict separation of private and professional spheres and on the organisation of the terminals and rest rooms. Transco particularly had to install toilet facilities and new cloakrooms and took advantage of this to make the duty room more user-friendly.

These changes have a substantial effect on the traditional driver's gender identity and the content of the model of the ideal employee. It is not anymore directly linked to men and masculine characteristics. It requires new abilities, traditionally related to women and femininity, such as courteousness, advice and listening (Nixon, 2009). However, the drivers do not passively accept these changes, which slowed down women's motivation to become integrated and to progress within the company. The management itself does not seem to be ready to insist on the new standard, as will see in the next part of our comments.

3. The difficult internalisation of the new model of ideal employee

The driver's professional identity and the standard to which the employees are compared is in a transitional state: traces of the old model are still to be seen and the new gender directives are struggling to take hold. Two sources were identified through our interviews which explain this situation: the men's resistance and the management's hesitation.

3.1. The men's resistance

Men are resisting changes in the occupation, as they feel threatened by women's arrival into the company. It is not so much the fear of losing their job that leads to these reactions than the fear of seeing the occupation's constitutive references disappear. Consequently, the older ones exaggerate the differences between the new recruits and the traditional workers to reinforce their feeling of belonging. For instance, the tutors, responsible for supporting the new recruits around the network for a few days, tend to stress to the young women what is at stake in their integration into a world of men.

> *"It's true that in a male environment, in addition she is a young and very pretty girl , she was put ... finally she was given a little warning because it's true that as it's a male environment, there are more of us, but she settled in very well."*
> *Roger, driver, AIR and tutor*

Another indication of this incomplete integration is in the drivers' obligatory clothing. Several items in the clothes given each year to the drivers are for men. This reinforces the feeling of strangeness among the women in this environment and goes against organisational expectations, which make the physical appearance one of the major characteristics in the job.

> *"Ah it would be interesting […] that the clothes we are given, some should all the same be women's sizes, as I have the impression that we are taken as men when we are dressed. And*

I have several colleagues who agree with me. […] The bomber jackets are men's models, and even if we are sized XS, they are still too big."
Lucie, driver

The women also tend to be considered as second-class employees: more delicate, less available and less capable of withstanding the working pace and the flexible working hours. They are always suspected of being more frequently absent particularly due to domestic chores which are supposed to be a priority for them.

"Women always have the same problem, seeing that the children are looked after. So we, as men, it's often the women to look after that, but it's more or less everywhere. For instance if you have young children, if you are single and you finish at 10 p.m., what do you do for your kids? It's dead so you don't take the job."
Philippe, driver and AIR

The women must also extricate themselves from the seduction relations into which several of their male colleagues try to put them, with the risk of losing their professional credibility and getting a bad reputation. Their behaviour is closely scrutinised and they have less latitude to interact with their colleagues than the men who can be extrovert, make spicy jokes and have physical interactions.

"As I am a woman, if you start to laugh with everyone, that's bad. If you start to laugh with all the men, oh yes, you are taken for someone quite easy it will be said and as a result it all goes to hell."
Virginie, group leader, former driver

"For me, at work, it's not the skirt, it's the trousers. It's the question of the work, with the customers and colleagues. Like that, there are no insinuations, there are no incitements, it's as clear as that."
Jacqueline, driver

Finally, there seem to be fewer opportunities for women to move up to the status of supervisor. Drivers may be promoted to this level if they succeed in the written examinations then the interviews. The proportion of actual women supervisors is only 6.67% over several years, which means a total of 2 women for 28 men. Several of the women interviewed do not dare to sit for the examination because they are afraid that they will not be capable of supervising the drivers. As Pruvost (2008) observed in the police, height and corpulence are still considered to be major assets for a team manager. Strength of character is also often mentioned as a characteristic required to win the drivers' respect.

> *"There are not a lot of women supervisors because I think that perhaps we hesitate to apply for the job. Personally, I would like it but I feel that I'm not big enough. You must have a heck of authority all the same. You must have quite a strong temperament, must be able to order everyone around like that."*
> *Aurore, driver*

Appointing women to the job of supervisor sounds like challenging the established order. The fact of there being very few of them increases the attention they are given. They must then assert an authority which is not naturally recognised in them without being contrary to the qualities of diplomacy and gentleness that are expected in a woman (Fels, 2004). The potential candidates are tested, destabilised, even intimidated by remarks or jokes (Cayado et Almudever, 2011).

> *"I already have a problem ... at least I have a complex due to my size [1.48m]. It's true that at work they often joke about it because everyone teases me a bit about it but now I laugh about it, there is nothing to worry about, I don't take it seriously, even me because in any case it's better to laugh but they say 'when you are supervisor, we won't be able to see you behind your desk' and it's then that I tell myself 'there, it's impossible' we laugh among colleagues but behind the jokes, I tell myself they are absolutely right. It's not possible, I cannot, I don't see myself."*
> *Aurore, driver*

3.2. The management hesitating to insist on the new standard

For its part, the company's management does not seem to be prepared to insist on the new standard that its strategy has laid down. It is adopting a somewhat passive attitude consistent with waiting until the women themselves apply then adapting to the unchanged organisational structures.

For example, on reading the job description for the group leader, the relational and listening skills seem to be crucial to the first three assignments, namely: 1. Organise the drivers on a daily basis based on the results the company expects and on the occupation's basic elements; 2. Take part in integrating the drivers and contribute to improving their skills; 3. Be ready to listen to the drivers taking their suggestions and requests into account. Nevertheless, this same job description highlights ‘relational and teaching qualities’ as abilities and not as skills. These qualities are also under-valued in favour of more virile aptitudes such as discipline or charisma. The company kept the old criteria on which promotion and performance are based, which does not allow a change in the employees' description of what being a group leader means.

Another organisational area widely dominated by the men is that of ticket inspection, that the volunteer drivers can handle at the same time as the driving tasks. This activity is also open to women but an unwritten professional rule restricts their access to it. In fact, a lone woman, or even a group of women, cannot inspect transport tickets without a man being present. Their autonomy in this assignment is therefore limited. Their presence is appreciated just to calm down confrontations with passengers without tickets. Under these conditions, it is of no interest to open up ticket inspection to women.

> *"Four women, it's enough to come across a big man who doesn't want to hear anything, who doesn't want to pay and who will do anything to get out of it, he will manage to do so or we are able to fight back, which is not the case, therefore one man at least is needed. The men are bigger. But one woman at least is needed who all the same knows how to manage conflicts, who calms things down."*
> *Véronique, driver and ticket inspector*

Finally, women's access to the job of radio controller (PC) seems problematic. In theory, it is open to them, nevertheless there are no women there. When we asked why not, the systematic reply was that the company already let a woman do it but that it was a failure. This negative experience seems to cut off access for all women from now on as if they were a homogeneous group and all identical.

> *"There are no women in radio control room. In the past, there was one in the team. But the, the men took it very badly. With the drivers, all went very well, she expressed herself well. But apparently it was the supervisors who, at the time, took it badly that there was a woman in the radio control room. […] After this experience, it's strange that no woman has been selected."*
> *Jacqueline, driver*

Apart from the management being overcautious about changing the criteria for access to certain jobs, questions arise about the method of tackling anti-social behaviour. Passenger transport companies, such as Transco, can assess the extent of anti-social behaviour by means of the report forms filled in by drivers when they encounter a problem during their round (Bishop et al., 2009). However, the drivers interviewed told us that reporting incidents was exceptional. In general, they prefer to play them down and not to spend time on them. This emotional detachment is a constitutive reference of the occupation, rooted in the drivers' identity (Nixon, 2009; Bishop et al., 2009).

> *"Another time, stones were thrown at me, but I don't see that as an attack, it's nothing. In my opinion, they are not after me. I was just in the wrong place at the wrong time. […] Even if someone insults me, I don't take it as an attack. I don't care."*
> *Philippe, driver and AIR*

Even if the drivers consider it an incident they prefer to manage it themselves rather than to report it. Managing conflicts on their own responds to a need to be in control of themselves and others; a central reference in the masculine hegemonic identity of the operational employees (Ely and

Meyerson, 2006; Bishop et al., 2009; Nixon, 2009). In this way, by managing incidents on the network themselves, even if it means using physical force, the drivers reinforce their feeling of belonging to the "male" social category. Similarly to some of their male colleagues, women stigmatise drivers of both sexes who do not demonstrate courage and responsiveness when attacked.

> *"So it's up to us to stand for ourselves, at night we don't have much choice. […] For instance, there is someone [passenger], I am at war with him. A bit nerve-racking when I go to work at the moment because I say to myself "if I come across him, there'll be problems." And I already warned the supervisors by saying "I'm warning you if I come across him, I don't know what I'll do". Because he is aggressive, he is vulgar, he insults me, he belches in my face."*
> *Josiane, driver on night shift*

It is also rare that incidents are reported as they may disqualify a driver applying for the position of group leader. When a driver applies, his file, which contains his absences, his assessments, passengers' complaints and also reports of incidents, is studied. A large number of reports is seen as a driver's inability to manage confrontational situations on his own and may therefore cast a doubt on his ability to supervise a team of drivers. Which, *in fine*, means that the drivers must manage attacks themselves, at the same time reinforcing the driver's hegemonic masculine identity.

I. CONCLUSION

Transco's development is in a transitional stage. Up to now, the management accepted its image as a masculine company and the bus driver's standard was a reflection of this portrayal: a rather strong and virile man, independent in the exercise of his occupation, tolerating a stressful and

wearing working environment. Transco's strategic re-orientation is bringing about a modification in the standard as what is expected of the bus driver is changing. Even if driving was the driver's main task in the past, today it seems to have been side-lined in favour of customer relations, which becomes the critical and differentiating skill. The management moreover is tending to recruit people with profiles more in line with this new approach to the occupation. On the other hand, it has not yet changed its management rules, its organisational structures and its performance criteria to align them with its strategy and to establish the new standard. It seems that it recognises attractive qualities in women to implement its new strategy but it is not ready to entrust them with more responsibility. These two attitudes may have one and the same motive: the still very stereotyped view that the management has of women and the occupation.

We have identified several limits in this study. Firstly, it is based on a unique case, making it difficult to generalise the results obtained. However, we endeavoured to show how our results are similar to other studies carried out in passenger transport companies in France (Scheller, 1996, 2009, 2010) and abroad (Bishop et al., 2009) or in other professional contexts (Ely and Meyerson, 2006; Pruvost, 2008). Secondly, we excluded from our analysis the concept of *critical mass,* according to which a certain number of women taking on a masculine occupation can tip over the masculine organisational culture (Lepinard, 2007). This threshold is often set at 30% (Igalens and Sahraoui, 2010). In Transco, less than 20% of the drivers are women. In theory, we were not able to observe substantial changes connected solely with women's arrival. It would be interesting in a later study to compare Transco with a company in the same Group but in which 30% or more of the drivers were women. Finally, after our study, we were able to highlight many human and financial costs related to the process of identity building, particularly the fact that the company is not attractive to women, that the specificities of female mobility are concealed, that attacks and incidents are not reported, and the costs related to aggressive driving. We feel that exploring this avenue in terms of costs and benefits in the gender aspect of the culture and professional identities could be profitable.

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1 The *Label Egalité* was instituted in France in March 2004. It is a tool for setting up practical methods to encourage professional equality in organisations and to lead an equality policy. It is granted by AFNOR – Association Française de Normalisation (*the French Standardisation Agency)* – after the application for equality certification has been examined and an opinion given by the certification committee, made up of the social partners and State representatives. Once certification has been granted, the certified company or body ensures that the methods stipulated in the terms of reference are implemented, terms of reference which include eight mandatory criteria and ten optional ones, structured around three fields: culture, HRM (Human Resources Management) and the concept of parenthood.

Progress or failure:
The quest for gender mainstreaming in transportation policies

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This article examinesthe gendered order ofurban mobility.Today's cities are growing and consequently, the length and numbers of urban travels are increasing.The character of transportation is a barrier impeding on access and mobility for women and low-income men. After an overview of conditions for women's mobility in cities and some examples from Asian cities, a couple of policy initiatives are presented and discussed; 'Gender and Development', the UN supported sustainable transport and initiatives by the Development Banks. The shortcoming of gender mainstreaming has important implications for the quality of life of women as well as for societal development. Time has come for policy-makers to take a more equitable approach to transport planning in line with the ambition of sustainable transport.The failure of gender mainstreaming of transport policies is explored by means of a 'gender and development' approach and, finally, discussed in terms of empowerment and agency.

Gender and Development, Mobility, Cities, Transportation, Policy, Development Banks, Women, the UN, Sustainable Transport, Empowerment

I. INTRODUCTION

A growing number of urban families are dependent on the earnings of female breadwinners. Urbanisation is often associated with greater mobility for women. “Yet, most urban women experience profound disadvantages compared to men in their daily life” (Tacoli and Satterthwaite 2013:3). Increasingly, women work far from home and spend considerable time in public space using various means of transport; riding buses and trains, walking and bicycling. Transport facilities are a prerequisite of city development and modernisation since they facilitate access for businesses and trade to all kinds of societal resources, and are also a prerequisite for increased mobility for women. It is this very sector that makes possible the gains in trade, the economies of scale and specialisation that are at the core of increasing productivity and economic growth. To meet today’s demands for continued growth, the systems of transport have undergone a dramatic process of modernisation and huge investments have been---and still are being---made to increase transport efficiency and support further economic growth associated with trade, mobility, and social development. This is partly done by promoting patterns of spatial and regional specialisation in urban areas, which in turn require extended personal travel increasing the number, length and time spent on journeys.

Infrastructural improvements, road extensions, and so on connect market actors and facilitate economic growth, as seen in a number of emerging economies and in businesses. The time has come to reduce poverty and increase the incomes of single households and women by improving access and conditions for personal travel in cities. However, we know that transport policies become gendered through multiple mechanisms related to women’s legal status, position in the labour market, and participation in decision-making (Thynell, Tran and Schlyter 2010).Conditions for women in cities vary and how they “juggle domestic responsibilities, marital relationships and paid work” imply varying levels of constraints (Tacoli and Satterthwaite 2013:6).

This article discusses ‘women in development’ and ‘gender and development’ from the perspective of urban transport and some related international policies.[1]These two strands have explored and debated ways to improve gender injustices. One important concept is empowerment which is presented below. The on-going and developments in the area of urban transport present a range of new possibilities to improve the access, mobility,[2] and well-being of females while promoting cleaner air and safer journeys, and meeting transport needs equally. Historically, gender aspects or women’s transport needs have not been seriously considered in the sector of transport but perhaps a window of opportunity has been opened and making it possible for policies based on the travel needs of women to be implemented?

At the same time, wealth in urban areas is to a large extent created by the low-income families (Sassen 2006). International organisations have therefore proposed that urban

renewal and poverty reduction programs shall also influence the objectives in the sector of transportation to meet the increasing challenges in urban mobility.[3]

A brief look at women's experiences and gender aspects of transport makes evident the policy failure of gender mainstreaming in the sector of transportation. This article explores possibilities of gender mainstreaming in urban transport policies by means of a 'gender and development' approach. Streets are a public arena for mobility and access to resources and street life mirrorspolicy, planning, economic and social trends. How is public space in streets being used and planned for, and by whom? After a brief review of some Asian cities,a couple of discourses and policies on access and mobility are presented. For some reasons, studies of access and mobility for women and gender equality in transport are still largely missing.[4]

Issues and Aim

Transport relations are complex social phenomena that are embedded in political, economic and structures. Trivial understandings of women's social undertakings that do not reflect the complexity of travel patterns will not bring about policies, or new practices that benefit women's access or mobility.

The purpose of this article is to explore the conditions of women in traffic and transportation by means ofexamples from Asian cities together withWorld Bank initiatives and UN recommendations. The perspectives in Gender and Development, GAD,are also brought in along with the concepts of empowerment and agency,to stress some political declarations that recognise the need for comprehensive policies in traffic and transportation. The concept of sustainable transportation is also introduced and discussed.

The problems associated with emerging economies and growing mobility demands are overwhelming or even insurmountable.[5]Hazardous urban growth has put enormous pressure on cities' infrastructure to accommodate greater numbers of people and meet their basic demand for access and mobility, leading to a dramatic intensification of transport-related problems. National and regional transportation policies vary widely, but, in general they stress the role of transportationin economic development, as illustrated by the policies in China and Vietnam.[6] So far, the conditions access and mobility for the majority of the population and, in particular, for women, in Asian cities have not improved, and such neglect hinders a solid societal development.

Due to a number of uncertainties such as fuel shortages, raise of fuel prices and environmental hazards with detrimental consequences for modern transportation are changing. At the same time, changing costs together with increasing pressure on urban access and mobility are creating opportunities for new forms of initiatives in city and transportation planning. During the last decades the notion of sustainable

transportationhas been guiding a somewhat more progressive discourse and new planning models in the sector of transportation.

Women and transportation policies

The research field of women in developing countries emerged decades ago and strategies to improve conditions for women have been outlined in several sectors. The concept of equity[7] or social justice lies at the heart of several policies and is a vital part of increasing social sustainability, with its call for social and gender issues to be accounted for in urban transportation planning. Such perspectives can be further developed by means of case studies and by applying notions such as empowerment/disempowerment; strategic life choices; resource management; agency; environmental fairness; gender equality; gender mainstreaming in policy; and so on. In research there are several strands of research such as 'Women in Development'[8] and 'Gender and Development'[9]that are apt to explore relevant topics. Gender and social equity is a central aspect of sustainable development and, in sustainable transportation.[10]

The normative tradition in the interlinked area of urban research dates back to *e.g.* Henri Lefebvre (1982, org. 1967) and David Harvey (1973). The latter, in his book *Social justice and the city*, claimed that the principle of justice has profound relevance for urban development and for the link between spatial form and social processes. In this linkage, transportation plays a vital part by removing barriers to accessing various resources, such as spatial distance.

Equality involves ensuring that the perceptions, interests, needs, and priorities of women and men (which can be very different because of their differing roles and responsibilities) be given equal weight in planning and decision-making (Sida 2005). The introduction of policies focusing on equality includes a qualitative as well as a quantitative aspect of the distribution of infrastructural facilities. The equality dimension is seen as a guarantee of increasing sustainability in transportation, as further discussed below. Finally, references to the body of knowledge of 'Women in Development' are numerous and include Women's Empowerment Framework, Longwe 1990; Undoing internationalized oppression, Rowlands 1997; Ability to make choices, Kabeer 1999; Eyben 2004; Cornwall 2004. The early studies were later on further explored and replaced [11]by 'Gender and Development'.

Gendered travelling: attitudes and behaviour

Notably, the prevailing cultural values sometimes improve or further aggravate women and men's options for transportation.12 Gender differences in travel behaviour are often related to the kind of work a person takes on (Hanson 1996) which sets the agenda for travel distance, means of transportation, journey purpose, and the extent to which several trips are linked together. The caring and reproductive activities related to household management, childcare, care for the elderly or physically disabled, or working

in thelabour market, are often carried out in the informal sector or through part-time jobs.[13]Although women's travel patterns differ from those of men, the demands of women have often been neglected or overseen in transportation planning and design, limiting or excluding women's access to education, work, recreation, and social activities.

Earlier research has identified differences in men's and women's *attitudes* to travel as well as in their travel behaviour. The travel behaviour reflects men's and women's gendered lives and social roles, such as differing household responsibilities, position in the labour market (geographical and hierarchical), and access to vehicles (Law, 1999; Rømer Christensen et al, 2007; RES 2005--2006, 2007, Rosenbloom, 2004). Some studies have also targeted the differences between men's and women's attitudes to travel in relation to environment concerns (Polk, 2003, 2004;Matthies et al, 2002; Thynell, Tran and Schlyter 2010). Research has also shown that variables such as gender and employment status that describe a person's role within the household have a greater impact on individuals' travel than do measures of social status (such as occupation or income) (Hanson 1996: 185--186).

Men and women usually have different shares of household transportation burdens and accordingly have different travel and transportation needs. Women often suffer from limited access to available means of transportation.Lack of road andfare integration leads to higher transportation costs and often deters women and girls from making a journey. A woman usually makes more and shorter travels having more diverse destinations and modal splits than men that tend to commute more than women do. Female also travels for other purposes and at off-peak hours than men do and, primarily women's mobility patterns have an impact on their household unit as well as their neighbourhoods and ultimately countries a whole.To a large extent women's engagement in improving living conditions beyond their home in the neighbourhood are seen as extension of the home duties, "especially since domestic chores depend heavily on neighbourhood conditions" (Tacoli and Satterthwaite 2013:3).

As for women's transportation needs, accessibility is crucial to allow women to cope with a mixed agenda as well as keep up with their social networks. Poor women are especially dependent on their social networks to be able to provide for their children. In this context, travel is a critical issue and costs of journeys may impede their capacity to cope with daily life through networking. Therefore women's reproductive duties and economic and/or other social considerations cause their travel destinations and times to differ from those of most men. At the same time, economically active women might travel to the same destinations as men, but unsafe roads are often a strong deterrent for access. For instance in Dhaka, Bangladesh, 25 per cent of the people in the streets are women.[14]

In general most women state that roads do not meet their needs whereas men find them adequate (World Bank 2010). Transportation increases access for men to employment, market and education whereas women gain indirect benefits through lower costs for wood, water and goods through suitable transportation. Women also state that they gain

time for education, access to health and freer time for productive activities by means of transportation. But, females 'do not have technical skills' and are therefore seen as inferior to men (ibid).

Besides women are poorer than men and females often do-not-use motorized means-and consequently suffer more from spatial constraints (ibid). For example, women prefer to work closer to home than men do, even at the expense of better work or earnings. Women might walk instead of taking a bus to save money. The use of transportation by low-income persons and the urban poor is mainly shaped by their income, location, and activities. For instance, some patterns can be discerned in their travel behaviour according to their occupations, and it is known that the majority of them work at times in semi-skilled and unskilled jobs in the informal sector,[15] and live in city slums usually located in the city centre, or in peri-urban or remote areas. Because of their *modus vivendi*, the low-income families are more exposed to the risks associated with hectic traffic such as injuries, fatalities, harmful noise levels, and polluting emissions. When travelling or walking marginalised families in most cities are facing structural discrimination.

2. URBAN GROWTH AND TRAVEL CONDITIONS

Asian cities are growing rapidly, with a recorded population of 3.9 billion in 2005, which is 42 per cent greater than in 1980.[16]Asia's urban population is 1.7 billion and is expected to reach 2.8 billion by 2030. An increasing number of the inhabitants are poor, and more than 240 million urban dwellers subsist on less than one dollar per day in Asia. On-going urbanisation is desired and seen as attractive, but it is not planned for and, cities do not provide proper housing or relevant transportation facilities for their new residents. In this section some examples from urban Asia will be used to stress changes in cities.

An ever-increasing amount of the global population lives in urban areas.[17] A study by UN-Habitat estimates that during the next twenty years, 95 per cent of the world's urban growth will be absorbed by cities of the developing world.[18]In Asia it is estimated that half of the population will be living in cities by 2020 and that half of them will be poor people living in slums or squatter settlements.[19,20]Besides, urbanisation include fragmented social relations and erode support for the most vulnerable persons (Tacoli and Satterthwaite 2013:5). Today, roughly two thirds of all poor people live in Asia. Trends for urban poverty are not optimistic and in 2020, 700 million people might be living in cities and public transportation needed to access places and resources will be an even more critical issue.

Notwithstanding their enormous disparities---historical, economic, sociological, political, and cultural---the problem of worsening transportation conditions has become a generic feature of Asian developing-world cities.[21] By and large this is reflected in poor public transportation availability and service, staggering congestion levels at peak hours, alarmingly high rates of road accidents causing injuries and deaths, and critical traffic-

related perils such as air pollution, noise, and long-term impacts on the environment. Cities like Jakarta, Hanoi, Delhi, Mumbai, Metro Manila, Bangkok, Kuala Lumpur, and Beijing all exemplify this to various degrees, and share some common conditions summarised as follows:[22]

- Growing cities mean longer distances and more time spent travelling. In many places transportation infrastructure is decaying or non-existent.
- There are serious shortages of infrastructure. For example, road provision is only 6 per cent in Calcutta,[23] Xian Hanoi.[24]
- Existing roads can be extremely congested; badly maintained; lack of drainage, proper signalisation; adequate width; and contain a hazardous mix of traffic types.
- Bicycles play a pivotal role in Asia, along with other traditional non-motorised vehicles (NMVs) and motorcycles, which are also used to transportation goods.
- Budgets are severely restricted for investing in construction and maintenance of 'soft' modes of transportation, for instance footpaths, bus stops, and streetlights.
- A large proportion of women are dependent on public transportation which often is inadequate, overcrowded, inefficient, uncomfortable, dirty, smelly, unreliable, poorly maintained, and sometimes also dangerous.
- Rates of traffic-generated air pollution and noise are soaring.
- There is a high rate of traffic injuries and fatalities, the majority of which involve unprotected road-users: pedestrians, drivers of NMVs, or motorcyclists.

Traffic management is often precarious or virtually non-existent, with few cities making significant progress in this area. Enforcement of existing laws is largely neglected.

In countries like Cambodia, Bangladesh, the Philippines, and Mongolia, where about 40% of the population subsist below the poverty line [25] poor and women also suffer disproportionately from the negative social effects of inefficient and chaotic transportation systems, such as physical constraints to reach places of work, education, health care, and other essential services, and a high risk of pollution-related diseases and injuries.

Due to the social changes caused by urbanisation, women's demand for work-related commuting is predicted to increase considerably. In absolute numbers, womenworking outside of their home have been steadily rising in Asia and are expected to continue doing so.However, according to the same statistics the share of women in the labour force has not been increasing in all countries, since in many places women will continue to perform traditional or informal activities. These two kinds of basic activities sometimes comprise separate occupations, but may very well be intertwined and not taken into account in the planning process.

In some cities, men and women are physically separated in public transportation. These sex-segregated services began more than a hundred years ago on commuter trains in the US and, are nowadays, found during rush hour on trains and buses in busy many cities;

Mexico City, Tokyo, Tehran, and Dhaka. The so-called lady solution, or 'pink service' is based on the physical characteristics of women and not defined according to the social activities of women and their daily needs. The 'Pink Solution' is an example of the neglect of gender inequality as a relational issue, and as a matter of structural inequality, which needs addressing. Some car manufacturers, like AB Volvo, have launched car models designed for women the 'pink cars'. At the end of the day, the 'pink solution' applied in public transportation or taxis solves some acute problems of harassments but it is an anti-equity solution and, in the long run they exclude women from influencing issues of transportation because problem are already solved. Such initiatives have been debated in Women and Development studies and later on dismissed as stand-alone initiatives locking-in problems since they do not consider structures and relations. The Pink solution might stigmatize female travel and exclude the travel conditions of women in planning and design of systems of transportation.

3. SOME OTHER PROBLEMS IN THE STREET SPACE

Currently, difficulties with mobility and accessibility are present in all cities despite their unique socio-cultural features. "For a very large number of women in urban areas the constant threats, from verbal harassment to outright violence whenever they leave the home are an unwelcome reality" (Tacoli and Satterthwaite 2013:5). Some women spend their time directly exposed to traffic because they make their living on the streets, as sales persons, cooking, in road construction or cleaning the streets.Furthermore, vulnerability is aggravated due to lack of proper nutrition, health-related preventive measures, or lack of access to health care. Some common experiences of women who commute daily are:

- Long travelling distances and spending long hours on the road,
- Mixes of various travelling modes including animals in the street space,
- Shortage of walking space for pedestrians (no footpaths, crosswalks, signalisation) and vehicles parked on footpaths,
- Irregular and unreliable bus service. Sometimes overcrowded and at other times recklessly competing for passengers,
- No traffic priorities (lanes for buses, separation for NMVs or pedestrians),
- Bus stops without proper signalisation or protection (roofs) from the weather,
- Routes not being synchronised and network not fitting the re-location of activities,
- Being exposed to humiliation and sexual harassment on buses, from pedestrians, bicyclists and motorcycles,
- Security issues: drug dealers, pickpockets, and purse-snatchers,
- Excessive levels of noise and pollution.

The overall finding is that most transportation policies are gender-blind and lack a public-service component to meet the transportation demand of low-income women and men. Many of the risks that women experience in rapidly changing cities have been alleviated in cities where policies and budgets are effective.

Public Transportation: the women's perspective

The basic role of transportation is to provide access some kind of resource. Public transportation is a key part of any sustainable transportation policy because of its positive social and environmental aspects linking to low-carbon transportation and recommendations on sustainable transportation. Some of the basic parameters proposed for guiding policies for public transportation can be summarised in the five A's: Affordability, Availability, Acceptability, Accessibility[26] and Appropriateness, described as follows:[27]

Affordability deals with the financial burden that transportation costs inflict on passengers, especially the disadvantaged.[28] Paying a visit to sick relatives needs to be feasible also for economically marginalised inhabitants as well as travel to work or school.[29,30]

Availability comprises the alternatives, timing, and frequency of routes,[31] which may aid or inhibit people's ability to reach essential activities. One of the characteristics of poverty is 'poverty of access'. For instance unreliable, dangerous, overcrowded, and time-consuming routes and vehicles restrict access.

Acceptability refers to the overall conditions of public transportation and whether it meets the basic expectations of a wide range of passengers including women. Poor transportation facilities contribute to stigmatising the means of travel of poor persons (Barter 1998).

Accessibility refers to the ease of use of public transportation. For example, buses with high steps can be burdensome for women. Reaching distant bus stops, as must be done by most people living in the suburbs, can be strenuous for women because of their physical conditions or dangerous roads and uncertainties.

Appropriateness concerns the entire design of transportation infrastructure and policies. So far systems of transportationreflect a male view on appropriate transportation technology and travel behaviour. Men are usually represented as travellers, and both policy and research focus on men's travel patterns and interests. Until now,male behaviours and values associated with male identity have been the guiding concepts of transportation.

The conclusion is that transportation conditions become another barrier for low-income households and women in particular, and the gendered order excludesthem from resources.

Appropriate or Reasonable conditions vary in relation to local context and cultures, but some aspects of travel are crucial for the so called 'captive riders' without alternative means of travelling:

- **Reliability:**Transportation services should be predictable according to a timetable or other available information. Users should be informed when services change.
- **Safety:** Traffic safety has to be assured. Passengers should not be exposed to dangers on public transportation. The walk to the station and the time spent waiting there should also be made safe.
- **Security:** Passengers should not be exposed to theft, harassment of any kind, or disparaging comments that cause uneasiness or discourage passengers from travelling by public transportation.
- **Health:** The health of passengers and other road users or persons living alongside the tracks or streets should not be jeopardised. Air pollution, dust, noise, and so on are to be controlled by authorities.
- **Information** about bus lines, fares, routes, timetables, and ownership of the transportation system, and the conditions for children, the elderly, and the disabled should be easy to locate in the passengers' language. They need to know where to look for information and possible changes of operations.
- **Public involvement:** The general public, including passengers, should have effective means to influence the planning and operation of public transportation. There should be a way to leave messages or otherwise contact public transportation authorities. Personnel are needed to attend to passengers, answer questions, and work with public relations.
- **Time saving:** Time should be saved, not lost, by using the service.
- **Economic benefit:** Public transportation should provide access to various resources, sources of income, or similar benefits. Public transportation should serve the places of economic significance (Thynell, Punte and Arora 2009b).

Even if a bus stop is at an acceptable distance,[32] it might be inaccessible due to dangerous streets. Accessibility could be considered low also if the bus stop offers no seats or shelter whatsoever, especially in adverse weather conditions. As seen above, improving accessibility is related to the overall transportation environment, but it often begins with the public transportation facilities themselves.

In the following part some international discourses and policies are scrutinized.

4.POLICY FRAMEWORK

This section focus on discourses and policies in three areas: research, funding banks and international organisations.

I. **'Women in Development' and, 'Gender and Development'**
II. **Development Bank policies**
III. **The UN, the notion of sustainable transportation and the Bali Declaration**

I. 'Women in Development', and, 'Gender and Development'

In 1995, at the UN Conference on Women in Beijing, President Zemin stated that: "Attaching great importance to the development and advancement of women, we in China have made gender equality a basic state policy in promoting social development.We are resolutely against any form of discrimination against women and have taken steps to maintain and protect the equal status and rights of women in the country's political, economic and social life" (Du and Kurz 2003).

A core idea in studies of 'Women in Development' was how to conceptualise the nature of the problem as well as the measures required to achievea real transformation in the lives/position of womenrelative to men. With this in mind measures were taken to integrate 'Women indevelopment' though targeted projects or separate components such as the stand-alone initiatives which ignored the cultural, political, economic and social relations that shape women's lives and their well-being.Later on the 'Gender and Development, policy framework emerged and the visions, needs and interestsof women and men (Moser, Kabeer and others scholars). The new theme was summarized as "A gender and development approach that recognises gender inequality as a relational issue, and as a matter of structural inequality which needs addressing directly and not only by women, but by development institutions, governments and wider society"(Chant and Sweetman 2012: 518).

The 'Gender and Development', GAD, had an agenda to transform unequal gender relations through the empowerment of both women and men by enabling them to question cultural values, practices and structures. This meant that "focus was not centred on women, but on the social, political and economicrelations as well as the structures and processes that create, reinforce and sustaininequality on one hand and result in different outcomes for both women and men onthe other" (AfDB 2001:x).Furthermore "[I]t seeks to take account of the link between culture and development in particular the cultural-specific forms of social inequality" (AfDB 2001:ii).

The underlying assumption of the GAD approach is that women as well as men may be privileged or disadvantaged by social and economic structures. In this context a better

understanding of women's as well as men's perceptions, position and scope for changing gender relations is seen as indispensable. In this perspective the fundamentally social nature of gender differences are stressed and the concept of "gender mainstreaming" is a tool for analyzing the relationship between women and men in access to urban mobility.

However, despite the protection that the Chinese legislation offers to women, there are gaps between the law and its implementation and enforcement (Du and Kurz 2003). The position of the Chinese government represents one of several viewpoints.Chant and Sweetman stressed that inequality is a relational issue and the equal rights of all women and girls - regardlessof age, or the extent of nature of their economic contribution will have to be addressed. "Gender and development should also involve the inclusion of other social actors vital in supporting the empowerment of women - including, most importantly, men and boys" (2012:527).The Gender and Development approach recognises that improvement in women's position requires analysis of the relations between women and men across a number of dimensions. It underscores the need to understand the ways in which the unequal gender relations may contribute to the extent and forms of exclusion that women face in the development process. By means of gender analysis and information about needs, priorities, opportunities, constraints well-informed policies that provide equal opportunities for women and men can be formulated. The main objective of the mainstreaming approach is, therefore, to bring gender issues centre stage in policy making, resource allocation, institutional structures and in decision making about development goals and objectives. Under this approach, the participation, commitment and co-operation of men are seen as critical in transforming gender relations.

According to scholars of International Relations, the achievements at the Beijing conference were later marginalised and excluded from the development agenda with the introduction of MDGs (Eyben 2004). Another explanation for the marginalisation of gender mainstreaming was offered by the shift of political attention due to the intense focus on security relations after the post-9/11 regime and the War on Terror (Marchand 2009). In the sector of transportation gender mainstreaming still waits to defined and implemented at the national level.But the academic discourse has continued and is further developed for instance by means of the concept of empowerment and agency.

II. Development bank policies

The motorization is a wide spread global market with several huge international businesses and economic institutions managing investments in the sector of transportation. In the years 2005 to 2009 the Asian Development Bank invested 11.3 billion US dollars in Asia (Lohani2010). And, in 2013 another 2.5 trillion US Dollar investments was seen to be needed for Asia alone according to ADB (Bali 2013).

During the last decadesseveral policies to improve transportationconditions for women were launched and, when presenting the Gender Action Plan, Paul Wolfowitz, President of the World Bank, said:

> "For the World Bank Group, promoting gender equality is a central component of fighting poverty. Therefore we need to focus on mainstreaming gender in non-social sectors that support shared growth---such as infrastructure, energy and transport---and improve data collection to understand women's participation in these sectors. … Creating opportunities for women is clearly smart economics" (Wolfowitz 2006).

The World Bank came out as strongly focusing on the economic role of women in development as presented by *The Economist* (15 April 2006*)* writing:'Forget China, India and the internet: economic growth is driven by *women.*' The World Bank developed some projects to improve the conditions for women in transportation in low-income countries such as Kirgizstan, Timor-Leste and on (Grieco and Turner 2005).

In the Third Millennium Development Goal (MDG),by the World Bank, the promotion of gender equality and empowerment for womenis considered a 'quick fix' and it reads:'The prospects for achieving the Millennium Development Goals are both directly and indirectly improved by enhancing gender equity. Thus, there are close links between the reduction of both gender inequalities and multidimensional poverty. The empirical evidence suggests that developing countries with less gender inequality also tend to have lower poverty rates (see the UN Human Development Index). The idea of the World Bank isthat poverty reduction should be formulated as a two pronged approach: broadly based economic growth to generate income-earning opportunities for the poor and, targeted interventions to meet their basic needs. In general, these define both the indirect and direct approaches to poverty reduction. Within this framework, transportation interventions provide a valuable policy instrument for poverty reduction. A transportation investment project may foster economic growth, or target the transportation needs of the poor, or directly generate employment opportunities for them. In any of these ways, the project contributes to poverty reduction (Gannon and Liu, 1997: 13). The current shortage of equity and gender considerations in investment policies are path dependent.

In as much as jobs and basic social services are highly valued, it can be said that the basic transportation access is of high value for poor families. In this sense, improvements in transportation conditions can have greater welfare implications for poor families than for wealthy. And, consequently, the lack of affordable alternative locations, providing affordable public transportation can have an immediate impact on the personal welfare of the urban poor.Improved transportation conditions will reduce poverty and improve life prospects for a huge number of women and low-income families in urban Asian through the positive impact that a good transportation system exerts on the local economy.[33]

In 2013, the ADB claimed that Asia and Pacific should be freed from poverty and that some 1.7 billion people in the region were poor and unable to access essential goods, services, assets and opportunities to which every human is entitled (ADB Statistics). In the ADB strategy 2013-2020, to remove barriers and unleash the socio-economic benefits of public transportation, gender equity was defined as one of the five drivers of change.

But,beyond the bank policiesremain the issues of public action and rights. And,as put forward by researchers Chant and Sweetman the smart economics "is concerned with building women's capacities in the interests of development rather than promoting women's rights for their own sake. We think this matter, because it does the agenda of the empowerment of women and the attainment of gender equality a very significant disservice. Going forward, it is necessary to reassert the primacy of gender justice and rights in a manner which eschews the notion that it is only worth investing in women if they can 'fix the world'" (2012:527). The notion of empowerment stress the gendered divisions in urban mobility and, Kabeer argues "To be disempowered means to be denied choice, while empowerment refers to the processes by which those who have been denied the ability to make choices acquire such an ability" (2005:13). The ability to voice concerns and to exercise choice in ways that challenge patriarchal power thus became the litmus test for 'true' empowerment (Cornwall and Brock 2005:1055; Kabeer 2005:13-16).

III. The UN, the notion of sustainable transportation and the Bali Declaration[34]

In tackling modern mainstream challenges of rapid motorization and dramatic increases in mobility of goods and individuals most large cities in Asia have been de-linked from environmental and social aspects of transportation. The introduction of sustainable transportationin recent years mightlead to a policy shift and away from moving vehicles and, instead, towards moving people and goods. So far sustainable transportation develops as an international discourse built on a comprehensive understanding of the topics at stake.

The elaboration of national sustainable transportationpolicy'sopens up a window of opportunity to improve the well-being of all road-users.[35]A sustainable transportation system also includes social aspects because it 'allows the basic access needs of individuals and societies to be met safely. It should also be in a manner consistent with ecosystem, health, and with equity within and between generations', and furthermore it 'is affordable, operates efficiently, offers choice of transportation mode, and supports a vibrant economy.'[36]

Furthermore, at an intergovernmental meeting in2013 the UN Secretary-General Ban Ki-Moon declared that: "Transport is a key building block for sustainable development. Access to goods and services through efficient means of transport and connectivity is essential for poverty reduction". At the same he also said: "In both urban and rural areas, better planning for land-use and transport systems makes a great difference in facilitating

access to jobs, goods and services form men and women alike. On a global scale it is essential to design and build transport infrastructure to make it safer and more environmentally friendly, and to minimize vulnerability to climate change and natural disasters", he added further.

The Bali Declaration, 2013, was part of a political process based on the understanding that the transportation sectors calls for zero tolerance towards congestion, pollution and road accidents. It also called on countries to devise and implement appropriate transportation policies, programmes and enforcement measures to protect their citizens, environment and property while strengthening the socio-economic sustainability of the Asian region. Sustainable transportation comprises three kinds of sustainability: environmental, economic, and social. Furthermore the key elements are defined as: a) Public health, b) Land-use planning, c) Environment- and people-friendly urban transport infrastructures, d) Public transport planning and transport demand management (TDM), e) Non-motorised transport (NMT), f) Social equity and gender perspectives, g) Road safety and maintenance, h) Strengthening roadside air quality monitoring and assessment, and, l) Strengthening the knowledge base, awareness, and public participation.[37]The goal is to bring about a paradigm shift on the role of motorisation and mobility.

Summing up of the political framework

The emphasis of sustainable transportationduring the last decades has largely focused on capacity building and research efforts dedicated to the environmental and economic aspects due to the character of motorised mobility and modernisation. Not much attention been paid to explore the vast field of gender and social equity in traffic and transportation. Different ways to operationalize policies are still to be defined and not many organisations or countries have "genuinely shifted their policies to reflect a concern for more holistic ideas of human development (epitomised by the work of AmartyaSen), rights-based development, or notions of human well-being and happiness" (Chant and Sweetman 2012:518). The state of the art of gender issues motivates research and policies that favour women's mobility and physical access to resources and that facilitates for women to participate in society

In 2007, the Swedish Environmental Protection Agency published a report called 'A study on gender equality as a prerequisite for sustainable development' that further explores these issues in a more holistic and less economic way (Johnsson-Latham 2007). But Professor Marianne Marchand and other scholars of International Relations have correctly noted that 'Although gender mainstreaming is a major concern of the UN, seven of the eight goals [of MDGs] were not formulated in gender sensitive terms.' So, again, after the launch of the MDGs in 2000, gender specialists within the UN system had to ensure that gender was being 'mainstreamed' into each of the MDGs (Marchand 2009).

A comprehensive discourse based on contributions from several mostly international political and economic stakeholders slowly finds a foothold and, for this reason the Asian process and some of its outcomes like the Bali Declaration, the Bangkok 2020 Declaration and, the Aichi Statement are unique and worthy of further explorations and support. Several ASEAN member countries are inquiring into ways to develop at least gender based components of policies. Marie Thynell has been an expert staff of the UNCRD for ten years and has several times assisted in writing and discussing policy formulations such as the Aichi Statement 2005, the Bangkok Declaration 2010, and the Bali Declaration 2013.

5. CONCLUDING ANALYSIS

It can be concluded that states and markets are involved in promoting mass motorisation as a means of modernising and supporting economic growth and,most of the capacity building in traffic and transportation has focused ontransportation businesses. So far, the design of transportation infrastructure and policies reflects a male view on what constitutes appropriate transportation technology and travel behaviour without paying much attention to different user groups, their travel experiences or the safety, security, comfort for women.

This review confirms that historically, the planning of traffic and transportation has been gender-blind and do not take the equity issues or the different practices and experiences of womeninto consideration in policy and planning.

The discourse about ‘Smart economics’ as launched by the World Bank oversimplifies the complexity of social and economic structures. The discourse on ‘Smart economics’ conveys an economic efficiency perspective on women’s mobility as a means of facilitating economic growth and where “[w]omen are enlisted as foot soldiers to serve in battles whose aims are not related directly to their interests” (Moser 1989; Molyneux 2006). It is a top-down view on development that lacks the relational and structural perspectives.

The century old practices of excluding women from men in in public transportation on buses and trains, the ‘pink solution’,diminishes possibilities of violence against women and criminal behaviour in the street space such as harassment, rape and theft. But, it does not incorporate women’s demands and experiences into policies facilitating a change of the gendered design of urban transportation or provide access to places for women. The male norm is still in control and,the quest for gender mainstreaming in transportation policies underlines the conflicting interests in urban mobility and the open challenges to male norms. Therefore, women’s empowerment, and to make visible demands through agency and voice is more likely to bring about desired shifts then pink initiatives.

As to summarize, the gendered differences are related to variations in the social roles of men and women. Travel behaviour reflects the gender-based division of labour, power relations and the reproductive role of women and thus the travel needs vary. The travel patterns and behaviour are expressions of the prevailing culture and social structures such as aperson's role in the household or family, the occupation and economic situation of females. And, as long as such societal, social or cultural structures are not taken into account in planning for access for women changes are unlikely to occur. Hopefully, the social dimension will be further explored by means of studies of gendered structures, behaviour and establishment of new transportation practices and policies.Thediscourses provoked by the concept of sustainable transportation and by concepts like empowerment and agency can be further developed and spur changes.

This brief run-through of discourses and policies in Gender and Development, at the World Bank and in the UN,brings us back to the question of a new window of opportunity to incorporate gender into policy and planning, for instance, through sustainable ways of defining traffic and transportation conditions. The very large and fragmented number of stakeholders in traffic and transportation on both supply and demand sides, make it possible to create new arenas where others than the usual 'suspects' are given a voice to influence conditions and policies. This 'others' might be women or the general public that depends on urban mobility in everyday life. The opening of such a window based on a different judicious and judicial mix can certainly change the scene in the streets of tomorrow.

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[1] Gender is a social variable applicable to all other cross-cutting variables such as race, class, age, ethnicity, sexual orientation, religion, disability, and locality. Gender roles of men and women are not fixed but changeable (Sida 2005).

[2]Accessibility designates the number of opportunities available within a certain distance or travel time. Mobility refers to the ability to move between different activity sites, *e.g.* from home to school (Hanson 1996:4).

[3]Donor organisations such as the Swedish International Development Agency (SIDA) and the German GIZ.

[4]Gender equality is a key element of the human rights system established by the United Nations Universal Declaration of Human Rights in 1948. The declaration states that rights and freedoms shall not be limited by a person's sex. It establishes that 'All human beings are born free and equal in dignity and rights' (http://www.sida.se/shared/jsp/download.jsp?f=SIDA4888en_Gender_Policy.pdf&a=3584).

[5]Thynell 2003.

[6]Thynell, Tran and Schlyter 2010.

[7] The term "equity" is used to refer to the degree of progressive distributional impact in general, and improvement in the welfare of the lowest income group as corresponding to the lowest quintile or, the group below an absolute poverty line (i.e., poverty alleviation) in particular.

[8]'Women in Development' targeted the integration of women's need into development mainstream (AfDB 2001).

[9]Later on Gender and Development were developed to deal with shortcomings of mainstreaming gender in development having a focus on gender and the social, political and economic relations as well as the structures and processes that create, reinforce and sustain gender inequality. It also seeks to redress the unequal relations between men and women. This approach recognises that improvement in women's position requires analysis of the relations between women and men across a number of dimensions(AfDB2001:).

[10]Gender and equity sometimes goes together but can also be separate issues. In this article gender and equity are mixed some parts and separated in other places.

[12] In Dhaka, women are often prohibited from entering crowded buses for cultural and religious reasons (Vasconcellos 2001: 170-171).

[13] Women and children engage in unskilled manual jobs in the informal sector to a great extent (Forastieri 1999).

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[22]Vasconcellos, 2001. See also Iles, 2005 and Pucher, J. et al, 2005.

[23]Vasconcellos, 2001: 12. Road supply as percentage of urbanized areas in other Asian cities: 7.4 in Shanghai, 11.4 in Bangkok, 20 in Seoul, 21 in Delhi. Compare with 24 percent in Tokyo or 25 in Paris.

[24]Thynell, Tran and Schlyter 2010.

[25] In these countries, the percentage of people below the national poverty line reaches 40 and 36.1 per cent. See: https://www.cia.gov/cia/publications/factbook/index.html.

[26]Carruthers et al 2005.

[27]Thynell, Punte and Arora, 2009b.

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[31]Carruthers et al 2005.

[32] A standard for bus stop accessibility is often 400 m.

[33] The contribution of transport to income growth has been widely documented by the World Bank, the Asian Development Bank, and the United Nations Economic and Social Commission for Asia and the Pacific.

[34]The Regional EST Forum in Asia encompasses twenty-three countries: Afghanistan, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, PR China, India, Indonesia, Japan, Lao PDR, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Pakistan, the Philippines, Republic of Korea, Singapore, Sri Lanka, Thailand, Timor-Leste, and Viet Nam and Russian Federation.

[35]Marie Thynell is an expert to the UNCRD and has elaborated the parts on gender and social equity since 2005 and ongoing. She is also a co-author of five declarations.

[36]From the definition by the Centre for Sustainable Transportation of Canada.
[37]The Aichi Statement.

To retire from work has potential consequences for patterns of everyday mobility in numerous ways. People born during the 1940s and are now retiring are more heterogeneous than earlier cohorts of retirees. They experience more years with good health after retirement, engage more in leisure-time activities and make more trips and errands. Among women especially, there has been an increase in holding of a driver´s license as well as in ownership and use of car, compared to earlier generations of retired women. According to this knowledge, transportation behavior and mobility patterns among people in this generation can be expected to differ from previous generations. The aim of this study, which is part of a PhD-project, is to explore mobility in connection to the transition from working life to retirement and older peoples their own perspectives, resources and experiences in the shaping of their mobility. The data consists of travel diaries and qualitative interviews with 24 recently retired women and men living in a medium-sized Swedish city. The time- geographic approach will be used to describe and understand complex spatial and temporal connections between people, places and material artefacts. Currently, two research articles are in progress[1] [2]. Further analysis of the material will take the gender perspective into account which means that women's and men's opportunities for mobility will be analysed based on; where their activities are temporally and spatially allocated, what modes of transport they use, to what extent they have obligations to others such as grandchildren or if and to what extent they are dependent on others for mobility.

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Daily organization of trip chains:
A gender issue?

Practices of urban and interurban mobility of women have undergone many changes since the last twenty years. The increase in female employment, a larger motorization or upheavals in the organization of daily schedules, redefines the daily mobility of women. Although the distinction between men and women remains current in mobility studies (Carron, 2007), women have yet "caught up" the gap behind men (Coutras, 1997). But can we speak of gender equality in the spatial practices of displacements?

The study of "Enquête Ménages-Déplacements'" (EMD) carried in 2007-2008 in the Toulon Metropolitan Area (AMT) will allow to study the construction of the commuting (all movements from home until the individual goes back) for this part of the population. The objective is to observe the characteristics of the organization of the mobility behavior of women and to identify a standard profile based on spatial, demographic and social factors.

Currently, this spatial approach shows that women organize and structure their commuting so as to "optimize" their daily mobility. With the recurring problem of "double day" (CERTU, 2005 Courtas, 1993) coming from the need to manage both work and family life (Gwiazdzindski, 2003), women move nearly as much as men, similar in time, but with shorter distances. However, wouldn't this phenomenon be related to the spatial construction of trip chains for women? This segmentation would result in a reduction of the distances between two places. Women have their completely different paths mobility of men? Or they insert their travel program activities related to household moving and less far to make more time consuming activities?

The aim of this work is twofold. On the one hand, discuss and confirm the different logical in spatial organization of daily mobility between men and women. On the other hand, we observe what the new features of mobility of women are today, and the changes compared to previous generations.

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DESIGNING WOMEN FRIENDLY TRANSPORT INTERCHANGES

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ABSTRACT

Transport interchanges play a crucial role in urban development, embodying an attraction cell of movements and facilitating links among different modes, routes and destinations. Today's women face a number of additional challenges on their daily movements, i.e. transferring from a mode to another while carrying a baby trolley, finding baby caring facilities at terminals, doing household shopping while waiting at a station, feeling safe travelling at night, finding a secure playground for their children while waiting for the next tram, etc. Time saving with utilizing waiting time and priority movement and secure mobility for women are listed among the selected for evaluation aspects for efficient and women-friendly design of transport interchanges.

Towards this direction, this paper aims at identifying the aspects of developing efficient operated transportation hubs that fit appropriately to urban environment and serve effectively women mobility needs, and prioritize their movements. An internet based survey was conducted, in order to investigate the degree of women satisfaction from the New Railway Station of Thessaloniki transport interchange. In addition, women made proposals for the interchange design and stated their preferences and reactions under different interchange scenarios.

INTRODUCTION

This paper was developed in the framework of the European project "City-HUB" (www.cityhub-project.eu). City-HUB project is a 30 month project dealing with design and operation of seamless, smart and safe intermodal public transport systems. Special focus is given in covering "vulnerable" target groups needs, i.e. the elderly, women, physically and mentally handicapped people in order to be able to adequately benefit from these interchanges. The project aims at developing accessible to all interchanges by erasing the social exclusion of women, covering efficiently their needs. Five parallel user satisfaction surveys are being conducted to the five pilot case study interchanges of the project: Moncloa interchange in Madrid (Spain), Ilford railway station in London (United Kingdom), New Railway Station in Thessaloniki (Greece), Kamppi terminal in Helsinki (Finland) and Kőbánya-Kispest interchange in Hungary. Especially for the Greek case study, a pilot survey has already been conducted in a representative sample and these preliminary results are presented in this paper, following a gender sensitive approach of analysis.

Women seem to be more affected by interchange design and operation, as they make more intermodal and chained trips [1] and they usually combine different tasks while travelling. Also, women travel much more than men with public transport modes, they have many things to do usually requiring a distribution of movements, they have serious time constraints and thus they are more affected by an efficient use of waiting time while transferring from a mode to another [2].

Urban transport interchanges play a key role as part of public transport networks, facilitating the links between public transportation modes. Time saving, urban integration, better use of waiting time and improvement of operational business models are some of the benefits that result from the development of efficient urban interchanges. However, despite the significant role of transport interchanges in the urban transportation scene, integrated design and operation systems are still missing, causing serious problems and gaps.

The above issues are studied and evaluated in a selected case study, thus, the New Railway Station of Thessaloniki in Greece. The station is the central passenger railway station in Thessaloniki, which is the second biggest city in Greece and the capital of the periphery of Central Macedonia with a population of approximately 1,000,000 residents. The station is located in the urban area of the city and the involved modes are commuter rail, interurban rail, local buses, suburban buses, interurban buses, taxis, bicycle ways, park and ride, kiss and ride, and metro (under construction). Apart from the provision of railway services, the station works as a terminal of the public bus services of the Thessaloniki Urban Transport Organisation (OASTH), while it is also directly connected to the interurban bus station, where scheduled destinations for Athens and other Greek cities are available. Stations' location is close to the urban central business distinct, allowing the movement of travellers all around the city.

To address travelers' point of view and actual needs expectations and proposals for its reformation, regarding the existing conditions in the pilot interchange, an internet based survey was conducted. The survey conducted to the employees of the Center of Research and Technology (CERTH), which is located in the opposite side of the city's urban area. The reason for selecting CERTH employees as a pilot sample of users was to investigate commuter users of the station in an expanded urban distance. A total number of 70 respondents' answered the questionnaire and 46 valid responses were analyzed.

Respondents evaluated the design and spatial development of the transport hub and pointed out the ground for interventions. The analysis of the survey results provided valuable feedback for the validation of the survey design so as to address real needs of station users.

Following the introductory section (chapter1), the state-of-the-art analysis is presented in chapter 2 and selected cases considered as good practices, are presented in chapter 3. The methodological

approach of the study is presented in chapter 4. Research results are presented in chapter 5 and specific recommendations are provided in chapter 6. Finally, the most important conclusions are highlighted in chapter 7.

STATE OF THE ART ANALYSIS

Transport interchanges gained attractiveness by many research projects, trying to identify the aspects for their efficient design and operation [3, 4, 5, 6, 7, 8, 9]. Two of the more representative projects are PIRATE and GUIDE. More than 250 reports were developed from each project, assessing transport interchanges focusing on operation, design and quality.

Transport interchanges act as a junction between the transport system and society [10] and could be further considered as "open gates" to the city, providing access to the central activities and social events. Aspects such as urban design, transportation and economy should be examined in parallel, so as to provide guidance on the proper interchange design and the contemporary city planning. Travellers tend to use an interchange based on their personal travel needs and perceptions. User perception is most commonly considered when assessing an interchange [6,7,8,11] and thus it is crucial to understand passengers' opinions [12]. Local authorities' or transport operators' perspectives may also be considered. MIMIC project (1999) stands as one of the early projects considering all perspectives [4].

It is commonly accepted that the design and operation of a transport interchange may influence the physical experiences and psychological reactions of a traveller, and thus an efficient design and operation should attract travellers and should be linked to the sustainability of an interchange. The GUIDE project (2000) underlined the major influence that the interchange design could cause to the general perception of traveller for public transport [5].

Travellers switch from one mode to another, either because there is no direct connection with urban public transportation from their origin to their destination or because they want to reduce their total travel cost [13]. In both cases, the interchanges work as the main node of the urban transport network and their efficient development and operation is of great importance.

Edwards (2011) [14] perceives transport interchange planning as a challenge for urban design. As he states *"Transport interchange design offers many opportunities to enrich the public realm, to support social sustainability and to create conditions for the economic recovery of inner city areas"*. This statement links to the general belief that transport interchange development should be part of the urban development strategy, aiming to support growth and regeneration in an urban area [15].

Interchanges should not be designed "isolated" from their surroundings, but they should be part of the urban environment. Interchange development should focus on increasing possibilities of activities for public transport users, who may utilize better their waiting time. Regarding land use development and, from the point of view of an open to non-travellers interchange development, some additional facilities that reduce barriers to interchange should be considered, such as: retail outlets, cash points, telephones, automatic vending machines, refreshment/bar facilities, etc. The planning framework for interchanges differentiates upon interchange categories, characteristics and planning goals [16].

Finally, based on the findings of the PIRATE project [9], the interchange location seems to be very crucial to the urban development. Strategies have been developed, regarding proper interchange location in order to provide a better public transport performance and urban development. Proper interchange design and operation has to be analyzed in a comprehensive framework of indicators evaluation, towards sustainability [17,18]

GOOD PRACTICES

Considering the state of the art analysis, the identification of good practices can be a useful tool to examine the key indicators that apply to a successful interchange operation. There are many interchanges that could be assessed as good practices focusing on selected criteria. King's Cross, UK station could stand as a paradigm of defined movement paths, Manchester Piccadilly Station as an example of great connectivity among means of transport, Berlin as an increased security station with way finding, passenger information, and provision of services [19]. Six selected interchanges are briefly presented below concerning different aspects that lead to consider them as good practices.

Lyon Perrache Railway Station, France

Lyon Perrache is one of the main railway stations in Lyon, France. Lyon is the second largest city in France with over 1 million citizens, and the first French city with an urban transport plan. The involved modes in the station are national rail, trams ,buses and coaches, metro. The station is considered as a well-designed transport hub for four main reasons: the design, the connectivity among the involved modes, its location in the center of the city of Lyon and the initial planning and vision [20].

Ashford International Station, Kent, UK

The involved modes in this station are: rail, buses, coaches and taxis. The station is considered as a good practice regarding the urban planning issues. The location of the station was chosen strategically before the opening of the Channel Tunnel and the availability of through Eurostar trains from London and Paris or Brussels. In the terminal and the station building, domestic as well as arriving and departing international passengers must be segregated once they have passed the ticket barrier, so separate routes are provided to separate platforms. Domestic passengers have a dedicated subway, facilities for departing international passengers are at the upper level and they have a bridge to the dedicated 'international' island platform, and arrivals use a subway which brings them into the immigration area of the terminal. On the far side of the tracks from the terminal is a high-speed bypass route for non-stop trains. Moreover there are some additional facilities at the station: bars and coffee shops, convenience store, ticket desks, toddlers' play area, toilets with baby-changing facilities and cash machines able to cover some of the daily travelers' needs. There is a coach drop-off point situated next to the main entrance, servicing group travellers. Moreover in the ground floor of the multi-storey car park is located a cycle parking, which is free and covered by 24-hour CCTV surveillance. This case of study represents a great example of strategic planning when considering a new interchange development, where all strategic planning components need to be considered and examined in terms of the vision of the total urban and transport development [20,21].

Manchester Piccadilly Station, UK

The Manchester Piccadilly Station was the Winner of the UK Integrated Transport Award 2003- Large Interchange Project of the Year. It is a metropolitan railway terminus with buses adjacent and urban light rail below. Piccadilly is the busiest station in Manchester and it is the fourth busiest station in the United Kingdom outside London with over 21 million passenger entries and exits between April 2010 and March 2011. According to Network Rail (manager of the station), over 28.5 million people use the station annually. Manchester Piccadilly handles over 83,000 passengers and 1,000 train movements every day. Although the large amount of movements in a station is usually difficult be handled, according to an independent poll carried out in 2007, Manchester Piccadilly has the highest customer satisfaction level of any UK station, with 92% of passengers satisfied compared with the national average of 60%. The satisfaction measurement was about the overall environment of the Manchester Piccadilly Station (Revamped station tops train poll". BBC News Online (London). 2 August 2007. Retrieved 2008-09-17). The station is now regarded as one of the best stations and interchanges in the UK. Involved modes in the station are: taxis, private cars picking up and setting down, southbound and eastbound buses, the southbound Metrolink light rail, free shuttle buses to the city centre. Except from the high user satisfaction level in the station, the station is considered among the most accessible

ones, considering that are available: escalators and lifts to all levels, wide access doors and gates, braille signs, hearing loops and disabled toilet facilities [20, 22].

Enschede Station, The Netherlands

Enschede is the main railway station in Enschede, the Netherlands. The city of Enschede has a modal split of 3 percent public transport; 42 percent cyclists; and 55 percent private motor vehicles within the city.(http://www.civitas.eu/index.php?id=117&city_id=194). The station is considered as a good practice regarding cycling facilities and promotion of soft modes of transport. There is a cyclist way and parking area near the station, offering the opportunity to move combining modes of travel in the station. The Interchange was winner of the International Integrated Interchange of the Year, 2003. (This description is based on a paper prepared by Michael Stacey of Brookes Stacey Randall, architects) [20].

Rotterdam Central Station, The Netherlands

The Rotterdam interchange includes the national railway station and multi-line metro station with trams and buses adjacent. Rotterdam station offers great train connections among intercity trains from all over the Netherlands and with the international highspeed trains (HSL and the Thalys) that stop in Rotterdam. From the Centraal Station one can easily and efficiently connect with metro, tram and buses. 110.000 transit travelers use stations operations daily. It has been estimated that in 2025 the daily passenger volumes will increase to 323.000 [20].

Circular Quay Interchange, Sydney, Australia

Circular Quay Station is listed among the most dramatic scenic interchanges in the world [20] It is the metropolitan railway- ferry station of Sydney with buses and ferry jetties below. The interchange is the oldest transport hub in Australia and is located at the historic focal point of the city, known as the Sydney Cove, in close approximate with the famous Sydney Opera House on one side and the towering Harbour Bridge. The location of the hub, along with the urban attractive zones and services, enhance the attractiveness to use a transit operation from the terminal.

Circular Quay has the most proper location to operate, as it is the starting and ending location of almost all Sydney's ferries. There are:6 ferry wharves with over ten different ferry services operate, 11 stands in the bus terminal with 74 different regular bus routes terminate there, 4 different train lines running through the terminal.

The interchange provides moreover advanced information and ticketing system. There is a transit shop located in the bus terminal of the hub allowing travelers to receive the necessary information regarding their transit trips. Following recent investments, many interchanges incorporate facilities designed to encourage people to walk or cycle to connect with other modes of travel. These facilities include safe walking routes, storage and secure bike racks. Finally, this interchange operates in accordance with the Disability Standards for Accessible Public Transport, and is accessible to the majority of citizens.

Considering the good practice components to the examined interchanges, a list of indicators could be examined according to the level of significance women perceive, by evaluating them in a selected case study.

METHODOLOGICAL APPROACH

Based on the results and assessment of the state-of-the-art analysis, and the components of successful interchange design as arising from the best practices in the previous chapter, key indicators for the design and reformation of transport hubs were identified under nine aspects, thus:

- Accessibility of the station through available modes of transport (car, bus, train, taxi, etc);
- Accessibility (elevators, ramps, "blind" guides, etc.);
- Environmental friendly services and infrastructures (e.g. green areas, recycle bins, etc.);
- Soft modes of transport (defined walking path, parking for cycling, etc.);
- Safety and security (lighting, Closed-Circuit Television - CCTV, etc.);

- Travellers' convenience (e.g. convenience of a mother carrying a baby trolley to move throughout the station;
- Information provision (real time information for delays, cancellations and incidents, pre-trip information for all available connections from the station, etc.);
- Land use (commercial shops, recreational areas, long and short term car parking, etc.);
- Connection of the station with the wider urban area (city center, port, airport, etc.).

All nine indicator categories were used for the setting up of the internet questionnaire survey that was conducted in order to investigate travellers' point of view regarding the existing conditions at the Thessaloniki railway station, and record real needs, expectations and proposals for the reformation of the station.

The internet based survey method is a commonly used method nowadays. Among the advantages of the method are: low cost, real-time access, automation, convenience for respondents, less time required, not influential from interviewers, more flexible design on the survey presentation and responses. On the other hand, as main disadvantages the following are considered: certain populations are less likely to have internet access and or knowledge to respond, the lack of an interviewer might cause problems in the cases clarifications are required, many receivers will probably delete the survey link before opening it [23]. In the case of the present survey, the advantages overcome the disadvantages, as the survey was well promoted in CERTH, all employees had internet access and qualifications and the authors provided clarifications upon requests.

The survey was conducted in the CERTH employees that are station users. CERTH is the city's central research centre, with six institutions and about 400 employees. The survey ran for two weeks in February 2013 and 46 (valid sample size) respondents (men and women) evaluated the design and spatial development of the hub, and pointed out the ground for interventions.

The questionnaire was structured in four discrete parts. The first part included questions about the demographic characteristics of the respondents, such as age, gender, education, occupation and income, as well as questions about their traveling habits regarding the specific station, like the transit frequency, the usual purpose of traveling (education, work, shopping, etc.), the transport mode to reach the station (car, bicycle, walking, etc.), etc. In the second part of the survey, the respondents were asked to state their opinion on the existing conditions at the station by grading the above indicators on a 6-point scale ranging from 1 (non-existent) to 6 (excellent), where there was always the option DK/NA standing for "Don't Know/Not Answer" responses. In the third part, alternative mobility scenarios with respect to the case study characteristics were presented to the interviewees and their intentions to follow them were recorded. In this case, respondents graded the scenarios on a 6-point scale, ranging from 1 (negative impact/decrease in movements) to 6 (positive impact/increase of movements). Lastly, in the fourth part, the respondents were invited to make any comments or proposals they have for the upgrade of the railway station.

RESULTS

In this chapter, the results of the questionnaire survey are presented, separated in three sections. The first section regards the analysis of the respondents' characteristics, the second one the results of the assessment of the existing conditions at the Thessaloniki railway station, and the third one, the findings of the assessment of the alternative mobility scenarios.

Analysis of sample characteristics

The valid sample analyzed in terms of this study, was composed by 21 men and 25 women. The majority of respondents (78%) were between 26-39 years old, 20% were between 40-59 and 2% between 18-25 years old. A high educational profile of the sample was recorded, as 85% held a Master

degree and 13% of respondents were university graduates. The remaining 2% were high school graduates. Regarding the annual income per capita, 7% of respondents stated that they have an income lower than 9.000 €, 71% belong in the category10.000 to 24.000 € and 22% had a higher than 25.000 € annual income per capita. Recreation was the main reason respondent visit the station (42%) followed by trips to work (16%). Moreover, 38% of the sample indicated that the station is 5-10km distance away from their origin or destination, while 17% are less than 5km away from their trip generator/attractor.

Assessment of existing conditions at the station

The results of the assessment of the existing conditions at the station by the respondents are presented in the following paragraphs. For the assessment, specific indicators per aspect (e.g. accessibility, safety and security, soft modes, etc.) were used, and the results are given in Tables 1-9. In order to record women point of view and assess potential statistically significant differences in the values of the indicators between men and women, the statistical analysis of the responses was carried out using non-parametric tests, which are regarded as powerful for analyzing data collected through questionnaire surveys [24]. Particularly, the normality of the data was assessed through the Shapiro-Wilk test, which is appropriate for small sample sizes (<50), while the Mann-Whitney two-sample U testing was performed to assess differences between the responses of men and women.

The first aspect examined was the accessibility of the station through the available modes of travel, such as car, bus, taxi, etc, and the results are depicted in Table 1, where the median rating of each indicator by men and women is presented, as well as the p-value. The rating scale used was ranging from 1 (non-existent) to 6 (excellent).

As it is shown in Table 1, statistically significant differences in median rating given by men and women were observed only in one of the six indicators of the specific aspect. More specifically, it was indicated that men are more satisfied than women regarding the level of reaching the station by car. Both men and women assessed the accessibility of the station by bus and taxi as above adequate, while, on the other hand, the train, bicycle and walk connections received low scores, highlighting the problems of the network.

For the evaluation of the accessibility level at the station, seven indicators were evaluated by the respondents and the results are presented in Table 2. In this case, all indicators were evaluated as below adequate and especially for the needs of people with disabilities. Focusing on women, it seems that they consider travolators and the assistance of available personnel as the most important deficiencies at the station.

Sustainability, in terms of providing friendly services and infrastructures, as well as promoting soft modes (cycling and walking) was also investigated in the station. Towards this direction, the participants of the survey were asked to evaluate eight indicators regarding the degree of how environmentally friendly the station is, and eight more indicators referring to the enhancement of the use of soft modes. Results showed that travellers are not satisfied at all with the present conditions at the station, since they emphasized the non-existence of green areas and recycle bins, the non-usage of recycled material and power saving features, the non-existence of energy efficiency infrastructure, and the lack of walking and cycling promotion (Table 3). Similarly, travellers, both men and women, addressed the absence of appropriate for walking and cycling infrastructure, and highlighted the need for the reformation of the station, which should provide right of way to people walking and cycling and proceed with weather protection infrastructure, canopies and stops (Table 4).

Focusing on safety and security, the five indicators used in this case were evaluated as below adequate by the respondents (Table 5), while there were not observed any statistically significant differences

between men and women. However, it seems that the presence of police officers and the Closed-Circuit Television systems increase the sense of safety and security for women.

Travellers' convenience was assessed though three indicators, and once again the difficulties that cyclists, pedestrians and mothers carrying a baby trolley face, were indicated (Table 6).

Regarding information provision, the findings of the survey showed that pre-trip information for all available connections at the station, real time information for delays/cancellations and incidents, station information and provision of information for all available modes and their connections in the station are considered as poor, while the central announcements for arrivals/departures and other events as below adequate (Table 7).

When assessing the opinion of the respondents on land use (Table 8), it was observed that almost all relevant indicators were granted as below adequate. Especially focusing on issues that are of high interest for female travellers, such as child labor areas and baby care facilities, it is clear that the station does not cover at all these needs.

The last aspect tested was the connections of the station with the wider urban area. In this case, due to the advantageous location of the station and the high bus connectivity with the majority of the urban destinations, the opinion of the respondents was rather positive (Table 9).

Assessment of alternative mobility scenarios

The findings of the assessment of fifteen alternative mobility scenarios are given in the following paragraphs. Once again, , the normality of the data was assessed through the Shapiro-Wilk test, and the Mann-Whitney two-sample U testing was performed, in order to investigate if there are any differences in the respondents' intentions in relation to gender. Respondents graded the scenarios on a 6-point scale, ranging from 1 (negative impact/decrease in movements) to 6 (positive impact/increase of movements). The results of the assessment of the above scenarios, in terms of whether the movements of the respondents under each alternative scenario would be affected, are presented in Table 10.

In general, results showed that the movements of the respondents under the fifteen scenarios would be affected, and, specifically, it seems that interventions, such as the provision of real time information, the increase of the frequency of the public transport routes connected with the station and the increase of the reliability of the movements related with the station, would increase the number of their movements.

Focusing on women, it is indicated that important parameters affecting their movements are the sufficient connections of the station with the rest public transport network, the frequency of the public transport routes connected with the station and the reliability of the movements related with the station. On the other hand, it seems that the connection of the station with cycling path or the bounding of walking paths inside the station would not be of high priority for their movements.

RECOMMENDATIONS

As part of the questionnaire survey, the respondents were invited to make proposals for the upgrade of the railway station. These proposals have been elaborated and adjusted to women transportation needs and expectations and are cited below, formulated as recommendations for key aspects of the development and operation of an urban transport interchange, thus accessibility, safety and convenience, information provision and infrastructure and services:

Accessibility

- Providence for people with reduced mobility skills and mothers carrying a baby trolley;
- Increase of the connectivity of the reliability of the movements related with the station;
- Promotion of sufficient connections of the station with the rest public transport network.

Safety and convenience

- Increase of police presence and enforcement;
- Creation of user friendlier station;
- Setting of Closed-Circuit Television throughout the station.

Information provision

- Development of information systems (voice and visual) for the provision of real time; information for departures, arrivals and delays;
- Information provision for all modes;
- Reduction of waiting time for ticketing.

Infrastructure and services

- Development of short and long term parking spaces;
- Redesign of the station in a more sustainable way;
- Development of green zones/areas;
- Creation of sidewalks and cycling facilities and infrastructure;
- Promotion of the commercial use of the main station building;
- Creation of child labor areas;
- Provision of baby care facilities.

CONCLUSIONS

In the framework of the present paper, an effort was made to identify the aspects of developing efficient operated transportation hubs that fit appropriately to urban environment and serve effectively women mobility needs, and to introduce a new approach for transportation hubs' design, able to fulfill women needs and prioritize their movements.

Towards this direction, a number of European transport interchanges were studied and relevant to women mobility transportation needs aspects were indicated. These aspects were then linked to a number of indicators, which were practically tested, through an internet based survey, in the case of Thessaloniki's railway station transportation hub in Greece. The scope of the survey was to investigate the degree of women satisfaction regarding the selected interchange mobility and spatial theme, to record proposals for its' reformation and to address stated preferences and reactions under different scenarios development.

The findings highlight the weaknesses and deficiencies of the station in terms of accessibility, environmentally friendly services and infrastructures, and safety and security. Focusing on women and summarizing the main findings it was observed that they consider the provision of information for all modes and real time information for delays/cancellations and incidents, as of high importance, and they do state the absence of services that are significant for them, such as the child labor areas and baby care facilities.

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List of Tables

644 **Table 1. Accessibility of the station through available modes of transport**

Indicators	Median rating		p-value
	Men	Women	
Accessibility of the station by car	3.0	3.0	0.856
Accessibility of the station by bus	4.5	4.0	0.032*
Accessibility of the station by train	3.0	2.0	0.331
Accessibility of the station by walking	2.0	2.02	0.872
Accessibility of the station by cycling	2.0	2.0	0.574
Accessibility of the station by taxi	4.0	4.0	0.628
(*) statistically significant with p<0,05			

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647 **Table 2. Accessibility level at the station**

Indicators	Median rating		p-value
	Men	Women	
Existence of elevators	2.0	2.0	0.621
Existence o f ramps	2.0	2.0	0.710
Availability of personnel	1.5	1.0	0.220
Existence of blind guides	1.0	1.0	0.899
Existence of escelators	3.0	2.0	0.584
Existence of travolators	1.0	1.0	0.907
Existence of way-finding signals	2.0	2.0	0.410

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649 **Table 3. Environmental services and infrastructures**

Indicators	Median rating		p-value
	Men	Women	
Existence of green areas within the interchange	1.0	1.0	0.153
Existence of green areas outside the interchange	1.0	1.0	0.142
Existence of recycle bins	2.0	2.0	0.377
Usage of recycled material	1.0	1.0	0.781
Energy efficient infrastructure	1.0	1.0	0.582
Power saving features	1.0	1.0	0.688
Promotion of walking	1.0	1.0	0.650
Promotion of cycling	1.0	1.0	0.425

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Table 4. Soft modes at the station

Indicators	Median rating		p-value
	Men	Women	
Provision of right of way to people walking	1.0	1.0	0.708
Provision of right of way to people of cycling	1.0	1.0	0.284
Possibility of transferring bicycles with public transport	1.0	1.0	0.346
Appropriate signals for cycling and walking	1.0	1.0	0.810
Provision of bicycles (for free or to let) in the station facilities	1.0	1.0	0.754
Canopies and stops for people walking throughout the station	1.0	1.0	0.731
Weather protection infrastructure for people walking or cycling	1.0	1.0	0.406
Demarcation of incoming and outgoing flows for people walking or cycling	1.0	1.0	1.00

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Table 5. Safety and security level at the station

Indicators	Median rating		p-value
	Men	Women	
Sense of security during the stay at the station	2.0	2.0	0.749
Sense of security when travelling with public transport from the station	3.0	3.0	0.661
Lighting throughout the station	2.5	3.0	0.956
Closed-Circuit Television	1.5	2.0	0.408
Policing	2.0	2.0	0.682

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Table 6. Travellers' convenience

Indicators	Median rating		p-value
	Men	Women	
Convenience of a mother carrying a baby trolley to move throughout the station	2.0	2.0	0.934
Convenience of a cyclist to move throughout the station	2.0	2.0	0.465
Convenience of a pedestrian to move throughout the station	4.0	4.0	0.982

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666 **Table 7. Information provision**

Indicators	Median rating		p-value
	Men	Women	
Pre-trip information provision for all available connections from the station	2.0	2.0	0.371
Information for all available modes of transport and their connections in the station	2.0	2.0	0.594
Real time information for delays/cancellations and incidents	2.0	2.0	0.919
Station information	2.0	2.0	0.697
Central announcements for arrivals/departures and other events	3.0	3.0	0.625

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668 **Table 8. Land use**

Indicators	Median rating		p-value
	Men	Women	
Commercial shops	3.0	3.0	0.806
Recreational areas	2.0	2.0	0.888
Cafe-restaurants	3.0	3.0	0.559
Waiting areas	3.0	2.0	0.067
Long-term car parking	1.0	1.0	0.160
Short-term car parking	2.0	1.0	0.165
Bicycle parking	1.0	1.0	0.270
Motorcycle parking	2.0	1.0	0.446
Taxi stop/parking areas	3.0	3.0	0.961
Cycling routes	1.0	1.0	0.308
Pedestrian routes	1.0	1.0	0.668
Bus stop lanes	4.0	3.0	0.774
Platforms with waiting area	3.0	2.0	0.05*
Kiosks with canopy	3.0	2.0	0.131
Luggage storage areas	2.0	2.0	0.811
Public toilets	2.0	2.0	0.820
Child labor areas	1.0	1.0	0.417
Baby care facilities	1.0	1.0	0.720
Pharmacy	2.0	1.0	0.666
Banks/ATMs	2.0	2.0	0.786
(*) statistically significant with p<0,05			

669 **Table 9. Connection of the station with the wider urban area**

Indicators	Median rating		p-value
	Men	Women	
City center	4.5	4.0	0.588
Universities	5.0	4.0	0.697
Technical schools	4.0	4.0	0.986
Hospitals	3.0	3.0	0.267
City Hall	4.0	4.0	0.798
Historic center	3.0	2.0	0.403
Central shopping center	4.0	3.0	0.636
Intercity bus station	5.0	4.0	0.202
Port	3.0	4.0	0.257
Airport	5.0	3.0	0.045*
Industrial area	3.0	3.0	0.837
(*) statistically significant with p<0,05			

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671 **Table 10. Respondents' perceptions under alternative mobility scenarios**

Scenarios	Median rating		p-value
	Men	Women	
Scenario 1: The station is connected with cycling path	4.0	3.0	0.262
Scenario 2: Bounding of walking paths inside the station	5.0	4.0	0.166
Scenario 3: Improvement of the station environment	4.0	4.0	0.772
Scenario 4: Real time information provision	5.0	5.0	0.815
Scenario 5: Organized parking area	5.0	5.0	0.636
Scenario 6: Organized free short-term parking area	5.0	5.0	0.482
Scenario 7: Direct connection of the station with crucial destinations (i.e. hospital).	5.0	5.0	0.899
Scenario 8: Development of bicycle parking area	4.0	4.0	0.809
Scenario 9: Provision of bicycles in the station facilities	4.0	4.0	0.936
Scenario 10: Construction of ramps	4.0	4.0	0.515
Scenario 11: Operation of more commercial centers	4.0	4.0	0.824
Scenario 12: Sufficient connections of the station with the rest public transport network	5.0	5.0	0.488
Scenario 13: Increase of the frequency of the public transport routes	5.0	5.0	0.543
Scenario 14: Increase of the reliability of the movements related with the station	5.0	5.0	0.777
Scenario 15: Efficient support of people with disabilities	4.0	4.0	0.660

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OPENING GROUND TO FEMALE TRANSIT MOVEMENTS. WOMEN'S VS OPERATOR'S PERSPECTIVE IN TRANSIT QUALITY OF SERVICE

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ABSTRACT

Quality of service undoubtedly became a key issue in attracting public transport users and providing massive commuting. Daily travel needs differentiate between male and female travelers, regarding their overall assessment of quality of service provided by public transport operators, linking to a gender sensitive travel behavior.

It is a matter of fact that today's women desire a higher level of safety and security sense at stops and onboard the vehicle, an accessible ramp to board/alight a vehicle when carrying a baby stroller, anticipate a clean vehicle to seat etc. At the same time, women follow a strict program nowadays, working and baby carrying at the same time, thus they require a reliable public transportation system with real time information provision in emergency cases. These needs of women, are addressed in the present paper, outlining the different perceptions and expectation of men and women regarding their assessment on 26 quality of service indicators of public transportation. The perceived and desired level of transit service quality by women are assessed in comparison with the provided and planned quality from transit operators' point of view.

To address the objectives of the research, an extended bibliography review has been conducted, and a list of indicators were selected and assessed by transit travelers and operators in three major Greek cities: Athens, Thessaloniki and Volos.

INTRODUCTION

From a gender perspective, transit movements differentiate among sexes as travel needs are different in terms of motive reasons and movement distribution. Women, make more intermodal and chained trips than men [1], as their daily life require a majority of task to be covered (i.e shopping, child accompanying, work, gym etc.) usually distributed in an extended part of the urban area. Moreover, women travel much more than men with public transport and have serious time constraints [2] .

Expect from gender categorization of movements with public transport as relying from different needs and habits, it is a matter of service quality that affects the transit ridership. Women perceive differently Quality of Service attributes; require more reliable public transportation, frequent lines and reasonable ticket cost. All these aspects are discussed in the present paper, and validated from the paper findings.

The present paper is divided into five sections beyond the introductory section. The first section is a literature review on similar approaches related to quality of services. The second part addresses the methodology used in the study, and the third the research findings. The main conclusions of the paper are presented in the following section (section four). The last section of the paper introduces authors suggestions for further researcher in the domain.

LITERATURE REVIEW

Quality of service is considered highly important to the vitality of every system, enterprise, organization and service in general. Many researchers examined quality of service in terms of the impact on the consumer and or user behavior, the general assessment of a service and the firm image. Researchers have address in many studies the differences among actual and perceived service quality [3,4,5]. Usually quality of service is examined under the perspective of user perception and previous experience [6]. On the other hand, user satisfaction is considered to influence the perception of the user and it is commonly related to the specific transaction [7]. Previous experience is listed among the parameters that formulate the expectations of quality one has from the provided services he experiences. Other factors that formulate user expectations are word of mouth and information provision.

The level of satisfaction relies from the comparison of expected and perceived level of service and users are dissatisfied if their perceptions are lower than expectations [8] otherwise users are satisfied [9].

The role of users in the quality of service formulation is very important. User is not just the receiver of the service quality output or the evaluator of the performed QoS. Gronroos et al.[10] consider the user as co-producer of the quality process.

Nowadays, offering high levels of transit service quality is matter of attracting public to transit services, offering alternative to car users, protecting the environment and promoting urban sustainability.

Many researchers tried to identify the quality of service components and develop methodologies to properly assess them [10, 11, 12, 13, 14, 15]. Service quality assessment comes from social and management sciences and thus it is a generalized approach should be followed to all operations. Still efforts have been made to measure the Quality of a Service, across different service sectors by many researchers [13, 16, 9, 17]. Outcomes of these efforts were some well know service quality measurement methods with application to a numerous of sectors, like SERVQUAL, E-S-QUAL and SERVPERF.

The actual need to study the quality of service comes from the need to understand the costumer and his/hers behavior. In the case of public transportation the customer is the transit user and the basic behavior is the selection to use a public transport mode instead of a private one, the selection of the mode and the route to follow. Expect from the basic behavior, the traveler could select to talk to other for his experience (word of mouth), to promote the transit system, to assess it etc.

Following the above reasoning, it is considered that a "positive "costumer/user behavior will link to higher returns [18, 19]). The returns in the public transportation case, could be attractiveness of the system, higher numbers of travelers, ticket revenues, positive user assessment etc.

To assess QoS in public transport, the generic dimension of tangibility, reliability, responsiveness, assurance and empathy is usually followed, as proposed by Parasuraman et.al [7] in the SERVQUAL model.

Research made so far, has proved that population characteristics and public transportation aspect influence generic dimensions. Demographic characteristics are considered to be very important in the quality of service analysis, as gender, age, income, education etc differentiate the performance ratings [20]

Moreover, the lack of existence of a public transportation service quality model requires the add-on to existing business quality models that many times fail to address completely the specific transport quality attributes.

Special focus is given in terms of this research, to the conceptual GAP model [13]. This model correlates costumers and service providers outlining the 5 gaps among them:

Gap_1: difference between user expectations and perceptions (service quality gap)
Gap_2: difference between users and operators expectations
Gap_3: difference between operators perceptions of users expectation
Gap_4: difference between service quality standards and actual service quality delivered
Gap_5: difference between service quality delivered to users and the promise of the service quality that should be delivered

In terms of this research the first three Gaps will be investigated in the selected Greek cities sample.

METHODOLOGICAL APPROACH

To assess the service quality two parameters need to be addressed: user perceptions and expectations and the ability of service providers (transit operators in that case) to meet users' expectations [21, 22]. In terms of this paper both parameters are examined. Two different surveys were conducted, based on the internet, one for the transit users and the other for the transit operators.

The internet based method selection to proceed with the survey is a common approach nowadays, due to the low cost, real-time access, automation, convenience for respondents, less time required to filled in, not influential from interviewers, more flexible design on the survey presentation and responses. On the other hand as main disadvantages a of the internet based surveys, are considered: the fact that certain populations are less likely to have internet access and or knowledge to respond (mainly age and income category influence), the lack of an interviewer might cause problems in the cases clarifications are required and the fact that many receivers will probably delete the survey link before opening it [23].

In the case of the present survey a clarification note was send to invitation receivers along with the survey link and contact details were given to those interested to receive more clarifications. The

collected sample gaps (in terms of age categories mainly) of the survey method used will be covered with a second round of questionnaires, face to face conducted to people with no internet access or qualifications. In terms of this research the internet based data collection are analyzed by gender, having collected comparable sizes for men and women. Regarding the survey developed for the transport operators, the problems of the survey method used were not existent as they all respond to this call.

The users' questionnaire followed the Customer Satisfaction Survey (CSS) approach, and similarly the operators' survey examined operators' level of satisfaction along with their level of understanding users' expectations.
Based on the results and assessment of the state-of-the-art analysis, 11 main quality of service indicator categories and 26 indicators were selected and examined both by transit users and operators in terms of their level of significance and level of performance (Table 1).

All the closed-ended questions were designed to generate responses on a five point Likert scale to measure the importance of service quality indicated as 1 not important, 2 slightly important, 3 important, 4 quite important and 5 very important. Using the five point Likert scale users and operators indicated the actual performance of the transit services as 1 very bad, 2 bad, 3 neutral, 4 good, 5 very good.

The period of the surveys were online was from 1st August to 31st of August, 2012. The sample respondents (users) for the study were selected from the population of the three selected cities by introducing the survey letter in main public transport operators and organizations newsletters, emailing universities, organizations, local authorities and enterprises of these cities. In the case of transport operators, the survey questionnaire was introduced in the head of each operation with an official invitation to participate.

Regarding user questionnaires, we collected 250 responses from which 211 were valid and were analyzed in terms of this research. At the same time all public transport operators invited to participate respond positively, providing us with 5 valid operators' questionnaires.

The two samples could not be analyzed in terms of quantitative comparison due to heterogeneity of the two samples (women and operators). Still, operators represent and affect all transit systems in the selected cities (case study cities: Athens, Thessaloniki, Volos). The analysis made to compare the two samples (women and operators) was qualitative and descriptive as it was the more suitable to address the research topic.

The user questionnaire was structured in two discrete parts. The first part included questions about the demographic characteristics of the respondents, such as age, gender, education, occupation and income, as well as questions about their traveling habits like travel frequency, usual purpose of traveling (education, work, shopping, etc.), transport mode usually used etc. In the second part of the survey, the respondents were asked to assess the level of importance and the perceived level of performance in the general transit system in Greece. The questionnaire of transit operators, followed the same structure with the users questionnaire, plus a third part where operators had to state their level of understanding users by stating what they believed users' perceive from the actual performance.

RESULTS

As indicated in Table 1, the sample of the users consisted of 96 men and 115 women, while the majority of respondents (66%) were among 21-40 years old. Almost 30% of transit users were students and a percentage of 24% were public sector employees. Another 24% were free launchers. The urban bus was the mode usually used by the 72% of the sample, while 19% usually prefer the

metro. The majority of respondents (36%) use the stated mode of travel for work trips and trips to work, while 20% had as aim studies, 15% personal issues and 12% entertainment.

A percentage of 73% of these trips were made either daily (26,5%) or many times in a week (23%) or weekly (24%).

The majority of respondents (48%) assessed in general the quality of service in the experienced public transport operations as medium. The experienced quality is perceived below adequate by the 20% of the sample and above adequate by 32%.

Moreover, public transport users were asked to state the perceived by them word of mouth influence in their previous assessment for the general quality of public transport services. 40% believed that it was not at all influential and 29% slightly influential in their decision making process. Only 11% stated a significant influence of word of mouth in their perceived quality of service assessment.

In the user survey, 11 service aspects treated as main indicators and 26 service attributes treated as sub indicators, were evaluated by users regarding their level of significance in the general quality of a public transport service (table 2). Each aspect was linked to one or more of the attributes and the level of correlation between them was examined (table 2). As a result of this correlation, path (r=,701) seems more important factor in the formulation of the significance perception of the user for the aspect of route characteristics than number of stops and distance between them (r=,540) or bus stop location (r=,438). In the same perspective, attributes 2.2, 3.1, 4.1&4.2, 5.1, 6.1, 7.1, 8.2, 9.1, 10.2 and 11.1 have a higher correlation importance with the related main aspects that other attributes under the same aspect category.

All 26 indicators, were evaluated by transit users in terms of their significance along with the perceived level of actual transit performance. The results were clustered considering the gender of users. In table 3, the level of importance is presented by mean values for men and women and the level of their perception of the actual performance of transit services, regarding Quality of transit Services.

Evaluating the level of importance among men and women, we can see that women give a higher importance on all quality indicators than men. The performance level women perceive is also higher than men in the majority of the indicators, but still they assessed more strictly 11 out of the 26 indicators, than men (indicated with bold in table 3).

Considering the hierarchy of importance, women and men prioritize differently the quality of service indicators. By mean values (table 3), women perceive as more important indicators: Reliability of runs that come on schedule (4,61), Service frequency (4,58), Ticket cost (4,53), Punctuality (4,5). Men believe that the most important indicators are: Reliability of runs that come on schedule (4,53), Ticket cost (4,44), Punctuality (4,41), Service frequency (4,31), Bus crowding (4,21.).

Women consider as less important indicators: Cleanliness of bus exterior (3,14), Administration of complaints (3,45), Comfort of seats on bus (3,54), Personnel appearance (3,58). Men assessed as less important indicators: Cleanliness of bus exterior (2,84), Administration of complaints (3,25), Personnel appearance (3,43), Comfort of seats on bus (3,48).

In terms of performed services, women prioritize: Number of stops and distance between stops (3,72), Ease of purchasing the ticket (3,66), Safety and competence of drivers (3,64), Bus stop location (3,58), Path (3,57). At the same time men prioritize: Safety and competence of drivers (3,65), Number of stops and distance between stops (3,59), Security against crimes at bus stops (3,46), Security against crimes on bus (3,45), Bus stop location (3,44) and Air conditioning on bus (3,44).

Operators believe that users prioritize the following quality indicators : Number of stops and distance between stops (3,8), Availability of information by phone, mail. (3,8), Path (3,8), Bus stop location (3,8), Use of ecological vehicles (3,6).

Operators on the other hand (table 4) recognize a higher importance level on: Reliability of runs that come on schedule (5), Punctuality (4,6), Ticket cost (4,6), Safety and competence of drivers (4,6), Security against crimes on bus (4,6) and Use of ecological vehicles (4,6). They recognize as less important aspects the: Availability of shelter and benches at stop (3,2), Comfort of seats on bus (3,2), Cleanliness of bus exterior (3,4), Number of stops and distance between stops (3,4), Availability of schedule/maps on bus, and announcements (3,6), Bus stop location (3,6).

Operators evaluated the level of performance of these indicators, stating a high quality performance on Number of stops and distance between stops (4,4), Punctuality (4,2), Safety and competence of drivers (4,2), Security against crimes on bus (4,2), Use of ecological vehicles (4,2), Availability of information by phone, mail.(4,2), Path (4,2). A low quality performance is related, from operators point of view with indicators: Availability of schedule/maps on bus, and announcements (2,6), Availability of schedule/maps at stops (3), Availability of shelter and benches at stop (3,2), Cleanliness of bus exterior (3,2) and Bus crowding (3,2).

From the qualitative comparison of the descriptive statistics for both women and operators, the first gap among their different opinions, level of perception and significance is obvious. To address that fact, an additional question on how operators perceive users' responses was addressed by the survey.

Operators perceive that users recognize a higher level of quality than they actually do. Operators believe in a higher score of 3.8/5 evaluation (for indicators: 1.1, 1.2, 1.3, 7.3), while users actually perceive a high score of 3.66/5 (for indicator: 1.2). The opposite gap of perceptions among users and operators exists in the lower ground. Operators believe users give in general the lowest evaluation in 7.1 factor of 2.2/5, while users actually perceive the lower quality level (2.63/5) for the 6.1 factor.

Analyzing operators statements and evaluation, it is worth mentioning the differences among their stated level of importance of the examined indicators and the level quality they perform. Column A-B in table 4, represents this information, pointing that 4 factors (1.1., 1.2, 1.3, 4.2) are over-performed regarding their importance. This actually indicates a gap on proper planning considering the fact that operators perform better less important quality indicators. Factors 4.4, 4.5, 7.3 and 10.2 are performed in a quality level that covers the level of significance, while all other factors, have a lower quality performance than operators perceived importance (vary from 0.2-1/5).

Another, worth mentioning element relies from the A-C column differences. This actually represents what operators believe is the gap user understands. Operators believe that users are satisfied from 1.1 and 4.1 indicators performance (equal importance/perceived level) and over-satisfied from 1.2 and 1.3 factors. Moreover, operators believe that all other aspects do not satisfy users (in a range from 0.2-2/5).

Finally, comparing B and C columns from table 4, we can address the gap operators believe that exists owning to the difference on the actual performance and the user perception operators estimate. Except from 1.2 indicator (Number of stops and distance between stops) which according to the operators, users totally recognize in the performed service quality, all other aspects are perceived in a lower quality level from users than actually performed (vary from 0.2-1/5).

CONCLUSIONS

In terms of this research an effort was made to identify actual and perceived Quality of service in public transport systems from both points of view women and operators.

Considering the Gap model approach the findings of the present paper could identify the first 3 gaps in the interaction of women transit travelers and transit operators.

By mean values, women perceive as more important indicators: Reliability of runs that come on schedule (4,61), Service frequency (4,58), Ticket cost (4,53), Punctuality (4,5). Operators on the other hand (table 4) recognize a higher importance level on: Reliability of runs that come on schedule (5), Punctuality (4,6), Ticket cost (4,6), Safety and competence of drivers (4,6), Security against crimes on bus (4,6) and Use of ecological vehicles (4,6).

In terms of performed services, women prioritize: Number of stops and distance between stops (3,72), Ease of purchasing the ticket (3,66), Safety and competence of drivers (3,64), Bus stop location (3,58), Path (3,57). Operators prioritize the actual performance: Number of stops and distance between stops (4,4), Punctuality (4,2), Safety and competence of drivers (4,2), Security against crimes on bus (4,2), Use of ecological vehicles (4,2), Availability of information by phone, mail.(4,2), Path (4,2).

Operators believe that users prioritize the following quality indicators : Number of stops and distance between stops (3,8), Availability of information by phone, mail. (3,8), Path (3,8), Bus stop location (3,8), Use of ecological vehicles (3,6). Thus, clearly there is a gap on understanding users' perceptions.

All these differences among women importance and performance evaluation, operators importance and performance assessment and operators understanding on users perception, sketch up the quality of service framework and outline the existing gaps that should be addressed to increase the quality of service in a transit system.

RECOMMENDATIONS AND FURTHER STEPS OF RESEARCH

The analysis of the combined assessment of the two surveys provides the means for developing a set of recommendations to transport planners, policy makers and authorities for improving quality of service, towards encouraging women transit mobility and improving public transport attractiveness for women.

Further steps of the research is to address and measure all the 5 gaps, according to Parasuramans' et al. model [13] in the selected case study area and propose improvements in the transit quality of service. Moreover, this research opens ground to investigate new planning processes based on a participatory base.

The present paper is part of the research conducted within the frame of a dissertation thesis that plans to investigate moreover the impact of service quality to actual user behavior and transit movements' distribution.

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List of Tables

492 **Table 1: General characteristics of transit users sample**

		N	%
Gender	Male	96	45,5
	Female	115	54,5
		211	100,0
Age	<=20	21	10,0
	21-40	139	65,9
	41-65	49	23,2
	>65	2	0,9
		211	100,0
Occupation	Private sector employee	28	13,3
	Public sector employee	50	23,7
	Free lancher	50	23,7
	Student	64	30,3
	Pensioner	5	2,4
	Unemployed	14	6,6
		211	100,0
Mode usually used	Urban bus	152	72,0
	Troley	3	1,4
	Metro	41	19,4
	Suburban rail	13	6,2
	Tram	2	,9
		211	100,0
Aim of travel	Work	76	36,0
	Study	42	19,9
	Markets/Shopping	20	9,5
	Entertainment	26	12,3
	Doctor/Hospital	3	1,4
	Personal issues	31	14,7
	Other	13	6,2
		211	100,0
Travel Frequency with Public Transport	Daily (>= 5 days/week)	56	26,5
	Many times in a week (3-4 times/week)	49	23,2
	Some days in a week (1-2 times/week)	50	23,7
	Occasionally (1-3 times/ month)	36	17,1
	Rarely (<1 time/ month)	20	9,5
		211	100,0
General assessment of the PT QoS	Very bad	6	2,8
	Bad	37	17,5
	Medium	101	47,9
	Good	59	28,0
	Very Good	8	3,8
		211	100,0
Perceived Word of Mouth influence in the assessment of the PT QoS	Not at all influential	80	37,9
	Slightly influential	61	28,9
	Somewhat influential	46	21,8
	Very influential	19	9,0
	Extremely influential	5	2,4
		211	100,0

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Table 2: Service aspects and attributes assessed in the survey

* Correlation is significant at the 0.01 level (2-tailed). The p value of the significance is in all correlations <0.001

Service aspects (Main Indicators)	Service attributes (Sub-Indicators)	Pearson correlation (r) between Main and Sub-Indicators *
1. Route characteristics	1.1 Path	,701
	1.2 Number of stops and distance between stops	,540
	1.3 Bus stop location	,438
2. Service characteristics	2.1 Service frequency	,392
	2.2 Daily service time	,551
3. Service reliability	3.1 Reliability of runs that come on schedule	,661
	3.2 Punctuality (runs that come on time)	,564
4. Comfort	4.1 Bus crowding	,646
	4.2 Comfort of seats on bus	,633
	4.3 Air conditioning on bus	,461
	4.4 Levels of noise and vibrations on bus	,473
	4.5 Availability of shelter and benches at stop	,280
5. Cleanliness	5.1 Cleanliness of bus interior, seats and windows	,642
	5.2 Cleanliness of bus exterior	,415
6. Fare	6.1 Ticket cost	,791
7. Information	7.1 Availability of schedule/maps on bus, and announcements	,553
	7.2 Availability of schedule/maps at stops	,400
	7.3 Availability of information by phone, mail.	,340
8. Safety and security	8.1 Safety and competence of drivers	,602
	8.2 Security against crimes on bus	,617
	8.3 Security against crimes at bus stops	,530
9. Personnel	9.1 Personnel appearance	,656
	9.2 Personnel helpfulness	,598
10. Customer services	10.1 Ease of purchasing the ticket	,417
	10.2 Administration of complaints	,550
11. Environmental protection	11.1 Use of ecological vehicles	,796

Table 3: Descriptive Statistics of transit users

	Level of importance			Level of perception		
	Men (M)	Women (W)	W-M	Men (M)	Women (W)	W-M
Indicators	**Mean Value**	**Mean Value**	**Mean Value**	**Mean Value**	**Mean Value**	**Mean Value**
1.1	3,68	4,17	0,49	3,43	3,57	0,14
1.2	3,7	4,09	0,39	3,59	3,72	0,13
1.3	3,52	3,82	0,3	3,44	3,58	0,14
2.1	4,31	4,58	0,27	3,25	3,3	0,05
2.2	4,2	4,45	0,25	3,14	3,17	0,03
3.1	4,53	4,61	0,08	3,16	3,2	0,04
3.2	4,41	4,5	0,09	3,27	3,25	**-0,02**
4.1	4,21	4,23	0,02	3,09	2,95	**-0,14**
4.2	3,48	3,54	0,06	3,3	3,34	0,04
4.3	4,14	4,18	0,04	3,44	3,4	**-0,04**
4.4	3,56	3,64	0,08	3,05	3,19	0,14
4.5	3,58	3,93	0,35	2,88	3,19	0,31
5.1	3,92	4,25	0,33	3,26	3,32	0,06
5.2	2,84	3,14	0,3	3,02	3,28	0,26
6.1	4,44	4,53	0,09	2,7	2,57	**-0,13**
7.1	3,91	4,04	0,13	2,65	2,64	**-0,01**
7.2	4,15	4,37	0,22	2,75	2,58	**-0,17**
7.3	4,02	4,12	0,1	2,99	2,81	**-0,18**
8.1	3,98	4,43	0,45	3,65	3,64	**-0,01**
8.2	4,03	4,37	0,34	3,45	3,39	**-0,06**
8.3	3,89	4,35	0,46	3,46	3,23	**-0,23**
9.1	3,43	3,58	0,15	3,05	3,1	0,05
9.2	3,61	3,79	0,18	3,14	3,23	0,09
10.1	4,08	4,38	0,3	3,29	3,66	0,37
10.2	3,25	3,45	0,2	2,72	2,6	**-0,12**
11.1	3,54	4,1	0,56	2,99	2,89	**-0,1**

544 **Table 4: Descriptive Statistics of transit operators**
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	Level of importance (A)	Level of actual performance (B)	Estimated user evaluation level (C)	A-B	A-C	B-C
Indicators	**Mean**	**Mean**	**Mean**	**Mean**	**Mean**	**Mean**
1.1	3,8	4,2	3,8	-0,4	0	0,4
1.2	3,4	4,4	3,8	-1	-0,4	0,6
1.3	3,6	3,8	3,8	-0,2	-0,2	0
2.1	4,2	3,6	3,4	0,6	0,8	0,2
2.2	4	3,6	3,4	0,4	0,6	0,2
3.1	5	4	3,4	1	1,6	0,6
3.2	4,6	4,2	3,4	0,4	1,2	0,8
4.1	3,8	3,2	2,8	0,6	1	0,4
4.2	3,2	3,8	3,2	-0,6	0	0,6
4.3	3,8	3,6	3,2	0,2	0,6	0,4
4.4	3,8	3,8	3,4	0	0,4	0,4
4.5	3,2	3,2	3	0	0,2	0,2
5.1	3,8	3,6	3,2	0,2	0,6	0,4
5.2	3,4	3,2	3	0,2	0,4	0,2
6.1	4,6	4	2,6	0,6	2	1,4
7.1	3,6	2,6	2,2	1	1,4	0,4
7.2	3,8	3	2,6	0,8	1,2	0,4
7.3	4,2	4,2	3,8	0	0,4	0,4
8.1	4,6	4,2	3,4	0,4	1,2	0,8
8.2	4,6	4,2	3,2	0,4	1,4	1
8.3	4,2	3,8	3,2	0,4	1	0,6
9.1	4,2	3,6	3,4	0,6	0,8	0,2
9.2	4,4	3,8	3,2	0,6	1,2	0,6
10.1	4	3,6	3	0,4	1	0,6
10.2	3,8	3,8	3,4	0	0,4	0,4
11.1	4,6	4,2	3,6	0,4	1	0,6

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Changes in driving restriction with aging among women

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Maintaining the well-being and the health status of the elderly people is crucial. For drivers, this requires the conservation of driving in safely way as long as possible.Sensory, functional, and minor cognitive changes appear in the course of normal aging, and are more severe in brain pathologies leading to dementia. They may profoundly affect driving [1], which is a complex task involving all of these functions, particularly attention and decision-making which are necessary for the selection of relevant information and situation-specific action. Many studies show that older drivers modify their driving habits[2, 3]. Driving regulation should have the positive impact of decreasing the risk of accident and conversely, insufficient driving regulation can have negative consequences in terms of road safety. An excessive regulation leading to a premature driving cessation could however increase the risk of social exclusion, depression, loss of autonomy and pathological brain aging[4, 5]. When this regulation process occurs in later life, gender differences have been reported in non-prospective studies [6-10]. Women regulate their driving more than men and do so earlier. Choi et al. suggest that these differences can be understood in the context of "gender roles"[11] with the car occupying a more important place for men than women, in a context of masculinity, speed andpower [12]. Men are more often the main driver [13, 14]and have higher mobility by car than women than women [15, 16] . Women could also have shorter "career" as drivers than men. They may obtain their license at an older age and stop driving for longer periods [17] . From an organizational point of view, women could also be less dependent on their car for mobility than men [11]. This difference in daily car use could facilitate driving regulation. These gender differences in images and roles could also lead women to enjoy driving less than men or to doubt in their driving abilities and this could lead to premature loss of mobility [18]and cause more men to make insufficient driving regulation. However the results of prospective studies are controversial. Some show that women are more likely to regulate than men [3, 19-21], while others have found no evidence of greater regulation in women [22-27]. These discrepancies can be partly explained by age, observation periods and different measures of regulation. As for the factors which might explain regulation, to our knowledge, only one prospective study has examined driving cessation factors in men and women separately [28]. However, this study did not include people with low global cognitive score. Nor did it take into account CNS pathologies which

are known to change driving habits significantly and possibly differently in men and women. A study by Seiler et al. showed, that in demented people , women were more likely to cease driving than men at a pre-demential stage [29].

It is important to understand the regulation process in men and women, in the general population, in order to identify the factors of this regulation, factors due to pathological aging or not. In order to do so, we decided to study regulatory processes in men and in women, taking into account cognitive performance and CNS pathologies, based on prospective data providing information on changes in mobility, living arrangements, health status, cognitive performances and CNS pathologies over time.

The 490 drivers of this study, 253 men and 237 women with a mean age of 76 years, were drawn from the Three-City Cohort of Bordeaux, a longitudinal study of people aged 65 years and older [30]. The participants were interviewed at home by a psychologist in 2003, 2006 and 2009 on a range of topics including socio-demographic characteristics, health (measures of motor and sensorial functions and several medical conditions) a cognitive evaluation and driving habits. A dementia diagnosis was also conducted for all participants by a neurologist. Driving restriction covers both driving cessation and a kilometer reduction. To study driving restriction factors, we used several Cox proportional hazard models with time dependent covariables.

In this prospective study, the rate of driving restriction is high. Fifty seven percent of participants had restricted their driving over the follow-up. Women restricted their driving more frequently than men:54% of men and 63% of women were reduced their distance driven or ceased to drive over six years. Pre-dementia, Parkinson's disease, advanced age and high initial mobility by car were common restriction factors in both genders. Prevalent dementia, depressive symptomatology,a decline in at least one Instrumental Activities of Daily Living and poor visual working memory performance were specific factors in men. In women, a low income, fear of falling, a slow execution time or a severe decline in global cognitive performance explain a regulation.

This study confirmed that in later life women restrict their driving more than men, and that restriction factors differ according to gender. The pattern of results suggests that, when cognitive deficits are present, women restrict their driving at an earlier stage than men. It remains to be seen if excessive restriction in women could have negative consequences.

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Poster

Elderly Women Use of Public Transport and Evolution from Before to After Retirement.

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Policies aiming to develop public transport mainly focus on daily journeys of people going to and from workplaces. In designing and organizing public transport planners and stakeholders pay lesser attention to the local trips requirements of retired people. However, in western countries, retired people and especially retired women represent an increasing part of the population. Thus, in the perspective of development of sustainable modes of transport for all, elderly women's travelling habits and needs should be considered.

Objectives

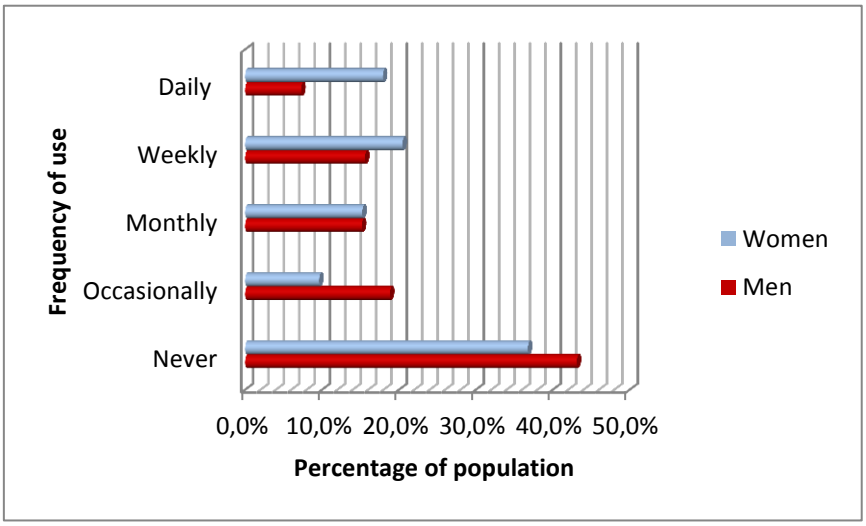
This study is focused on retired women's use of public transport. We examined the aims of the local trips associated with their use of public transport. We also analysed the reasons that motivate or hinder the use of public transport from the point of view of these elderly women.
Additionally, we checked whether women's use of public transport shows continuity or change from the period preceding retirement to the period following retirement.

Method

The data analysed in this paper are issued from a larger survey carried out in 2011 in six sites of France involving four urban agglomerations and two rural districts (see Keerle, Legendre, Roux, Gonguet, et al., 2013). This survey mainly relied on a questionnaire, but it also included interviews and focus groups.
Overall, 1234 questionnaires were analysed; participants were made up of 744 women and 490 men, whose ages range between 57 and 94, mean age = 68.3 (SD =5.5). It is noteworthy that the number of individuals considered in the different analyses varied depending on the missing responses or the question under investigation. For instance, in the analyses focused on the use of public transport [***PT***] before or after retirement, the people who retired before 45 for health, family or economy reasons were excluded.

Results

Use of Public Transport by Retired Women and Retired Men

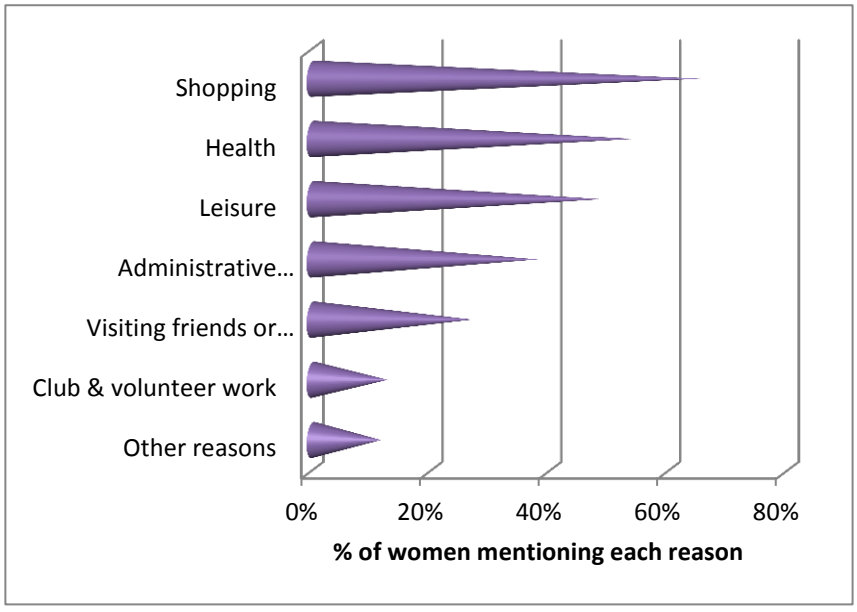


The comparison of the frequency of use of public transport by retired men and women clearly shows that women use ***PT*** more frequently than men. This is particularly obvious for "*Daily"* use; although less obvious this also true for "*Weekly*" use. Conversely, percentages of men who "*Never"* use and "*Occasionally*" use ***PT*** are higher. *Chi-square test* for these gender differences is significant: χ^2=50.37, p <.001.

Interestingly no significant differences were found among women of different age groups (<62, 62-67,68-71,72-77 and >77) in the frequencies of use of ***PT***.

This induces a more accurate examination of women's expectancies and aims when they use public transport.

Retired Women's Activities Related to Use of Public Transport

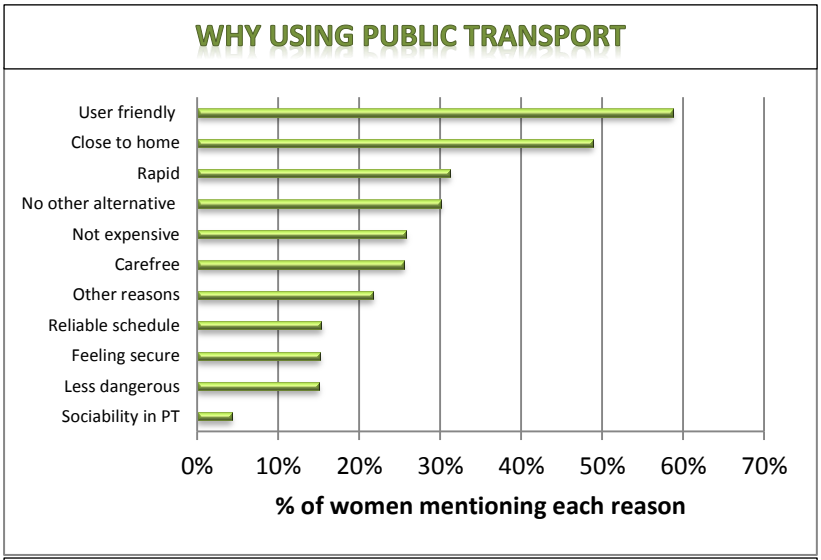


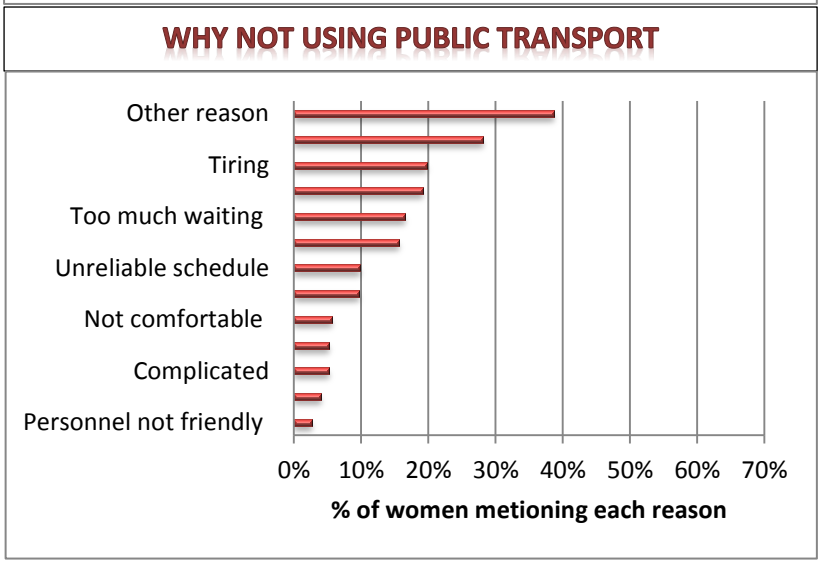
"*Shopping*" is the major reason mentioned by retired women for using the ***PT***. "*Leisure*" occupied the third position. However, the most important information brought by this result is that "*Health*" reasons and "*Administrative procedures*" occupy respectively the second and fourth position with more than 45% women mentioning them. Although less important, the mentions of "*Visiting friends or families*" as well as going to "*Club or volunteer work*", underline the role of public transport in keeping retired women active within a social network.

Overall, this pattern of aims linked to ***PT*** uses is certainly a hallmark of our population. It shows that the use ***PT*** by elderly women is not only related to what could be qualified of non-essential leisure activities, but encompasses a large array of living necessities. Furthermore, the importance of the medical visits draws our attention to the fragility and vulnerability of that population to constraints and physical obstacles that may be encountered while travelling by bus or subway.

Reasons that Motivate or Hinder the Use of Public Transport for Retired Women

The next step consisted in examining the reasons that the retired women mentioned regarding the positive or negative aspects related to their experiences or perceptions when using the ***PT***. The primarily reason mentioned by retired women to explain why they use ***PT*** is that it is easy to use: "*User friendly*". One can observe that this easiness is mentioned by nearly 60% of women whereas only 5% of them think that ***PT*** is complicated to use. The fact that the access to ***PT*** is "*Close to home*" is a particular incentive. Nearly half of the women surveyed explained that it is one of the reasons why they use ***PT***, conversely 10% of women explain that their use of ***PT*** is precluded or restricted because the access is too far from their home. Some reasons reported by the women in favour of ***PT*** refer to practicalities: "*Rapid*", "*Not expensive*", while others reasons refer to more subjective perceptions such as "*Carefree*". This notion of "*Carefree*" is made explicit in the additional comments of the respondents explaining that using ***PT*** permits to get rid of the stress related to driving in dense traffic and of parking in city centres. "*Secure feeling*" is more controversial, 15% of the women declared to feel secure in ***PT*** while 5% of them declared to feel insecure. Explaining why they use ***PT***, 30% of the women said that it is because they have "no other alternative". Although this is not a particularly positive motivation, it is an important piece of information that has to be taken into account by those who organise public transport. While examining the reasons explaining the absence or the restricted use of ***PT*** practical reasons such as "*Expensive*" can be spotted. Interestingly, negative opinions are also related to the organization and functioning of the transport network itself ("*Not convenient*", "*Too much waiting*"). However, the bulk of the reasons reported is related to adverse or uncomfortable experiences inside the vehicles ("*Crowded*", "*Tiring*"). These standpoints are further developed in the free commentaries associated to "other reason" that is the most important item of this series of negative reasons. The commentaries underline the fact that with aging, tiredness and difficulties of moving (e.g., slower movements, fragile equilibrium, problems to keep standing for a whole journey…) trips in public transport turn into a real challenge. Unfortunately, elderly women have the feeling that instead of encountering support their difficulties generate intolerance and incivility because they are slowing down the movements to get in or out of the vehicles.

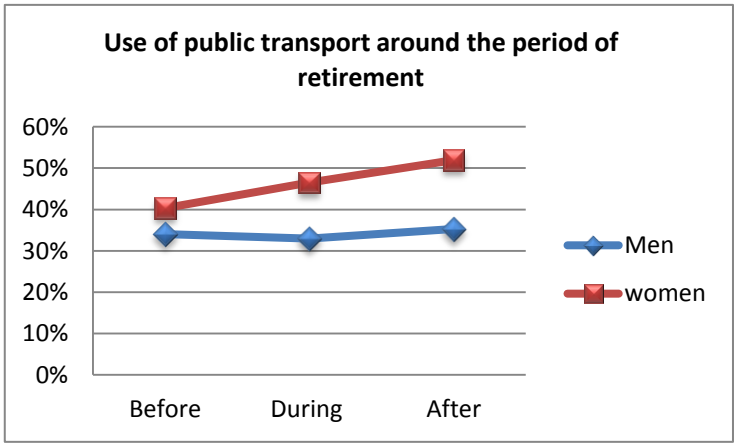




Nevertheless it must be underscored that the positive opinions were more numerous that the negative ones.

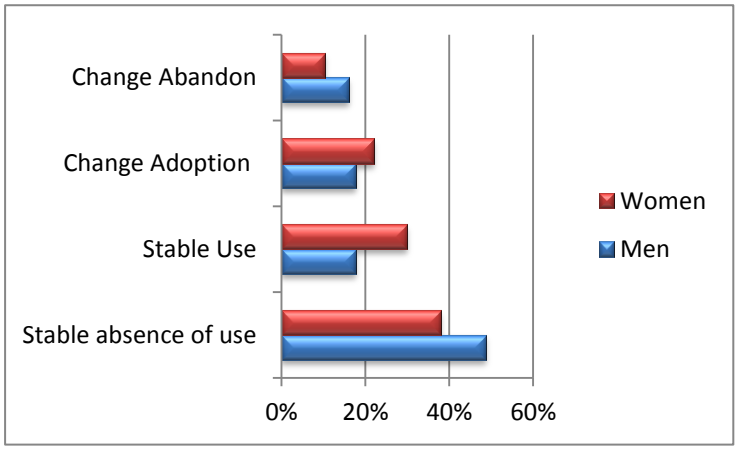
Evolution in the Use of Public Transport around the Period of Retirement

To examine how the change of status related to moving from work to retirement impacted the use ***PT,*** three five-year periods around the retirement were considered: a) the period during which the person retired, b) the period preceding this period and c) the period following the period during which the person retired. The figure shows that the percentage of women using ***PT*** increase from the period "*Before*" to the period "*After*" the period during which the person retired. In comparison, the percentage of men using ***PT*** remains stable all over these three periods around retirement.



Change in the Use of Public Transport before and after Retirement

To analyse more accurately how individuals change their habits regarding the use of ***PT,*** we compared the period preceding retirement to the period following to it. Firstly, it can be observed that only 10% of retired women abandon ***PT*** whereas they are twice as many (22%) to adopt ***PT***. On the other hand, it can be noted that the stability in use of ***PT*** observed for men at the population level hides the fact that 15% of men abandon ***PT*** while an equal proportion of them adopt ***PT***. The figure also shows that a larger percentage of men as compared to women are stable in the absence of use of ***PT*** from working period to the post retirement period. Conversely, women are proportionally more numerous than men to show a stable use of ***PT*** all over the period pre- and post-retirement.



Conclusion

Results clearly show that a larger proportion of retired women than retired men use public transport; moreover, retired women more often use public transport on a daily or weekly basis. Additionally, it comes out that once retired the women who were already using public transport before retirement keep on using them, and many of the women who were not using public transport before retirement adopt this mode of transport for their local trips. The findings establish that these trips are associated with a large array of living necessities such as shopping, but also with medical and administrative purposes.

All these evidences should incite those who plan public transport to pay a greater attention to the special needs of elderly women. Although retired women have expressed opinions broadly favourable regarding public transport, they also pointed some shortcomings of the networks. In particular they indicated that the number of bus stops is a critical point. Often, the choice is

made to reduce the number of bus stops in favour of a more rapid run time. If the public transport networks is to remain accessible to senior citizens, the distances between two stops in residential areas as well as in commercial areas should be reconsidered. Mentioning increasing difficulties due to aging, the retired women expressed reservations regarding overcrowding and problems of coexistence on the buses. These concerns could be alleviated by a careful attention to the elements facilitating access to vehicles and the conditions of comfort they offer (e.g. kneeling bus).

Reference

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Title: Woman perception on building more sustainable transport environment

Abstract: The dynamic transport development that has started at the end of XIX century is producing negative effects to all human being, which is today visible worldwide. The man-dominated car industry, created in order to serve and help to people, grow up over the accepted level of sustainability with human and environmental needs. This created a dramatic number of deaths in traffic accidents, unacceptable air pollution and degradation of our planet. Social transitions in gender equity in education and professional careers give way to implement women attitude into environmental actions. Selected research results are presented in the paper, showing gender differences in attitude to sustainable transport development. The social aspects of differences in brains between genders may explain the potential role of women in engineering in building strategies and searching for human directed solution in creation of sustainable transport.

Keywords: mobility, safety, road transport, environment

1. Introduction

The main assumptions of the work presented are based on the following reasoning:
1) The process of industrialization and the transport changes from the beginning of motorization area were ruled by the man controlled engineering world.
2) The man-dominated car industry, created in order to serve and help to people, grow up over the accepted level of sustainability with human and environmental needs. This created a dramatic number of deaths in traffic accidents, unacceptable air pollution and degradation of our planet.
3) The vision of the future disasters caused by continuing industry and transport development, make people look for sustainable solutions.
4) Social transitions in gender equity in education and professional careers give way to implement women attitude into environmental actions.
5) Today new trends are observed and necessity to gather all human potentials, also women in engineering, to correct and work on climate changes and related fields.
6) Transport engineering is producing majority of air pollution and together with global increasing mobility needs urgent thinking on sustainable transport.
7) The social aspects of differences in brains between genders may explain the potential role of women in engineering in building strategies and searching for human directed solution in creation of sustainable transport.

2. Sustainable development

Sustainable development is defined as balancing the fulfillment of human needs with the protection of the natural environment (1). A common definition of sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." The field of sustainable development can be conceptually broken into three constituent parts: environmental protection, economic sustainability, and social justice.

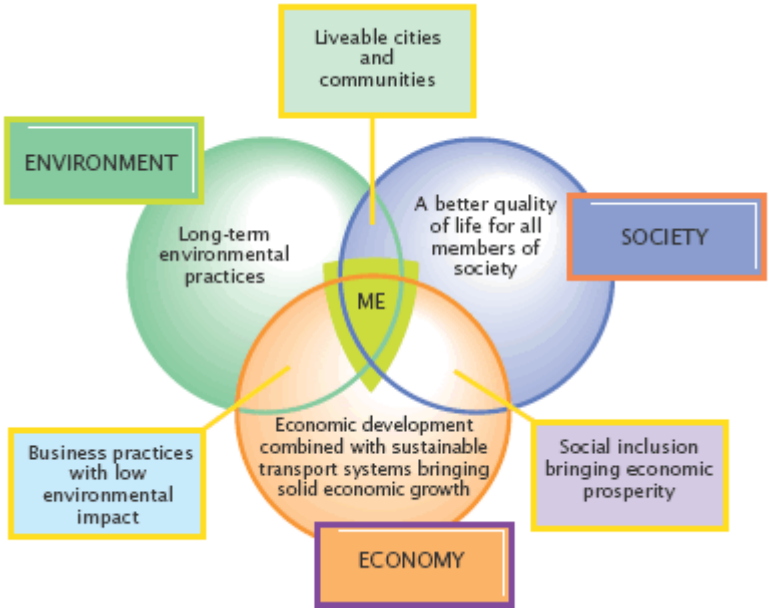

Figure 1. The Concept of Sustainable Development (Source [1]: Adapted from Ralph Hall, Introducing the Concept of Sustainable Transport to the U.S. DOT through the Reauthorization of TEA-21)

All the selected parts of sustainable development, environmental protection, economic sustainability, and social justice are related to transport sustainability in modern urban world. Sustainable transport

systems are bringing solid economic growth and a better life quality in cleaner environment especially in cities and in the large metropolitan areas. The task of creating sustainable transport development is a multi-criterion issue. Moreover, all citizens as an active transport users are directly or indirectly involved in the process of shaping the local systems of transport.

3. Sustainable public transport

Public transport offers many advantages over individual transport modes. It:

- costs less to the community,
- needs less urban space,
- is less energy-intensive,
- pollutes less,
- is the safest mode,
- improves accessibility to jobs, and
- offers mobility for all.

Public transport contributes to all aspects of urban life, and consequently transport appraisal needs to consider all of the following areas:

- **Economic** - public expenditure and income, user time savings, reliability and wider economic impacts;
- **Environmental** - noise, air quality, greenhouse gases, landscape, townscape, historic heritage and water environment;

Social - safety, security, accessibility, mode interchange, land-use policy, physical fitness and journey ambience

4. Research methods and analysis

Public transport appraisal has traditionally concentrated on assessing specific infrastructure projects, but there is increasing need to assess transport policy itself. Demand management schemes are being identified as a possible solution to tackle the congestion that hampers inter-urban and urban mobility. However, such options are difficult to assess with conventional appraisal. The very limited experience and number of practical case studies in demand management make accurate appraisal of their benefits difficult. Furthermore the impacts of demand management are also very broad; their diffuse impacts are difficult to separate from background ‘noise’ and are complicated to measure (1, 2) .

Several survey studies have been conducted in order to get insight into the gender related in sustainable transport use. The part of the results of research conducted in 2003 among Krakow metropolis inhabitants are shown in figure 2. The research took into account transport behaviours and had included 1500 inhabitants (3).

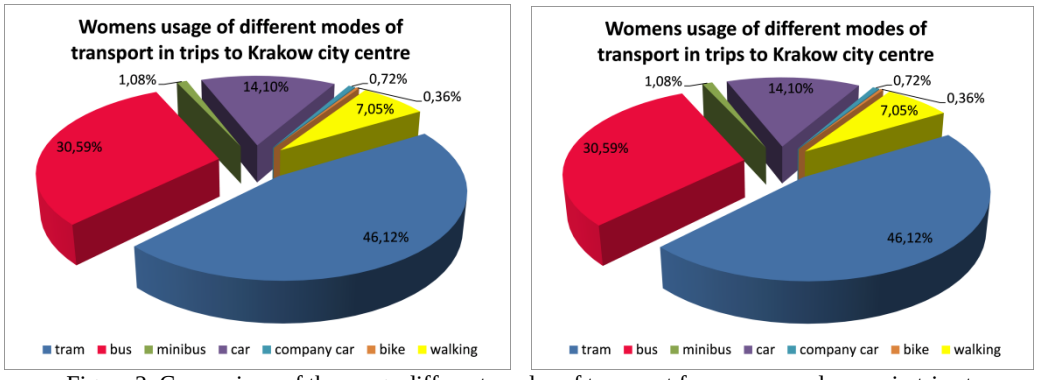

Figure 2. Comparison of the usage different modes of transport for women and men - in trips to Krakow city centre (Source: authors research based on (3))

The general comparison between men and women considering the usage of different transport modes shows that women choose more seldom the car in travelling to the city center. Car is a favourite mode to travel for about 23% of men and 14% women. Women also choose more often public transport – taking into account trips to city center slightly more than 75% of women use public transport, while tram and bus uses around 60% of men. It is important to noticed that only trips to the city center with its good accessible public transport service are taken into account (4). However, the difference in the usage of cars between men and women is similar in trips to other destinations as well.

Focusing on aspects of sustainable transport idea and supporting activities, the selected results of the research on Krakow suburbs population preferences are presented below. The research were conducted on order the Municipality of Krakow in 2007 and had included 500 inhabitants of Krakow agglomeration suburban area (5). The respondents were asked about their level of acceptance of the changes related to the implementation difficulties for car users.

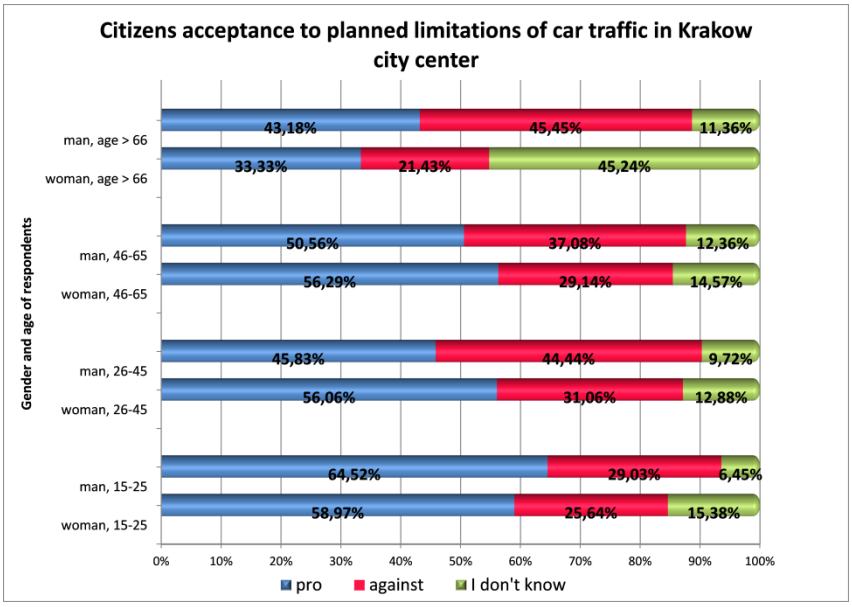

Figure 3. Citizens acceptance to extension of the charged parking zone in Krakow city centre.
(Source: authors research based on (5))

Analysis of the research results shows that slightly more women than men find the implementation limitations of car traffic in the city centre a good idea (54% of women and 49% men). In general women were less decisive in perceiving such restrictions. Strongly opposite are 28% of women (and 40% of men). The results are differential in various age group. Particularly among young women and men, there is a tendency of increasing acceptance of planned limitation changes related to the reduction of car traffic.

As shown in fig.3, less women than man disagree with car parking restrictions in their cities while considering all age groups of respondents. There are significantly more man than women who are opposing the plan of extension a charged parking zone, in each age group considered. The biggest differences between man and woman in the level of acceptance of such changes can be seen in the two age groups, namely the elderly and the young.

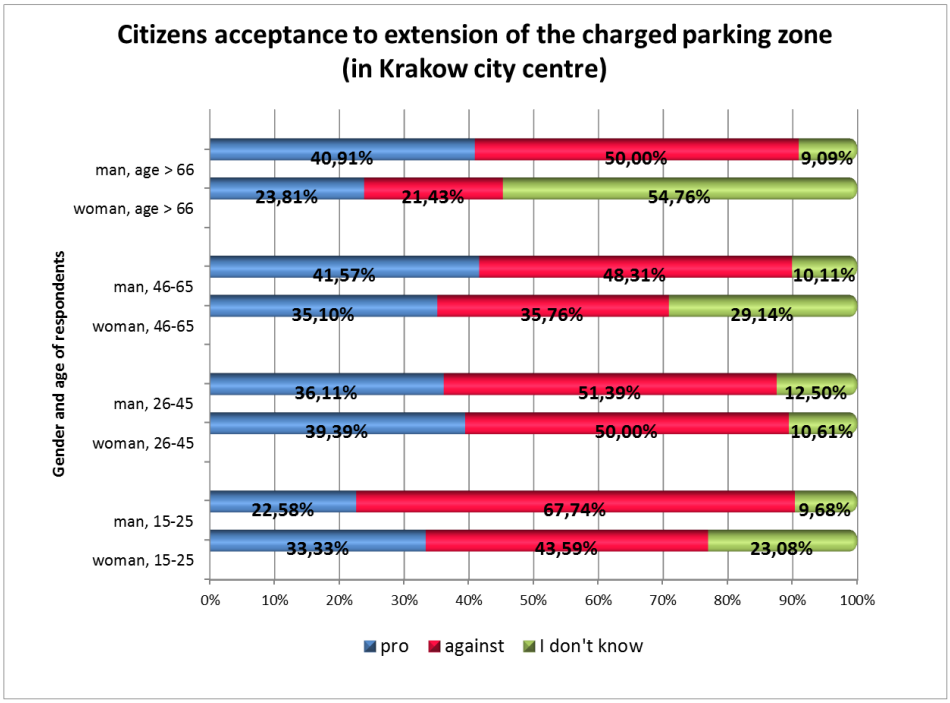

Figure 4. Citizens acceptance to extension of the charged parking zone in Krakow city centre. (Source: authors research based on (5))

The results of the oldest age group (+65) are interesting, because they show that over fifty percent of female seniors have no opinion (fig. 3). Among women over 66 years old there are 23 percent of disagree and 21 percent of those who agree with car parking restrictions in the area they live. This may result from the fact that women in older generation were not used to drive the car, when in their generation one car in family was a standard and driving this car was a man dominated task.

Several barriers of using the low energy transport were identified during the SIZE project results analysis (6) as mostly connected to the existing bad social attitudes, poor safety and security level and finally not proper infrastructural design. Walking, cycling and using public transport can be as beneficial for individual senior as for all society: sustainable mobility increases energy efficiency. Many trips in urban areas can be shifted to sustainable modes, since physical accessibility has improved in recent years. There are still mental barriers and it is necessary to convince older people that there are convenient alternatives (7). The recommendations developed constitutes basic principles for the implementation of measures (8, 2). Transport and mobility preconditions will improve the quality of life of senior citizens if they are shaped according to the needs and interests of senior citizens, and if information about existing options and possibilities is distributed accordingly. Finally, most of the measures that bring more friendly transport for olderly women are also good for all transport users, especially for young pregnant woman and those with small children.

5. Conclusions

Both theory and practice shows that sustainable transport systems are bringing solid economic growth and a better life quality in cleaner environment especially in cities and in the large metropolitan areas. Building in Europe the sustainable public transport is concerned as a high priority and urgent task. Recent research studies in European Community are directed to multi-criterion public transport appraisal, considering economic, environmental and social aspects of transport needs and practices.

Selected research results presented in the paper show the gender differences in perceiving sustainable transport development. Women equally with men participate in social life, but they use urban facilities and public transport in more sustainable way. Women appreciate social and environmental issues in selecting their transport needs and transport behaviour. The social sensitivity of women, make women

an important and significant actor in engineering world, in building searching for human directed solutions in creation of sustainable transport and better life quality.

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Gendered Perceptions of Positioning Technologies

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Abstract

The aim of this study is to investigate gendered perceptions of three potentially privacy-invasive technologies relevant to daily mobility – video surveillance (CCTV), positioning via mobile phone, and radio-frequency identification (RFID) tags – via contrasting scenarios and items measuring factors such as acceptance and desirability. Gender analysis indicates that females may favor more anonymous forms of surveillance. Also, that females, to a *lesser* degree, find it appropriate to use technologies, are willing to search for information about or are willing to discuss the technologies. The interaction of parenthood and gender is also explored, where parenthood also proves to affect males and females differently, where female non-parents often perceive technological applications less favorably than do other groups by having heightened risk perception, lower trust, lower acceptance, etc. These results, combined with an overall lack of willingness to discuss with influential parties (elected representatives or relevant authorities or companies) and a lack of willingness to search for information about a technology regardless of ratings of acceptance or privacy-invasiveness, lead the authors to submit that the respondents, and perhaps females even more so, feel a sense of resignation towards technological development. This may have broad implications for decision-making and democratic processes, as perceived lack of influence and perceived lack of interest in participation feed back into each other, which may further divide laypersons from experts, companies, and authorities, and entrench the gendered nature of surveillance.

Keywords
surveillance, gender, parenthood, mobility, privacy, risk, trust, acceptance, positioning, CCTV, RFID

1. Introduction

Data, data collection, and Information and Communication Technology (ICT) are not only pervasive in modern society; they are also considered the tools by which society will progress in this age of knowledge production and service provision. Within transportation, so-called Intelligent Transportation Systems (ITS) include sensors, cameras, global positioning systems (GPS), real time information, radio frequency identification (RFID), smart cards, etc., all of which are envisioned to aid in optimizing and managing travel and mobility, both on an aggregate level (flows) and on an individual level (choices). As personalization of services increases and alternatives to using these technologies become increasingly scarce (e.g. one cannot practically avoid CCTV or RFID if one needs to use public transportation), the picture of our movements

and activities becomes increasingly detailed. Does the pervasiveness of these technologies translate into general acceptance or desirability? How is acceptability linked to perceptions of privacy, risk, and trust for the data collectors? How does context influence these perceptions? Are perceptions of these technologies gendered?

The aim of this article is to investigate gendered perceptions of three potentially privacy-invasive technologies relevant to daily mobility – video surveillance (CCTV), positioning via mobile phone, and radio-frequency identification (RFID) tags – via contrasting scenarios and items measuring factors such as acceptance and desirability. We also explore the interaction of gender and parenthood. However, in order to discuss these perceptions, we first need to have some sort of understanding of risk perceptions and how they relate to socio-demographic characteristics, as well as of surveillance concerns and the potentially gendered nature of surveillance technologies.

The structure of the article is as follows: Section 1 discusses risk perception and surveillance; Sections 2 describes the method and material used in the study; Section 3 presents results of the study; Section 4 includes a discussion of the results and conclusions; and Sections 5 and 6 contain the acknowledgements and references, respectively.

1.1 Risk Perceptions

Formal definitions of risk vary, but often include a probability assessment based on statistics or expert opinions, e.g. the probability of an event with negative consequences. However, this technical definition has been criticized by e.g. Slovic (2001), who points out that experts' and laypersons' opinions alike are subject to value judgments and context, e.g. "framing" consequences in different but statistically equivalent ways (benefit vs. loss), and that many factors affecting risk perception are not included in theoretical, technical models of risk, e.g. inequity, control, voluntariness, and trust.

Framing a risk as general versus personal affects perceptions as well. This is also known as "unrealistic optimism" (Weinstein, 1980), where people think that bad things are more likely to happen to others and good things to themselves. Sjöberg (2000) also finds evidence of such "risk denial", where risk for oneself and one's family are both rated lower than risk for the general public, and that the "risk target" affects perceptions, where "no target" and "any one person" results in the same ratings as general risk.

Trust has also been proposed as a determinant of risk perception. In Sweden, trust in science has been found to play a more important role than social trust, emphasized in the United States (Drottz-Sjöberg and Sjöberg, 2003). Slovic (1999) points out that trust is subject to the "asymmetry principle", where distrust has the advantage as negative, trust-destroying events are more visible, influential, and psychologically believable. Distrust is also self-perpetuating and low trust for those defining and managing risk will also lead to low trust in their risk assessments. Trust is easy to destroy and hard to build.

Socio-demographic Factors

Socio-demographic factors such as gender, race, political affiliation, etc., are also important in explaining risk perceptions. Enander (2005) reviews how perceptions of security measures are affected by socio-demographics – gender, age, parenthood, civil status, and foreign background. She found that: women have higher perceptions of risk, worried more, and found the measures less inconvenient and more worthwhile than men; risk awareness increased with age and older people found security measures more worthwhile while younger people found them more inconvenient; parenthood and living with someone both increased risk awareness and lead to the adoption of more security measures; friends and family were considered important sources of information regarding risk; and people with foreign backgrounds were more risk aware but less prone to adopt security measures.

Previous research also shows the importance of interactions between socio-demographic factors. Studies from the United States have identified a so-called "white male effect" where white males perceive the world as safer and risky activities as more beneficial compared to other groups (e.g. Flynn et al., 1994; Finucane et al., 2000). Olofsson and Rashid (2011) investigated this effect in Sweden and concluded that it should be called a "societal inequality effect" instead. They found that in the relatively more gender equal Swedish society, foreign background, as a mediator of social inequality, etc., had a much greater effect than did gender. No matter the basis of social inequality, these studies clearly illustrate the importance of considering views of minority groups in each society.

Clearly risk is an elusive concept that depends on many factors, such as socio-demographic characteristics, context, framing, and statistics. As much as our modern society tries to minimize and control risk, Beck (1992) argues that we now live in a risk society, which, despite its futile attempts to eliminate risk, actually creates new risks. Lyon (2001) maintains that one such example is data collection, or surveillance, defined as "any collection or processing of personal data, whether identifiable or not, for the purposes of influencing or managing those whose data have been garnered" (Lyon, 2001:2).

1.2 Surveillance

Lyon (2001) argues that an information society is a surveillance society, as surveillance data flows are becoming general institutionalized phenomena creating webs of surveillance, reminiscent of Castells' network society in which "the key social structures and activities are organized around electronically processed information networks" (Castells, 2001). Even our relationships and activities are increasingly achieved via data flows, as we no longer need to be present to work, conduct business, or socialize. Already several years ago, the European Union stated that it is practically impossible for individuals to keep track of all the electronic traces they leave or take precautions regarding them (EPTA, 2006). Solove (2010) argues that the more fundamental problem is this powerlessness of the individual to control their personal data. This aspect of control is an important element of the concept of privacy (as related to personal data), as reflected in Westin's definition from the 1960s: "the claim of individuals,

groups, or institutions to determine for themselves when, how, and to what extent information about them is communicated to others" (Westin, 1967:7).

Another key factor in surveillance and privacy is context, as we do not share the same information with everyone. Nissenbaum (2010) argues that privacy concerns are concerns about "appropriate flows of control" that are dependent on contextual, social norms. Surveillance (personal data collection and processing) is not necessarily the issue per se as it can be beneficial in the right context. Rather it is linked to the ability to develop into an autonomous individual, as well as to power and control, privacy, and social inclusion/exclusion. As we will now see, the social context in which surveillance is exercised is also relevant to consider.

Surveillance in a Social Context

Although one may consider technology to be neutral or objective, treating all individuals in the same way, it is used in social and institutional contexts which are likely not neutral. Monahan (2009) argues that surveillance technologies operate on an abstract level and are not objective, but objectifying; that the stripping of social context and turning individuals into data enforces masculinized representations of the world. "In other words, exercises of power are rendered invisible by nature of the supposed neutrality of technologies, such that the sociotechnical sorting of the world is normalized" (Monahan, 2009:291).

Koskela (2000) argues that (video) surveillance (CCTV), for example, is inherently gendered, as those who decide to install surveillance devices and subsequently the surveillance operators (police and security guards) tend to be male. And although CCTV is often installed in public spaces and transit environments, women are still relatively more fearful in such places do not view technology as a substitute for staff presence (Loukaitou-Sideris, 2009). Perhaps because CCTV is not generally preventive and cannot undo damage already done, and it cannot even "see" some threatening situations such as verbal harassment. In interviews with women in Helsinki, Koskela (2002) found that surveillance evokes mixed feelings of both increased security and mistrust towards their effectiveness as well as towards those behind the cameras. A Swedish study, however, found that women held significantly more favorable attitudes towards CCTV in terms of reducing crime, increasing their sense of assurance, and not invading their privacy (Lindkvist et al., 2002), although no statistically significant gender effects were found in Oslo (Sætnan, Dahl, and Lomell, 2004). And despite containing a very relevant discussion into the potential effects of ITS and location-based services on women (including privacy aspects), Cottrill and Thakuriah's study (2009) is based on non-response rates in a Chicago-area household travel survey, rather than on any direct study of women's perceptions of ITS and privacy. In general, more research is needed in investigating the effects of technology on women's mobility experiences, and women's perceptions of those technologies.

Themes of Care, Control, and Convenience

Care, control, and convenience are common themes within discussions of surveillance technologies. For example, Lyon (2001) discusses the dual nature of surveillance (care and control) and also points out that surveillance is usually motivated by good intentions and "plausible justifications" such as safety, security, convenience, or efficiency, which fosters compliance. These themes are also relevant for the technologies of focus in this article, as exemplified below.

For CCTV, control is not only relevant in terms of trying to manage risk or space, or in the lack of control over privacy and personal data as touched upon above, but also in the sense of CCTV not empowering the person under surveillance. Those on the receiving end can only *hope* that the CCTV system is monitored, that negative events will be identified in a timely manner, that help will be dispatched accordingly, and that one can trust the surveillance owners and operators. As Koskela (2000) points out, being "under control" is not the same as being "in control", which, although potentially unpleasant, can increase one's sense of assurance (Sochor, 2013, 2014).

Although there are many positioning services targeted towards social networking, some are particularly geared towards "care", e.g. finding people or getting help in emergency situations. However, the same locator service or software that can "give you peace of mind and protect you and those you love against dangerous situations" (MTN WhereRU, 2013) can also be used to secretly track partners, children, and employees, or even stalk victims. Mason and Magnet (2012) argue that new surveillance technologies are more frequently used to stalk victims than they are to protect victims. From this perspective, surveillance technologies are, again, not neutral, but reflect the cultural contexts in which they are used.

Masters and Michael (2007) reviewed the applications of RFID within the framework of control, care, and convenience. They found that although care and convenience are often the justifications of use, control was the common, dominant theme. Günther and Spiekermann (2005) found that consumers' trust in RFID was dependent on their feelings of control over the technology. Also, those with higher formal education felt even *less* in control, which calls into question the effectiveness of the common expert response of "educating the public" (i.e. to attempt to align public opinion with expert opinion) in the face of risk (Söderberg and Wester, 2012).

We will now introduce the study and describe how applications of CCTV, mobile phone positioning, and RFID have been developed into scenarios. Furthermore, we will outline the survey questions developed from studies of risk and privacy perceptions.

2. Method and material

In the study presented in this paper, factors related to risk and privacy concerns are used to assess the Swedish public's acceptance of privacy-invasive ICT solutions. The questionnaire consisted of twelve scenarios (developed in cooperation with researchers at FOI, the Swedish Defense Research Agency); six potentially privacy-invasive technologies – retinal scanning, video surveillance, mobile phone positioning, e-mail monitoring, RFID tags, and DNA registration – each described in two different ways. For each scenario, one variable was altered in order to investigate if this manipulation would influence perception of the technology and is described below. Each participant was assigned two random scenarios (although not two scenarios within the same technology category), and answered in total 24 questions and rating statements after each scenario covering themes found within the above discussion of risk perceptions and privacy concerns. TNS SIFO International, a Swedish research company working with opinion polling, administered the individual, online questionnaires, and recruited the participants so as to represent the Swedish population in terms of gender, age, and region. In addition the participants were presented with background questions.

As the data is extensive, this article concentrates on the three technologies most relevant for today's urban mobility – video surveillance (CCTV), mobile phone positioning, and RFID tags – and two explanatory variables – gender and parenthood. For these three technologies, 21 items were selected for analysis in this article[1]. In total, 1196 participants' responses are included in this analysis.

Each of the technologies is described in two different scenarios. The video surveillance scenarios (designated "CCTV ID" and "CCTV no ID") differ in how easy it is to identify individuals in the recordings. Both scenarios are based on the local municipality installing CCTV cameras in your local town square in order to improve safety and security. The cameras are visibly placed in order to have a deterring effect and are connected to a manned surveillance center. The

[1] The questions/rating statements are described here in the order in which they are presented in the figures and tables (19 of 21 items). The results for the two items regarding who should be allowed to use the technology and with whom the participants would be willing to discuss the technology are presented in the text.
Left radar graph clockwise from the top (figures), and Q1-6 (appendices), "yes" or "no" response:
The technological application is privacy invasive: the participant would actively avoid it; the participant would search for information about it; it is acceptable; it improves society; and the risk for misuse of collected data is worth taking for society.
Right radar graph clockwise from the top (figures) and Q7-19 (appendices), response on a 1-5 scale:
The technological application makes society more vulnerable; the participant worries over its use; the participant is offended or upset by its use; the level of risk for misuse of collected data; the participant's trust for the data collectors; data collection is necessary; data collection is useful; it makes society safer or more efficient; it is effective in reaching the desired goal; it has many (dis)advantages; it is good-bad; the participant wants it; the participant would actively request it.

recordings are saved for three months. However, in Scenario "CCTV ID", the cameras will make it easier to identify persons if a crime is committed, while in Scenario "CCTV no ID", the cameras are equipped with software that de-identifies faces, making it hard to identify individuals.

The mobile phone positioning scenarios (designated "Phone Positioning" and "Phone Police") differ in the police being able to activate the positioning function or not. Both scenarios are based on a new service offered by your mobile phone provider that enables one to see the position of a mobile phone with a certain telephone number. The information is shown on a map accessed via a password-protected website. The positioning functionality is built into most mobile phones, but one must actively register in order to access the service. Scenario "Phone Police" goes on to describe how the police can activate the positioning function under special circumstances and without having to notify the subscriber.

The RFID scenarios (designated "RFID Travel" and "RFID Clothing") differ in the type of company using the personal information gathered via the RFID tags in order to improve or tailor their services. "RFID Travel" describes how you have many different cards using RFID technology, e.g. access cards at your workplace, public transportation travel cards, and a transponder in your car for paying road tolls. The information from these cards can be connected to you and your habits. You use your public transportation card daily by holding it up to a special card reader. Information about your trips is saved for three months and is used by your public transportation provider to improve their services, e.g. more frequent departures or new stations. "RFID Clothing" describes how there are many areas of application for RFID technology, e.g. access cards at work, public transportation travel cards, and marking goods for transportation and in stores. These RFID tags can be placed inside clothing, and special readers can get information about your clothing. This means that when you go into the (clothing) store, a salesperson can see where you bought your clothes and how much they cost. The store can make tailored offers based on this information.

To facilitate the flow of reading, aggregate responses (percentage "yes" answers and average ratings) can be found in Table 2. Asterisks indicating statistically significant differences between two scenarios (for a specific technology) or between participant groups (for a specific scenario) are placed in the figures and can also be found in Table 3 (* for $\alpha = 5\%$ and ** for $\alpha = 1\%$). The analysis has been performed using the statistical software package SPSS.

3. Results

The results are presented as follows: first, the socio-demographic characteristics of the participants; then, the participants' general attitudes towards the technologies and across scenarios. Finally, the effects of gender are explored, as well as the interaction of parenthood and gender.

3.1. Demographic characteristics

Table 1 provides an overview of the socio-demographic characteristics of the participants who received the six scenarios (about three technologies) presented in this article. The characteristics of this subgroup closely mirror those of the entire participant group, which is representative of the Swedish population in terms of gender, age, and region.

Table 1: Socio-demographic characteristics of the participants (in the discussed scenarios).

Demographic	Category	Number	Percentage
Participants	-	1196	100%
Gender	*Male*	596	49.8%
	Female	600	50.2%
Parent	*Yes*	909	76.0%
	No	287	24.0%
Gender × Parent	*Male Parent*	454	38.0%
	Male Non-Parent	142	11.9%
	Female Parent	455	38.0%
	Female Non-Parent	145	12.1%
Age	*16-24*	37	3.1%
	25-34	172	14.4%
	35-44	256	21.4%
	45-54	276	23.1%
	55-64	260	21.7%
	65+	195	16.3%
Region	*Large Town*	347	29.0%
	Medium Town	549	45.9%
	Countryside	300	25.1%

3.2. General attitudes towards technologies and across scenarios

The participants clearly considered CCTV the most positively of the three technologies: non-privacy invasive, acceptable, effective, etc. Neither were participants worried over or upset by its use. However, this did not lead to particularly low ratings of risk for data misuse, or particularly high ratings of trust for the data collector, of the necessity of data collection, or of actively requesting the technology. The possibility to identify individuals (or not) had little influence on the ratings between the two scenarios, although, as can be seen in Figure 1, “CCTV ID” received significantly higher ratings for the usefulness of data collection and for the risk of data misuse being worth taking in society.

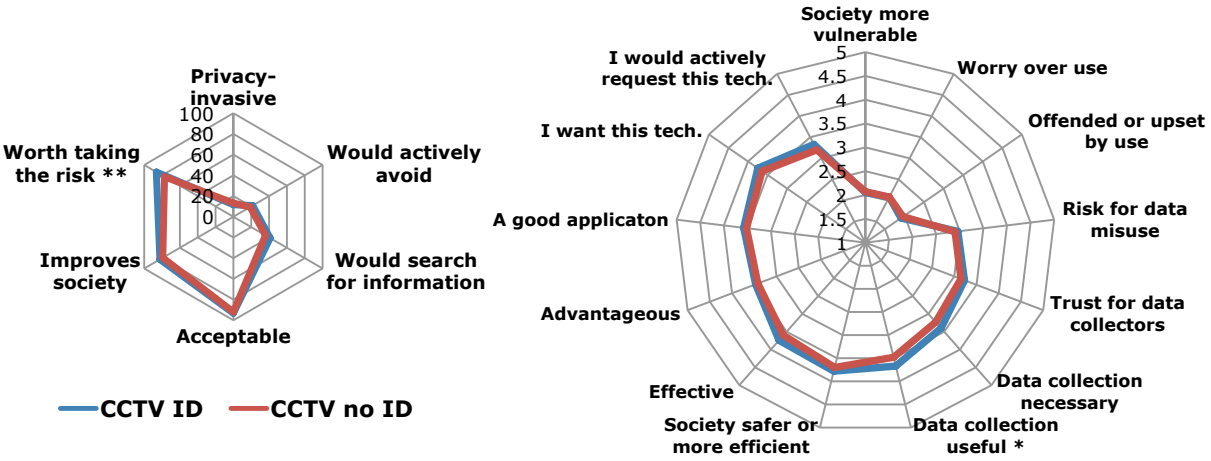

Figure 1: "CCTV ID" vs. "CCTV no ID" scenarios; percentage "yes" (left) and mean rating 1-5 (right); * for α = 5% and ** for α = 1% for χ^2 (1) (left) and t (right); † sig. results fall on opposing sides.

Positioning via mobile phones received more mixed results, as 52.8% of participants considered it privacy invasive and 37.6% thought that it improves society. Despite this, a majority found it acceptable and a minority would actively avoid it. Data collection in this context was not considered necessary, but perhaps useful. Trust for the data collector was lower and the risk for data misuse higher compared to CCTV. The participants were not generally worried over or upset by its use, although the ratings were higher than for CCTV. The possibility for the police to activate the positioning function even without notifying the subscriber induced a relatively more positive response. As can be seen in Figure 2, "Phone Police" was considered significantly more acceptable, effective, and received significantly higher ratings for improving society and making it safer or more efficient. It also lead to significantly greater trust for the data collectors, to considering data collection significantly more useful and necessary, and to significantly fewer stating that they would actively avoid it. Despite this relatively more positive response, the ratings for "Phone Police" did not manage to reach the positive levels of CCTV.

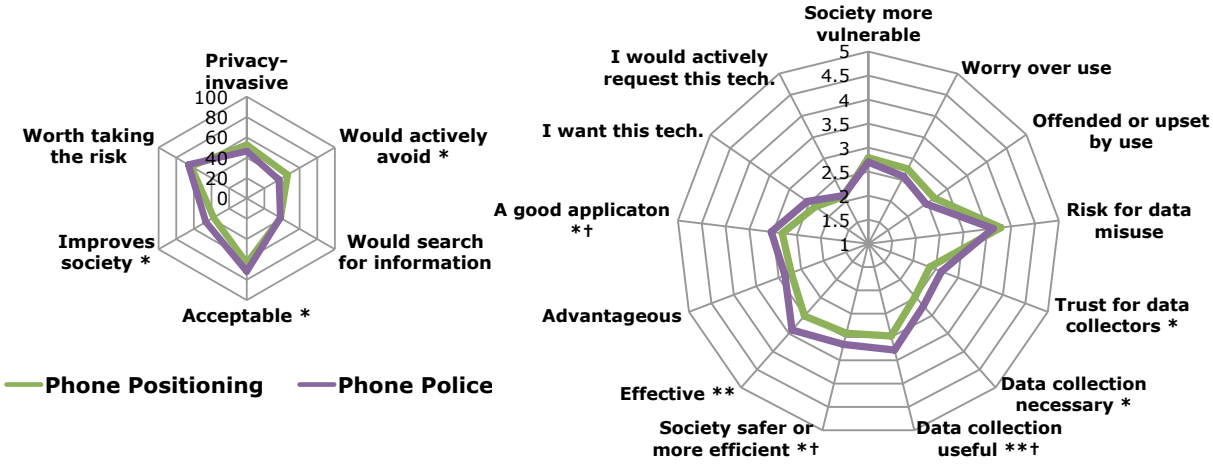

Figure 2: "Phone Positioning" vs. "Phone Police" scenarios; percentage "yes" (left) and mean rating 1-5 (right); * for α = 5% and ** for α = 1% for χ^2 (1) (left) and t (right); † sig. results fall on opposing sides.

The RFID scenarios elicited the most extreme differences in responses (see Figure 3). The responses to "RFID Travel" generally fell somewhere between the CCTV scenarios and "Positioning Police", i.e. it was considered non-privacy invasive, acceptable, fairly effective, etc., and participants were generally not worried over or upset by its use. The ratings for trust, risk for data misuse, and the necessity of data collection were slightly unfavorable, and that for the usefulness of data collection slightly favorable. On the other hand, "RFID Clothing" was clearly considered the most negatively of all the scenarios and in a fairly consistent manner across the board. It was by far considered the least acceptable and the most privacy-invasive and it was the only scenario where the majority of participants stated they would try to actively avoid this application of the technology and where a majority stated that the risk for data misuse was *not* worth taking in society. It received the lowest ratings for desirability (I want this tech.), for trust in the data collectors, and for the necessity of data collection. But surprisingly, the rating for risk for data misuse was not much higher than that of "Phone Positioning". Neither did the dislike for "RFID Clothing" lead to particularly unfavorable ratings for making society more vulnerable, or for being worried over or upset by its use, even if the ratings were more unfavorable than the ratings for the other scenarios.

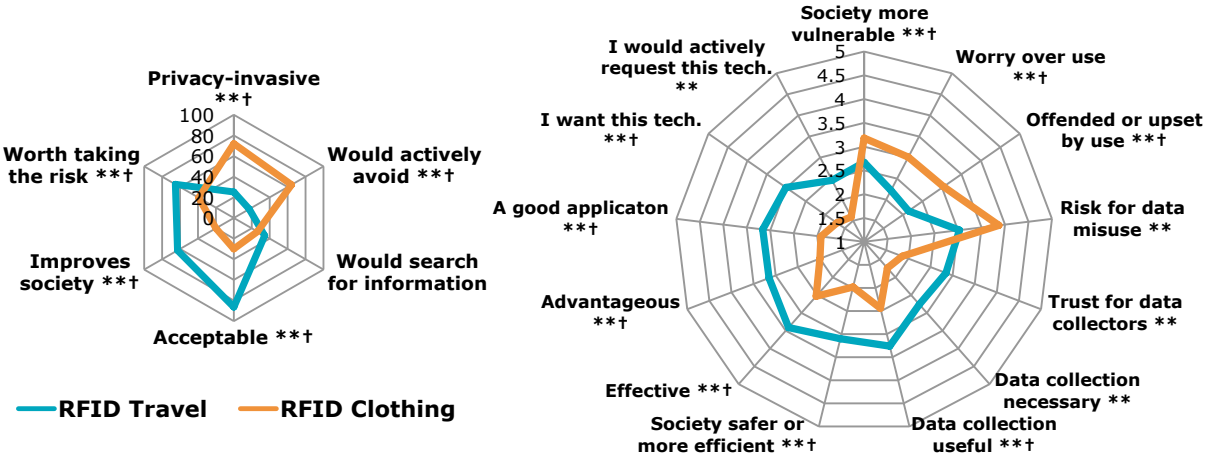

Figure 3: "RFID Travel" vs. "RFID Clothing" scenarios; percentage "yes" (left) and mean rating 1-5 (right); * for α = 5% and ** for α = 1% for χ^2 (1) (left) and t (right); † sig. results fall on opposing sides.

Curiously, participants' willingness to search for information about the technological application in question was fairly constant over the scenarios, where 26.4-41.2% stated "yes", they would search for information. The application with the highest acceptability rating ("CCTV ID") received the highest percentage of "yes" answers for searching for information, while "RFID Clothing" (with the lowest acceptability rating) received the lowest percentage. The survey also asked if each of the following groups should be allowed to use the technology: persons of age, parents, guardians (and should not be used). Again, no clear pattern emerges, although "Phone Police" received the highest percentage of "yes" responses for the groups parents (39.3%) and guardians (48.4%); "RFID Travel" received the highest percentage for persons of age (49.2%) and the lowest percentage for shouldn't be used (12.4%); and "RFID Clothing" received the lowest percentage for persons of age (19.2%), parents (10.4%), and guardians (15.6%), and 48.8% stated that it should not be used.

One final aspect which did not yield the expected differences across scenarios, although the results are interesting nonetheless, was in asking the participants to what degree they would be willing to discuss this technological application with the following groups: work colleagues, relevant authorities, relevant companies, their elected representatives, and their family and friends. In all six scenarios, family and friends was the highest rated option, $\bar{x} \in [3.25, 3.60]$, followed by work colleagues in second place, $\bar{x} \in [2.71, 3.14]$. The other three groups' averages do not reach the value of three on a 1-5 scale in any scenario, $\bar{x} \in [2.13, 2.58]$. The potential implications of this will be discussed below.

3.3. Gender's influence on attitudes

Gender proves to have mixed effects on attitudes towards privacy-invasive ICT solutions. Note here that this discussion is about *relative* differences between females and males, i.e. while both groups may think in the "same" way in general (e.g. both groups' averages are over (or under) three, or both may have majority yes (or no) answers, one group's attitudes can be significantly more favorable or unfavorable. In the case that the groups' averages are significantly different *and also* fall on opposite sides of the scale (e.g. one average above 3 and one below), this will be specifically indicated by a † symbol in the text and figures.

For the CCTV scenarios, there were almost no statistically significant differences between females and males. However, the trend was that "CCTV ID" yielded more favorable responses from males (11 of 18 points[2]), while "CCTV no ID" elicited higher favor from females (14 of 18 points), indicating that women may have a slight preference for a more anonymous form of video surveillance.

The "Phone Police" scenario also tended to be viewed more favorably by males compared to females (14 of 18 points, 2 significant differences), while females viewed "Phone Positioning" slightly more favorably than did males (10 of 18 points). However, in comparing the scenarios for each gender, the effect of the police did elicit more favorable responses among both males and females, including both groups having perceived the "Phone Police" scenario as significantly more effective († for females) than "Phone Positioning". For males, "Phone Police" was also considered significantly more acceptable, with higher ratings of trust, data collection more necessary and useful (†), society safer or more efficient (†), and a good application of technology (†) (see Figure 4).

[2] Here we also exclude the point on willingness to search for information, as we do not feel this reflects any particular favorable or unfavorable attitude.

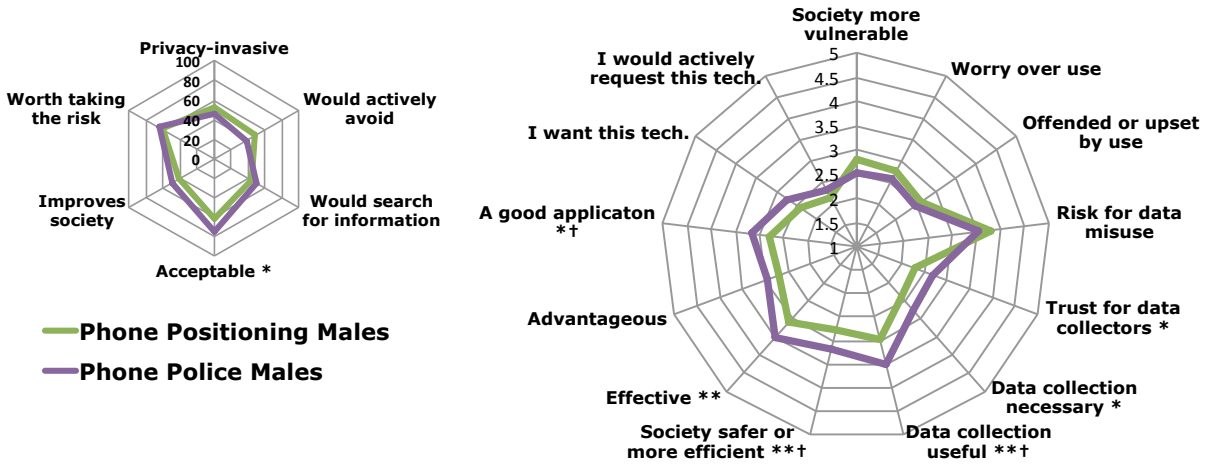

Figure 4: "Phone Positioning" vs. "Phone Police" scenarios for males; percentage "yes" (left) and mean rating 1-5 (right); * for α = 5% and ** for α = 1% for χ^2 (1) (left) and t (right); † sig. results on opposing sides.

For RFID, the "RFID Travel" scenario was more favored by females (12 of 18 points), who found it significantly less privacy-invasive, would less actively avoid it, and rated the risk for data misuse as lower (†). "RFID Clothing", on the other hand, was more favored by males (17 of 18 points), who agreed to a significantly greater extend that it improved society and made society more safe or efficient, was worth taking the risk, that the data collection was necessary and useful, that it was advantageous and a good application, and that they wanted and would actively request this technology. However, it can be pointed out that among each gender group, "RFID Clothing" was perceived far more negatively than was "RFID Travel", with significant differences in all 18 points for females and in 17 points for males (excepting "society more vulnerable").

In terms of searching for information, neither males nor females were particularly interested, although males were relatively more interested (males 35.5-50.0% and females 17.5-36.2%). However, males showed a greater interest in all but one scenario ("CCTV no ID") and this difference was significant in the cases of "CCTV ID", "Phone Police" and both RFID scenarios. And regarding which groups should be allowed to use the technology, results show that males generally feel it is more appropriate for more groups to use a technology compared to females. Males responded "yes" more often than females across all three groups (persons of age, parents, guardians) for 4 of 6 scenarios – "CCTV ID" (significant for guardians), "Phone Police" (significant for persons of age), "RFID Travel" (significant for parents and guardians), and "RFID Clothing" (significant for persons of age). It was vice versa for "CCTV no ID", where females responded "yes" more often. "Phone Positioning" was mixed where males responded "yes" more often for persons of age and parents, while women responded "yes" significantly more often in the case of guardians. This indicates that males generally feel it is more appropriate for more groups to use a technology compared to females.

Results also show that males are also more willing to discuss technological applications than are females. Out of 30 situations (6 scenarios x 5 potential discussant groups) males gave a higher average rating in 25 of them, including in all 5 of those situations that yielded a significant difference between genders. Both males and females followed the general trend, with the highest willingness to discuss in the case of family and friends followed by work colleagues (in all scenarios), and with ratings lower than three for all other discussant groups in all scenarios.

3.3. Parenthood's influence on attitudes

As one aim of this article is to explore the interaction of parenthood and gender, the focus here will be on briefly describing the effects of parenthood in order to set the stage, rather than on exploring the effects in depth. The general trend across the scenarios (with the exception of "RFID Clothing") is that parents had more favorable attitudes towards the technological application in question (with higher positive effects and lower negative effects), e.g. more effective, society more improved and more safe and efficient, higher trust for data collectors, lower risk for data misuse, less privacy-invasive, less worried and upset. Looking across scenarios by question, parenthood influenced responses to all questions in at least one scenario (with the exception of willingness to search for information). Note again that this discussion is about *relative* differences between parents and non-parents, as was the case in the discussion regarding females and males above.

The two most extreme examples of the influence of parenthood, where "CCTV ID" elicited significant differences in 13 of 19 questions and "Phone Police" in 16 of 19 (see Figure 5), both of which offer the potential to help if something happens, albeit after the fact and via the authorities. Although the same trend applies in the other scenarios (with the exception of "RFID Clothing"), there were fewer significant differences: 8 of 19 questions for "CCTV no ID" and only one to three questions in the remaining three scenarios ("Phone Positioning", "RFID Travel", and "RFID Clothing", where the one significant difference showed that parents were the more negative).

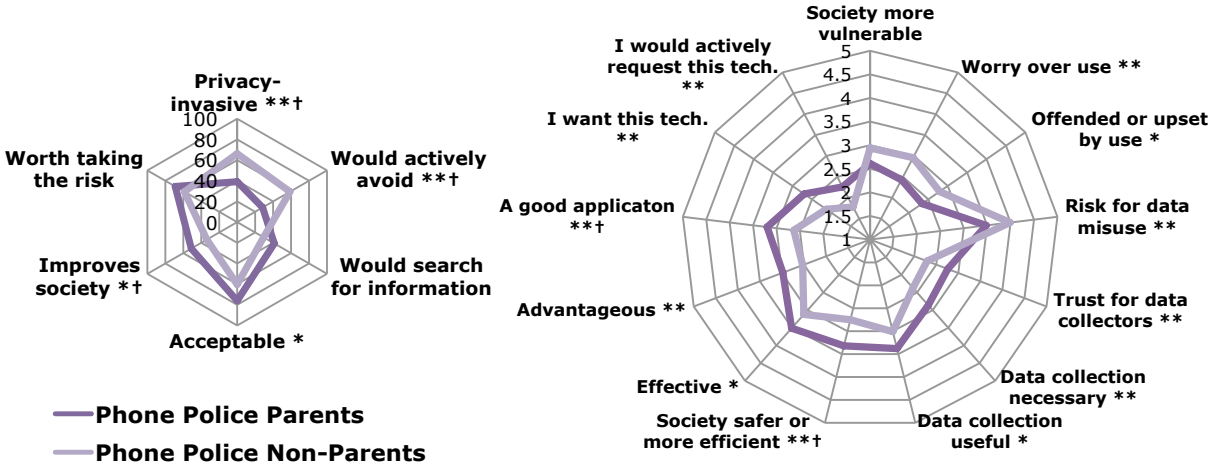

Figure 5: "Phone Police" scenario for parents vs. non-parents; percentage "yes" (left) and mean rating 1-5 (right); * for α = 5% and ** for α = 1% for χ^2 (1) (left) and t (right); † sig. results on opposing sides.

3.4 Does parenthood affect males and females differently?

In the initial analysis, parenthood and gender proved to be the strongest explanatory variables, but does parenthood interact equally or in the same ways with males and females in this study? The answer proves both interesting and complicated, although the general conclusion is that parenthood affects females' attitudes to a greater extent than it does males' attitudes (and in different ways), although differences were only found in a subset of scenarios.

In terms of the scenarios, "Phone Police" triggered parental reactions in both males and females, and both CCTV scenarios revealed differences for female parents versus non-parents. On the other hand, "Phone Positioning" and "RFID Travel" revealed few differences, and "RFID Clothing" proved impervious to such effects. All of the questions except for searching for information were affected in at least one scenario for females (parents versus non-parents), whereas only eight questions were affected in at least one scenario for males. Overall, privacy-invasive, worry, and society safer or more efficient were affected the most frequently for females (in at least three scenarios), and society safer or more efficient for males (in two scenarios). This will be discussed further below.

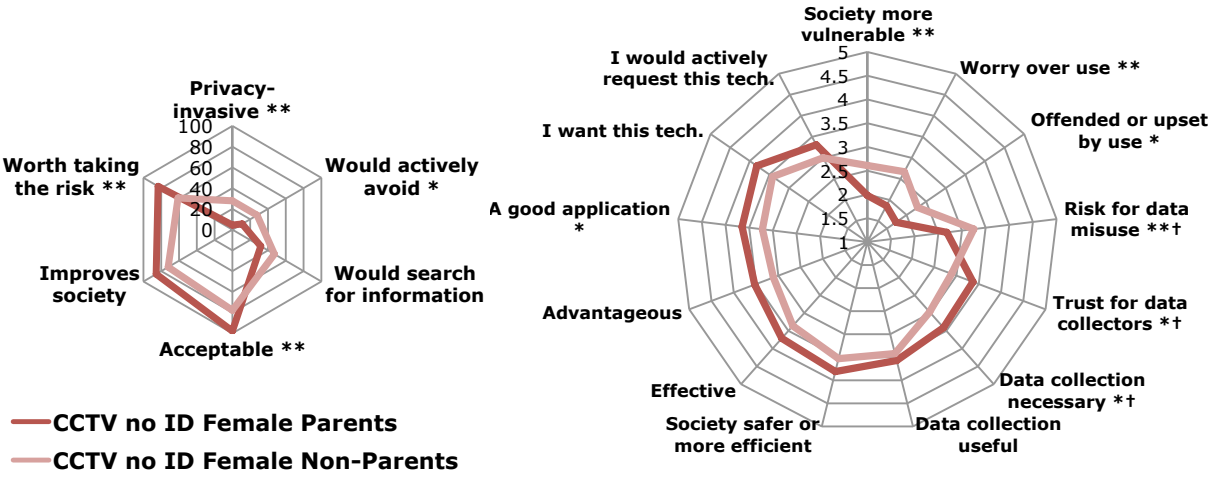

Figure 6: "CCTV no ID" scenario for female parents vs. female non-parents; percentage "yes" (left) and mean rating 1-5 (right); * for α = 5% and ** for α = 1% for χ^2 (1) (left) and t (right); † sig. results fall on opposing sides.

As mentioned in the previous section, parents gave more favorable ratings for "CCTV ID" than did non-parents. However, further analysis showed that it was nearly always the affect of parenthood on females that generated the differences, where female non-parents gave the least favorable ratings in 15 of 19 questions (significant for 9 of the 15 compared to female parents), while the most favorable ratings were mostly spread between male and female parents. This pattern was even stronger for "CCTV no ID", where female non-parents gave the least favorable rating in 13 of 19 questions and female parents the most favorable in 17 of 19 questions (significant for 11 of the 19) (see Figure 6). For the questions regarding risk for data misuse, trust for data collectors, and the necessity of data collection, the averages even fell on opposite sides of the scale (†). Across *both* CCTV scenarios, female non-parents (compared to female parents) felt that CCTV is significantly more privacy invasive and that it makes society

more vulnerable; they also expressed worry and offense to a greater extent and had lower trust for the data collectors. (Of these scenarios, parenthood only affected males' attitudes in the case of "CCTV ID" being significantly more worth the risk for male parents.)

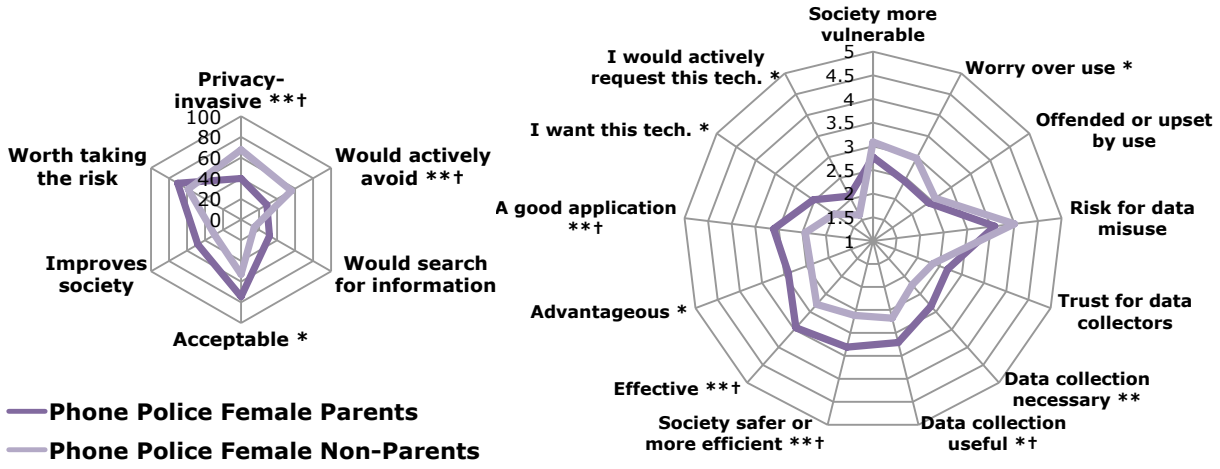

Figure 7: "Phone Police" scenario for female parents vs. female non-parents; percentage "yes" (left) and mean rating 1-5 (right); * for α = 5% and ** for α = 1% for χ^2 (1) (left) and t (right); † sig. results fall on opposing sides.

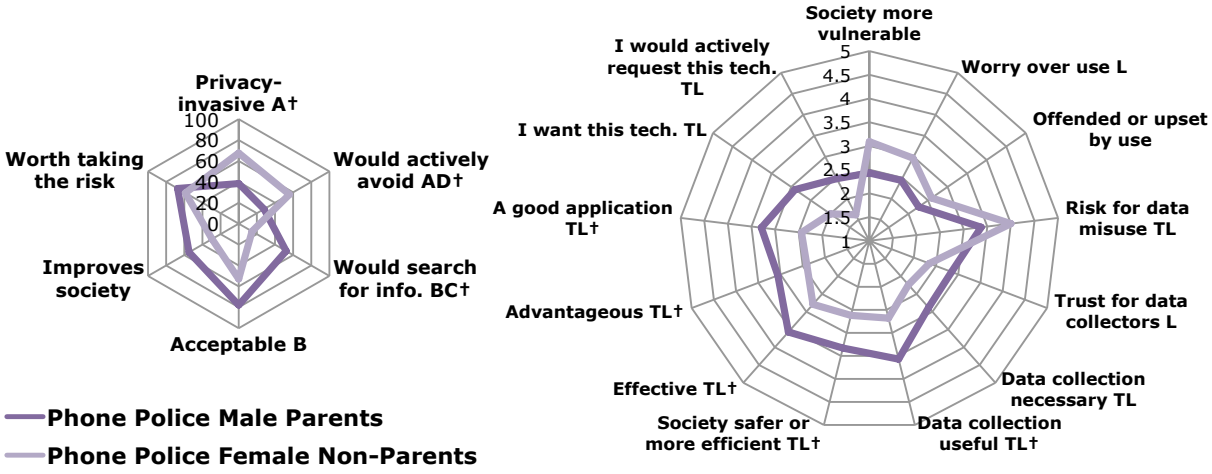

Figure 8: "Phone Police" scenario for male parents vs. female non-parents; percentage "yes" (left) and mean rating 1-5 (right); χ^2 (3) (left): A & B = FNP overrepresented in "yes" and "no" categories (respectively), C & D = MP overrepresented in "yes" and "no" categories (respectively); F(3) (right): T & L = significant difference (α = 5%) between MP & FNP in post hoc test (Tukey and LSD, respectively); † sig. results fall on opposing sides.

Parenthood proved to affect both males' and females' attitudes in "Phone Police", but not necessarily in the same way (see Figures 7 and 8 contrasting female non-parents with female parents and male parents, respectively). Here, female non-parents gave the least favorable rating in 15 of 19 questions (significant for 12 of the 15 compared to female parents), while male parents gave the *most* favorable rating in 16 of 19 questions (significant for 6 of the 16 compared to male non-parents). Parenthood had similar affects on males and females in that, for both groups, non-parents gave significantly less favorable ratings for privacy-invasive (†), would actively avoid (†), and I want this tech. Otherwise, the effects did not overlap for males

and females. Male non-parents (compared to male parents) were more offended, perceived greater risk for data misuse, and felt lower trust for data collectors. Female non-parents (compared to female parents) perceived the application as less acceptable, effective (†), good (†), or advantageous and would actively ask for it to a lesser extent. They also worried more and thought that data collection was less necessary and less useful (†), and that society would be less safe or efficient (†). These results become even more interesting when taking the "Phone Positioning" scenario into consideration, in which we find no affects of parenthood for females and only one for males (society safer or more efficient). In general, the most favorable ratings for "Phone Positioning" were found among the parents and unfavorable among non-parents (in both cases, mixed between males and females). Here we conclude that factoring in the police definitely triggers parental effects, although more frequently for women and not necessarily in the same ways for men and women.

Parenthood did not prove to affect males and females much in the RFID scenarios. In "RFID Travel", the most favorable ratings were generally found among parents (slightly more often among females), and the unfavorable among parents (slightly more often among males), although these differences are not often significant. Again, female non-parents found the application to be significantly more privacy invasive than female parents, and both male and female non-parents gave significantly lower ratings in the application making society safer or more efficient (†). For "RFID Clothing", almost all the most favorable ratings were found among males, mostly non-parents (14 of 19 questions) and the unfavorable ratings among females, more among parents (9 of 19 questions), although we find no significant affects of parenthood on either males or females. (Rather, gender yields the significant differences, although this is not the main focus of this paper.)

As we have seen, parenthood affected males and females differently in three scenarios in particular (and across the majority of questions as well), but in any questions in particular? Female non-parents rated four of six scenarios as significantly more privacy invasive than did female parents – both CCTV scenarios, "Phone Police" (†) and "RFID Travel" – versus one scenario for male non-parents ("Phone Police" (†)). Female non-parents also worried significantly more than female non-parents (both CCTV scenarios and "Phone Police") and had a more negative outlook on the application making society safer or more efficient ("CCTV ID", "Phone Police" (†), and "RFID Travel" (†)). Male non-parents also questioned the application's contribution to safety and efficiency to a greater extent for "Phone Positioning" and "RFID Travel" (†).

4. Discussion and Conclusions

The results from our analysis paint a complex picture of how females and males perceive risks and benefits associated with privacy-invasive technologies. In the following discussion, we will start by presenting more specific points and then move to broader conclusions.

Parenthood affects males and females differently in this study. Our analysis suggests that female non-parents perceive technological applications less favorably than do other groups,

especially the CCTV and "Phone Police" scenarios. We argue that if parents have a heightened risk awareness compared to non-parents due to the dread of something happening to their child(ren), this means that the risk target shifts from oneself to one's child, which would explain why parents are more favorable towards the scenarios in this study. This is in line with parents being more likely to adopt security measures (Enander, 2005). Female non-parents, however, differ from the other groups by having heightened risk perception, lower trust, lower acceptance, etc., of the surveillance technologies. For this group, we argue, the risk target is oneself, and if trust for the data collectors and the perceived effectiveness of surveillance technologies are low, the risk target is seen as more vulnerable rather than more secure. This is in line with arguments presented by e.g. Koskela (2000) who points out that being "under control" is not the same as being "in control" and that surveillance is inherently gendered.

Gender revealed several trends of interest. For the CCTV and Phone scenarios, males (relative to females) tended to favor the alternative in which there is a greater possibility for control by external parties or authorities, i.e. "CCTV ID" and "Phone Police", whereas women (relative to males) tended to favor the alternative with less possibility for control, i.e. "CCTV no ID" and "Phone Positioning". This is again in line with the above argument regarding control (Koskela, 2000).

Males found it more appropriate for more groups to use a technology, and males were also relatively more willing to search for information regarding the technological applications, although neither group was particularly interested in the absolute sense. Furthermore, males were generally more willing to discuss the technological than were females, although both groups showed the same patterns regarding with whom they were willing to discuss. Both groups were most willing to discuss the technological applications with their friends and family, which is in line with Enander's (2005) findings, followed by work colleagues. On average, they were not interested in discussing them with the three groups who may have any influence: relevant authorities, relevant companies, and their elected representatives. And these results were stable across all scenarios, regardless of levels of acceptance, trust in the data collectors, or risk for data misuse.

Taken together, this paints a rather bleak picture both from the gender and the aggregate group perspectives. First, that females are less likely to be self-informed about technological applications, perhaps partly due to their relatively greater skepticism towards the appropriateness of their use; then, that females' opinions are also less likely to be communicated at all, let alone to parties of influence. Second, that both males and females are dissuaded from communicating with government and companies about technology. We submit that the participants do not feel that they can avoid or affect these types of surveillance (as generally pointed out by e.g. Lyon (2001), EPTA (2006), and NRC (2007)) and, thus, feel a sense of resignation towards them, especially as it is these very companies and government agencies that are behind the surveillance. For female participants, the situation is compounded, perhaps due to the gendered nature of surveillance. If, as Strickland and Hunt (2005) point out, negative public opinion is not enough to stop the use of negatively perceived technologies, and that the most negative voices of all are less likely to be heard, then the public (and women in

particular) may feel resignation towards technological development or even decision-making processes in general. This is particularly ironic given that technology is now perceived as a tool for increasing democratic participation in governance, so-called e-governance.

Another issue related to this postulated resignation is a lack of true choice. We argue that the idea that there is always a choice of whether or not to use a technology is fast becoming, if not already, a false choice. We cannot *practically* refuse the technological solution in use, as trying to perform daily tasks without it is *too* inconvenient, expensive, or difficult. Only avoiding the scenarios presented in this article would entail avoiding public transportation (which tends to be relatively more utilized by women) and mobile phones, which is not realistic. If true alternatives are not available, either for the technologies themselves or for the data collection policies (opt-out/opt-in), then what motivation does an individual have to discuss these issues with government and companies, particularly if women are underrepresented in those decision-making bodies.

The results of this study show no relationship between perceived privacy-invasiveness, acceptability, and the willingness to search for information. Thus, it is not likely a useful approach to try to bridge the so-called "knowledge gap" between experts and laypeople with more information. This reinforces research showing that providing "factual" information does not necessarily change attitudes (or change them in the direction desired by the experts, see e.g. Günther and Spiekermann, 2005; Söderberg and Wester, 2012), especially if differences of opinion are based on differing aims and values (Hansen, et al., 2003). In the case of surveillance technologies, when they and their (contextual) consequences violate (or reinforce) one's values in some way, one's perceptions of them will be duly influenced; thus, merely attempting to address the perceptions of the technologies by presenting information about them will not be effective. Furthermore, if that information does not even reach all segments of the population, then this creates an additional social imbalance.

In the information age, our entire society is becoming binary – either use the technology or do not participate in the modern society. If one does accept the idea of technology being able to drive governance, what then happens with those who do not have access to the technology, who are singled out by the technology, who cannot use the technology as the developers have intended, who do not know how to use the technology, or who are not interested in such technological solutions? Here there are clearly barriers for social groups such as the poor, elderly, disabled, women, etc. Indeed, the future of democratic processes is unclear if the ability to make one's voice heard also becomes dependent on e.g. purchasing power (of technology) and technological savvy.

Further work, all of which should contain a gender perspective, includes extensions and specifications of scenarios to study effects of function creep and shifts in balance of power between individuals and organizations or authorities. Also, to investigate the potential interactions of resignation, willingness to pay, and the concept of privacy as a public good. If end users consider or assume privacy and data protection to be a default (or to address a general risk more likely to negatively affect someone else), then they will not likely take active

steps to protect their privacy or be willing to pay for it if it is approached as an extra feature or service. If so, "privacy by design" (e.g. RAE, 2007; DIB, 2013) becomes an even more important tool in protecting privacy and personal data.

5. Acknowledgements

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Table 2: Aggregate responses; Q1-6 percentage "yes" answers; Q7-19 average rating (1-5 scale); P = parents, NP = non-parents, M = males, F = females.

			Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19
			%	%	%	%	%	%	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$
CCTV ID	All		11.6	21.6	41.2	93.2	82.4	86.4	2.05	2.08	1.91	2.96	3.23	3.40	3.67	3.78	3.74	3.47	3.58	3.75	3.33
	M		14.8	25.8	47.7	90.6	82.0	85.2	1.93	2.04	1.90	2.93	3.28	3.38	3.72	3.80	3.75	3.54	3.70	3.75	3.38
	F		8.2	17.2	34.4	95.9	82.8	87.7	2.17	2.13	1.93	3.00	3.17	3.43	3.62	3.75	3.73	3.39	3.47	3.75	3.27
	P	All	8.4	19.9	43.5	93.7	85.3	89.5	1.92	1.96	1.82	2.89	3.35	3.47	3.69	3.88	3.84	3.54	3.65	3.84	3.43
		M	13.3	24.5	49.0	91.8	82.7	88.8	1.81	1.91	1.86	2.86	3.38	3.44	3.67	3.88	3.83	3.62	3.76	3.81	3.46
		F	3.2	15.1	37.6	95.7	88.2	90.3	2.06	1.98	1.78	2.92	3.31	3.51	3.71	3.89	3.85	3.46	3.55	3.87	3.40
	NP	All	22.0	27.1	33.9	91.5	72.9	76.3	2.42	2.49	2.20	3.20	2.85	3.17	3.61	3.42	3.42	3.22	3.36	3.46	3.00
		M	20.0	30.0	43.3	86.7	80.0	73.3	2.33	2.37	2.03	3.17	2.97	3.17	3.87	3.53	3.50	3.27	3.50	3.57	3.13
		F	24.1	24.1	24.1	96.6	65.5	79.3	2.52	2.62	2.38	3.24	2.72	3.17	3.34	3.31	3.34	3.17	3.21	3.34	2.86
CCTV no ID	All		13.2	18.8	36.0	92.0	79.2	77.2	2.07	2.08	1.96	2.90	3.15	3.23	3.48	3.70	3.60	3.42	3.52	3.64	3.20
	M		15.4	22.0	35.8	91.9	76.4	77.2	1.98	2.08	2.03	2.96	3.06	3.18	3.43	3.67	3.59	3.42	3.51	3.58	3.19
	F		11.0	15.7	36.2	92.1	81.9	77.2	2.16	2.09	1.88	2.84	3.24	3.28	3.53	3.73	3.61	3.41	3.53	3.71	3.22
	P	All	10.0	16.8	35.3	94.7	82.1	81.6	1.97	1.93	1.86	2.81	3.22	3.29	3.51	3.76	3.67	3.48	3.59	3.72	3.29
		M	15.2	22.2	38.4	91.9	78.8	79.8	1.96	2.00	1.99	2.93	3.08	3.19	3.45	3.72	3.63	3.43	3.54	3.63	3.27
		F	4.4	11.0	31.9	97.8	85.7	83.5	1.98	1.86	1.73	2.68	3.37	3.41	3.57	3.81	3.71	3.53	3.65	3.82	3.31
	NP	All	23.3	25.0	38.3	83.3	70.0	63.3	2.38	2.57	2.25	3.18	2.92	3.03	3.38	3.52	3.38	3.22	3.30	3.40	2.93
		M	16.7	20.8	25.0	91.7	66.7	66.7	2.04	2.42	2.21	3.08	2.96	3.13	3.33	3.50	3.42	3.38	3.42	3.38	2.83
		F	27.8	27.8	47.2	77.8	72.2	61.1	2.61	2.67	2.28	3.25	2.89	2.97	3.42	3.53	3.36	3.11	3.22	3.42	3.00
Phone Positioning	All		52.8	46.4	38.4	63.6	37.6	63.2	2.79	2.76	2.67	3.78	2.37	2.47	2.98	2.92	3.01	2.72	2.81	2.35	2.11
	M		53.5	48.8	43.4	61.2	41.1	61.2	2.81	2.75	2.64	3.81	2.29	2.39	2.99	2.78	3.10	2.70	2.82	2.40	2.15
	F		52.1	43.8	33.1	66.1	33.9	65.3	2.77	2.78	2.69	3.74	2.45	2.55	2.97	3.06	2.92	2.75	2.80	2.29	2.07
	P	All	49.0	44.8	38.1	64.4	37.6	64.4	2.76	2.74	2.62	3.75	2.41	2.51	2.99	3.01	3.06	2.78	2.87	2.41	2.18
		M	50.0	48.0	42.9	62.2	41.8	62.2	2.80	2.71	2.60	3.82	2.32	2.43	3.02	2.92	3.19	2.77	2.92	2.46	2.22
		F	47.9	41.7	33.3	66.7	33.3	66.7	2.73	2.77	2.65	3.69	2.51	2.58	2.96	3.09	2.93	2.79	2.82	2.36	2.13
	NP	All	66.1	51.8	39.3	60.7	37.5	58.9	2.89	2.84	2.82	3.86	2.23	2.34	2.95	2.61	2.84	2.54	2.61	2.13	1.87
		M	64.5	51.6	45.2	58.1	38.7	58.1	2.87	2.87	2.77	3.77	2.23	2.26	2.90	2.35	2.81	2.48	2.52	2.23	1.90
		F	68.0	52.0	32.0	64.0	36.0	60.0	2.92	2.80	2.88	3.96	2.24	2.44	3.00	2.92	2.88	2.60	2.72	2.20	1.84
Phone Police	All		46.4	36.5	38.1	71.8	46.4	66.3	2.70	2.58	2.46	3.62	2.63	2.73	3.28	3.16	3.40	2.86	3.04	2.55	2.13
	M		45.8	37.5	50.0	75.0	50.0	65.0	2.53	2.58	2.47	3.54	2.67	2.77	3.51	3.20	3.53	2.94	3.16	2.72	2.33
	F		47.0	35.6	27.3	68.9	43.2	67.4	2.85	2.57	2.46	3.69	2.60	2.68	3.08	3.13	3.28	2.78	2.94	2.39	1.95
	P	All	39.1	28.3	41.3	76.1	51.1	69.0	2.61	2.43	2.34	3.48	2.76	2.86	3.38	3.32	3.51	2.98	3.20	2.70	2.26
		M	38.4	27.9	52.3	77.9	54.7	67.4	2.43	2.44	2.26	3.37	2.85	2.88	3.57	3.33	3.57	3.06	3.29	2.90	2.48
		F	39.8	28.6	31.6	74.5	48.0	70.4	2.77	2.43	2.42	3.58	2.68	2.84	3.21	3.31	3.45	2.91	3.11	2.53	2.07
	NP	All	66.2	58.8	29.4	60.3	33.8	58.8	2.94	2.96	2.79	3.99	2.29	2.37	3.01	2.75	3.12	2.53	2.63	2.13	1.78
		M	64.7	61.8	44.1	67.6	38.2	58.8	2.79	2.94	3.00	3.97	2.24	2.50	3.35	2.88	3.44	2.65	2.82	2.26	1.94
		F	67.6	55.9	14.7	52.9	29.4	58.8	3.09	2.97	2.59	4.00	2.35	2.24	2.68	2.62	2.79	2.41	2.44	2.00	1.62
RFID Travel	All		25.2	17.2	34.4	86.4	62.8	65.2	2.67	2.22	2.14	3.03	2.85	2.76	3.26	3.10	3.41	3.15	3.16	3.01	2.46
	M		32.2	25.6	40.5	85.1	66.1	62.8	2.79	2.30	2.27	3.25	2.74	2.74	3.29	3.18	3.49	3.15	3.16	3.12	2.55
	F		18.6	9.3	28.7	87.6	59.7	67.4	2.57	2.14	2.02	2.83	2.95	2.78	3.22	3.02	3.33	3.16	3.17	2.91	2.37
	P	All	20.8	16.7	35.4	88.5	64.6	67.7	2.64	2.17	2.07	2.95	2.88	2.80	3.25	3.20	3.45	3.20	3.22	3.07	2.51
		M	30.0	25.6	42.2	87.7	67.8	67.8	2.77	2.24	2.20	3.16	2.77	2.79	3.26	3.30	3.53	3.22	3.22	3.16	2.56
		F	12.7	8.8	29.4	89.2	61.8	67.6	2.53	2.11	1.95	2.76	2.98	2.81	3.25	3.11	3.38	3.18	3.22	3.00	2.46
	NP	All	39.7	19.0	31.0	79.3	56.9	56.9	2.78	2.36	2.38	3.31	2.74	2.60	3.28	2.78	3.26	3.00	2.98	2.81	2.29
		M	38.7	25.8	35.5	77.4	61.3	48.4	2.84	2.45	2.48	3.52	2.68	2.58	3.39	2.84	3.35	2.94	2.97	3.00	2.52
		F	40.7	11.1	25.9	81.5	51.9	66.7	2.70	2.26	2.26	3.07	2.81	2.63	3.15	2.70	3.15	3.07	3.00	2.59	2.04
RFID Clothing	All		72.0	64.4	26.4	30.0	20.0	39.2	3.18	3.01	3.04	3.87	1.86	1.74	2.44	1.98	2.53	2.00	1.92	1.70	1.59
	M		66.9	61.3	35.5	34.7	26.6	49.2	3.02	3.02	2.97	3.83	1.92	1.87	2.66	2.19	2.67	2.16	2.07	1.92	1.76
	F		77.0	67.5	17.5	25.4	13.5	29.4	3.33	2.99	3.12	2.90	1.91	1.60	2.22	1.79	2.40	1.84	1.78	1.49	1.43
	P	All	73.5	64.6	25.4	27.5	18.0	40.2	3.19	3.01	3.06	3.86	1.85	1.72	2.44	1.93	2.52	1.95	1.88	1.61	1.55
		M	68.5	60.9	32.6	30.4	22.8	50.0	3.07	3.01	2.97	3.79	1.89	1.84	2.59	2.11	2.58	2.05	2.01	1.83	1.74
		F	78.4	68.0	18.6	24.7	13.4	30.9	3.30	3.00	3.15	3.93	1.81	1.62	2.31	1.75	2.46	1.85	1.75	1.41	1.37
	NP	All	67.2	63.9	29.5	37.7	26.2	36.1	3.15	3.02	2.98	3.89	1.90	1.77	2.43	2.16	2.57	2.16	2.07	1.98	1.72
		M	62.5	62.5	43.8	46.9	37.5	46.9	2.91	3.06	2.97	3.94	2.00	1.97	2.88	2.41	2.94	2.47	2.25	2.19	1.81
		F	72.4	65.5	13.8	27.6	13.8	24.1	3.41	2.97	3.00	3.83	1.79	1.55	1.93	1.90	2.17	1.83	1.86	1.76	1.62

Table 3: Statistical significance (* for α = 5% and ** for α = 1%); Q1-6 χ^2 (df=1), Q7-19 t; S1a-S3b = "CCTV ID", "CCTV no ID", "Phone Positioning", "Phone Police", "RFID Travel", and "RFID Clothing", respectively, P = parents, NP = non-parents, M = males, F = females.

		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19
		χ^2	χ^2	χ^2	χ^2	χ^2	χ^2	t	t	t	t	t	t	t	t	t	t	t	t	t
2xCCTV	All	.	.	.	.	.	**	.	.	.	.	.	.	*	.	.	.	.	.	.
	M	.	.	.	.	.	.	.	.	.	.	.	.	*	.	.	.	.	.	.
	F	.	.	.	.	.	*	.	.	.	.	.	.	.	.	.	.	.	.	.
	P	.	.	.	.	.	*	.	.	.	.	.	.	.	.	.	.	.	.	.
	NP	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2xPhone	All	.	*	.	*	*	.	.	.	.	.	*	*	**	*	**	.	*	.	.
	M	.	.	.	*	.	.	.	.	.	.	.	*	**	**	**	.	*	.	.
	F	.	.	.	.	.	.	.	.	.	.	.	.	.	.	**	.	.	.	.
	P	.	**	.	*	**	.	.	*	*	*	**	**	**	*	**	.	*	*	.
	NP	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2xRFID	All	**	**	.	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
	M	**	**	.	**	**	*	.	**	**	**	**	**	**	**	**	**	**	**	**
	F	**	**	*	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
	P	**	**	*	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
	NP	**	**	.	**	**	*	.	**	**	**	**	**	**	**	**	**	**	**	**
M vs. F	S1a	.	.	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	S1b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	S2a	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	S2b	.	.	**	.	.	.	.	.	.	.	.	.	**	.	.	.	.	.	*
	S3a	*	**	*	.	.	.	.	.	.	**	.	.	.	.	.	.	.	.	.
	S3b	.	.	**	.	**	**	.	.	.	.	.	*	*	**	.	*	*	**	*
P vs. NP	S1a	**	.	.	.	*	**	**	**	*	.	**	*	.	**	**	*	.	*	*
	S1b	**	.	.	**	*	**	*	**	*	*	.	.	.	.	.	.	.	.	.
	S2a	*	.	.	.	.	.	.	.	.	.	.	.	.	*	.	.	.	.	.
	S2b	**	**	.	*	*	.	.	**	*	**	**	**	*	**	*	**	**	**	**
	S3a	**	.	.	.	.	.	.	.	.	*	.	.	.	**	.	.	.	.	.
	S3b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*	.
P: M vs. F	S1a	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	S1b	*	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	S2a	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	S2b	.	.	**	.	.	.	.	.	.	.	.	.	*	.	.	.	.	.	*
	S3a	**	**	.	.	.	.	.	.	.	**	.	.	.	.	.	.	.	.	.
	S3b	.	.	*	.	.	**	.	.	.	.	.	.	.	*	.	.	.	*	*
NP: M vs. F	S1a	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	S1b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	S2a	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	S2b	.	.	**	.	.	.	.	.	.	.	.	.	*	.	*	.	.	.	.
	S3a	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	S3b	.	.	**	.	*	.	.	.	.	.	.	.	**	.	*	*	.	.	.
M: P vs. NP	S1a	.	.	.	.	.	*	.	.	.	.	.	.	.	.	.	.	.	.	.
	S1b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	S2a	.	.	.	.	.	.	.	.	.	.	.	.	.	*	.	.	.	.	.
	S2b	**	**	.	.	.	.	.	.	**	*	*	.	.	.	.	.	.	*	.
	S3a	.	.	.	.	.	.	.	.	.	.	.	.	.	*	.	.	.	.	.
	S3b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
F: P vs. NP	S1a	**	.	.	.	**	.	*	**	**	.	*	.	.	**	**	.	.	*	.
	S1b	**	*	.	**	.	**	**	**	*	**	*	*	.	.	.	.	*	.	.
	S2a	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	S2b	**	**	.	*	.	.	.	*	.	.	.	**	*	**	**	*	**	*	*
	S3a	**	.	.	.	.	.	.	.	.	.	.	.	.	*	.	.	.	.	.
	S3b	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Picking up children from day-care centers following a disaster: Working mothers' attitudes and behavior in Tokyo at the time of the Great East Japan Earthquake

Key words: picking up children, disaster, multiple regression, working mother

In this study, we examine difficulties related to picking up children in metropolitan Tokyo after natural disasters by analyzing events surrounding the Great East Japan Earthquake of March 11, 2011. After the earthquake, when public transit was paralyzed, many people working in central Tokyo were unable to return home, while others walked for 10 hours or more to do so. This exposed a serious social challenge for a resilient society in that parents who could not pick up their children from day-care centers experienced psychological stress. We evaluated the challenges and related factors surrounding picking up children in Tokyo after the earthquake. The goals of this study were:

- To demonstrate the actual difficulties of picking up children in the Tokyo metropolitan area after the Great East Japan Earthquake, and
- To analyze the factors affecting the physical and psychological difficulties.

We conducted a web survey in April 2012 of 647 mothers working in central Tokyo who had children in kindergarten at the time of the disaster. Before the questionnaire, to explore the items for the survey, we conducted face-to-face or e-mail-based semi-structured interviews with a total of 14 women in their 30s who lived in Tokyo and left their small children at day-care centers. We asked respondents for detailed information on their child pick-ups and returning home after the earthquake. The interviewees provided a variety of child pick-up and returning home behaviors. For example, some respondents asked their partners, their parents (grandparents of the children), or relatives who were close to the day-care center to pick up their children, while others decided not to go to the day-care center because they had great confidence in the day-care center workers. There was a respondent who continued to work until 5 pm because she did not consider it appropriate to leave her office before the normal work end time.

The results indicated that some of the respondents picked up their child before the expected time, but some picked up their child as late as after midnight. The peak expected time of child pick-up was 18:00; the actual time was 16:00 (the earthquake occurred at 14:46). In cases where the mother could not pick up the child, she tried to

make use of a network of personal contacts, such as her husband, relatives, and friends. Indeed, 81.3% of the respondents were due to pick up a child, but only 39.7% succeeded; 26.7% of children were picked up by the father (respondent's partner), 10.0% by other families, and 13.6% by relatives.

The main mode of contact with the day-care center was the telephone, but the telephone network was down part of the time, so there were many people who could not communicate with the day-care center by phone. In fact, 39.7% succeeded in communicating by telephone while 37.9% did not. In Japan, there is an emergency back-up system in case the phone network is down. This is known as "Disaster Message Dial". Disaster Message Dial is a voice message board used in disaster situations such as earthquakes, provided by the phone company NTT East. However, people's awareness of it was low; therefore, it is important to increase awareness of this system. Additionally, the establishment of other communication method(s), including e-mail, Twitter, and SMS should be explored.

Regarding employers' decisions after the earthquake, 21% of the respondents were not allowed to return home before the normal work end time. However, 34.3% were provided with assistance to return home by their employer, such as water, maps, and helmets.

Although more than half of the respondents had not discussed child pick-ups from the day-care center with their partner before the disaster, after the disaster, almost half had such a discussion. The experience became a chance to better prepare for future disasters.

A multiple regression analysis showed that respondents that did not know their walking route to return home suffered from higher physical and psychological difficulties in picking up their child. This issue could be resolved if people understood their walking route to return home in advance. One of the interviewees said that her company had distributed walking maps for returning home to all employees as a disaster prevention countermeasure.

Respondents that had good relationships with the day-care center suffered from more psychological difficulties in picking up their child. The reason was not clear from this study. One possible explanation could be that respondents worried about the burden on the nursery teachers if they could not contact the day-care center. Thus, it is possible

that this result might be related to communication methods between working mothers and day-care centers. This issue requires further examination.

A limitation of this study was that we used only cognitive factors, such as “difficulties”, for the analysis. By using the location of a respondent’s home and workplace, and their location at the time of the disaster, we could calculate the approximate distance between them using a geographic information system (GIS). We could then assess whether the actual distances should reasonably cause physical and psychological difficulties in pickup up children. In addition, the difficulties of the respondents should also be further analyzed quantitatively.

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Effects of Gender on Presence and Virtual Driver Perception in Driving Simulators

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ABSTRACT

Driving simulators are routinely used by researchers to study driver behavior. However, (limited) previous research has shown that the user gender may modify the perception, or even usability of these devices. For example, Mourant and Thattacherry (*1*) shows that men and women have different sensitivity to simulator sickness. These differences are liable to introduce biases in behavior studies and other virtual reality applications such as driver training.

The validity of driving simulators depends on a number of factors, such as platform dynamics or 3D-database realism. In our research, we focus on simulated traffic behavior. Although there is a huge literature on traffic simulation, its main purpose has been to study capacity, security or recently environmental impact of traffic. Hence, the use of traffic simulation models in virtual reality devices, where the entities interact with users, has not been validated. In this paper, we study how users perceive virtual entities, focusing on the role of gender.

An experiment has been developed to evaluate the users perception of the driving simulator and of the simulated drivers, using questionnaires and user behavior data. We use the well-known presence concept - developed by Witmer and Singer (*2*) - to assess the overall validity, and an *ad hoc* questionnaire to assess the virtual entities behavior credibility. We propose a methodology including a set of tools and data processing units enabling inter-human and virtual agents behavior comparison.

We have found very few significant correlation between driving traces, the perception of the virtual environment and background questionnaires, including gender, driving behavior (see Reason et al. (*3*)), and immersion tendency, which seems to indicate that the *Archisim* driving simulator does not induce gender bias, and that the virtual drivers replicate in the same way men and women behavior. This study calls for further evaluation of the impact of age on the use of driving simulators.

INTRODUCTION

Driving simulator is one of the main tools to study driver behavior in controlled situations. Furthermore, this device has been included as an optional part of the initial training of drivers in several countries such as France. Godley et al. (*4*) points out the well-known advantages of driving simulators: the cost is reduced, the situations are repeatable, the environment is controlled and the subjects are not put at risk. However, the use of simulators is not neutral with respect to the driving task. In particular, the simulators do not replicate accurate physical sensations and device control, have different immersion qualities, and may induce simulator sickness.

To the best of our knowledge, it is yet unknown whether gender is a factor of such adversary effects. In driving simulator studies, there are two obstacles to such an analysis: firstly, sample populations are not always described (split by gender), and secondly, even when it is mentioned, the limited size of the samples does not enable the researchers to provide a gender-sensitive analysis.

In this article, we study the correlation between driving (behavior questionnaires, driving simulator experiment traces and external annotation), observation of driving (credibility), and background questionnaires. Concerning the driving behavior, a well documented difference between women and men is the risk-taking tendency as shown by Byrnes et al. (*5*). What has been less studied is the effect of the driving simulator device on participants behavior. We use objective (driving) and subjective (questionnaires) data in order to (1) study individual and group behavior, (2) analyze their composition (age, gender, immersion tendency, virtual devices habits) and (3) compare it to a behavioral traffic simulation.

In the following section, we introduce the methodology and data clustering process. Then, we analyze experimental data to show that few differences were found between women and men traces, depending on the driving situation, and that age is a more likely influence on driving simulator use. Finally, the traffic simulator was found not to be very good in reproducing human behavior, but no strong gender differences were found.

Behavioral validation

Pavlov and Anrep (*6*) define behaviors as a set of observable actions of a person in the environment. There are different levels of human behavior: The lowest level corresponds to simple reflex actions such as going into first gear in a car. The intermediary level is tactical, it is built on an ordered sequence of elementary behaviors.The highest level of behavior is the strategic level, corresponding to the long term. It is based on a choice of tactics and evolves according to the dynamics of the environment and the mental state of the person. In our study, we want to evaluate the last two levels (tactical and strategic) of behavior.

Subjective and objective approach

The subjective approach comes from the Virtual Reality field and aims at validating the agents' behavior in simulation. It consists in evaluating the general (or detailed) immersion quality via the presence effect using questionnaires such as the presence questionnaire, found in Lessiter et al. (*7*). In our case, the notion of presence is too broad because it includes various elements (visual quality, sound quality, *etc.*) of the device, but does not detail the virtual agents behavior credibility component. However subparts of the presence effect evaluation are consistent with our goal:

- Lester et al. (*8*) defines the behavioral credibility as "*users interacting with the agent believe that they observe a human being with his own beliefs, desires and personality*",

- Patrick (*9*) describes the psychological fidelity as follows: *The simulated task generates for the user an activity and psychological processes which are similar to those generated by the real task.* In a similar way Leplat (*10*) defines it as when "*the simulator produces a similar behavior to the one required in the real situation*".

In this article, we focus on the behavioral credibility and especially on its qualitative and quantitative evaluation. A solution is to set up a mixed system where humans control avatars in the virtual environment. The evaluation of presence or of behavioral credibility is subjective. This is why it is sensitive to psychological phenomena such as the inability to explain one's judgments (see Javeau (*11*)). Moreover this evaluation does not necessarily explain missing behaviors nor the faults of the behaviors judged as not credible.

That is why we propose to complete these subjective studies with an objective analysis of simulation data. The objective approach is generally used in the field of multi-agents systems: it consists in comparing quantitative data produced by humans with data produced by different categories of virtual agents. It aims at verifying that the behavior of the agents is identical to the one observed in reality and therefore at evaluating the realism of the simulation. When the number of agents increases, objective evaluation is generally done at the macroscopic level because real data are both more readily available and easier to compare with simulation outputs as done by Champion et al. (*12*). This macroscopic validation is necessary but not sufficient to validate the agents' behavior. A valid collective behavior does not imply that the individual behaviors that compose it are valid. Thus, an analysis at the microscopic level is required, although microscopic data analysis and comparison is complex.

Hence, subjective and objective approaches complement each other in two different ways: human expertise and raw data.

APPROACH

Our goal is the evaluation of the human and virtual drivers (also called *agents*) behavior in the context of driving simulators. The method we propose is based on the aggregation of individual data (for both agents and human participants) into behavior clusters that will support the actual behavior analysis. In this view, behavior clusters act as abstractions of individual traces. This paper details the computation of such clusters (section *High-level behavior & comparison*) and their use for behavior analysis (section *Experimentation*).

By using the gender information on the participants, we are able to analyze the behavior reproduced by the agents (and the lacking human behaviors) in term of gender. The originality of our model is that we use the two available types of data: objective data with logs, to qualify the realism of the simulation, and subjective data via questionnaires, to qualify both behavior and credibility.

General approach

The general architecture of the method is described in the Figure 1. It consists of 4 main steps: collection of data in simulation, generation of agents data, automatic clustering of data, and clusters comparison.

The first step of our method is to collect data about human participants. We first consider subjective data, using questionnaires about the studied activity (called *behavioral questionnaires* in the figure), the participant's relation to immersion, and the experiment itself. Secondly, we collect objective data, using immersive (or participatory) simulation in the virtual environment.

The raw data from participants' experiments in the simulator is called *logs* and the answers to questionnaires are called *answers* in the figure.

The second step produces new simulations in which the human participant has been replaced by a virtual driver. This step provides agents *logs*. Our objective is twofold. First, we want to study the correlation between categories of participants and their behaviors observed in the simulation so as to verify that the automated clustering of observation data is related to task-related high-level behavior. Secondly, we need to compare participants behavior and agents behavior in order to report on the capability of agents to simulate human behavior depending on the gender. In both cases, this cannot be done on raw data (should it be questionnaires or data logs). Logs, especially in the case of participants, are noisy: two different logs can represent the same type of tactic or strategic behavior. Hence, in order to generalize the analysis of our logs to a higher behavior level, we propose to use behavior categories (called *abstractions* in the figure). These categories serve as abstraction to the logs by gathering together, within the same cluster, different logs representative of the same high level behavior. This is done using automatic unsupervised clustering methods (because supervised algorithms require labeling of a large amount of logs by an expert). In the same way, we use clustering methods on the questionnaires scales.

The comparison of these abstractions is our final step. We evaluate the similarity between agents and humans logs and the reported categories for humans (dashed arrow). This comparison is used to verify that the logs automated clustering corresponds to task-related high-level behaviors. If there is a strong similarity between the composition of behavior clusters and participant reported categories, it then means that behavior clusters are meaningful in terms of participant typology. Furthermore, it allows us to evaluate the level of credibility of our virtual agents in the simulation and to deepen the evaluation with a gender analysis.

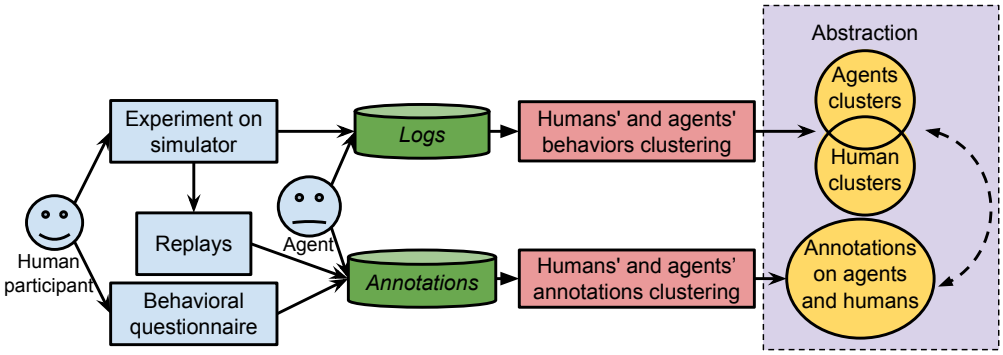

FIGURE 1 An architecture for behavior analysis and evaluation.

Human participants and agents

For the comparison between participants and agents behavior clusters, we collect the same logs for simulated agents as for the participants. As will be discussed in section *Objective approach data*, the clustering algorithm does not work directly on raw data: we use higher-level representation based on field expert knowledge.

Different types of agents are generated by exploring the parameter space such as normativity, experience, decision parameters ... The agents are placed in an identical driving situation

to that presented to participants, so that the same logs are collected. The clustering is done on both agents and human participants logs, gathered together in the general term of *main actors* (see section *Objective approach data*).

For the evaluation step, it is possible to distinguish three cluster types in term of human-agent composition:

1. The clusters containing both human and agent main actors; they correspond to high-level behaviors that are correctly reproduced by the agents. We can divide this cluster type in three, depending on the participants' gender:
   - a cluster with agents and only male participants meaning that this agent behavior corresponds to a male behavior.
   - a cluster with agents and only female participants meaning that this agent behavior corresponds to a female behavior.
   - a cluster with agents, male and female participants. The agent reproduces a behavior shared by both genders.
2. The clusters consisting of simulated agents only correspond to behaviors that were produced only by the agents. In most cases, it reflects simulation errors, but it can also be due to a too small participants sample.
3. The clusters consisting of participants only correspond to behaviors that have not been replicated by the agents, and are thus either lacks in the agent's model, or due to a too small agents sample in the parameter space. We can refine the analysis in term of gender according to the cluster composition: male only, female only, or both genders.

In the end, we combine this agent-human comparison with the *annotation* analysis: the participants behavior clusters are correlated to their reported categories. Furthermore, the composition of the behavior clusters in term of simulated agents and participants allows us to give explicit information about those agents and to observe the composition in term of gender.

Case study

Our method was tested in the context of driving simulators. We want to evaluate the realism and credibility of the behavior of the *IFSTTAR*'s road traffic simulator's agents (see Figure 2) by using the *Archisim* driving simulator described by Champion (*13*). To do this, the participants drive a car on a road containing simulated vehicles. The circuit provides three driving situations about 1 minute of driving each: The first one is on a single carriageway with two lanes in the same direction. The main actor encounters a vehicle at low speed on the right lane. The second one is on a single carriageway with two traffic lanes in opposite directions. A vehicle at low speed is on the right lane while several vehicles are in the other traffic lane. The third one is on a divided high-way with two traffic lanes for each carriageway, where the main actor encounters a congested traffic due to several trucks.

Our method is illustrated in the following sections with this application to the study of driving behavior. However, the presented method may be used in any kind of participatory simulation, by choosing relevant task-related questionnaires.

FIGURE 2 Driving simulator device.

DATA

Subjective approach data (questionnaires)

The behavior of human participants in virtual reality is prone to biases induced by the device. We are thus interested in the participants behavior in their task, but also in their relation to the device in order to control the experience. For virtual reality systems we propose to use three sets of questionnaires:

- a set concerning the studied activity, allowing an ulterior comparison with agents' behaviors,
- a set concerning the type of relation of the participant with the immersion device, and
- a set concerning the experiment itself to evaluate the device and the behavioral credibility of simulated agents.

Typology of behavior

In the first place it is necessary to submit a behavior questionnaire specific to the field before the experiment to characterize the general behavior of the participant in the studied activity (*i.e.* participants *habits*). In the context of our application to driving simulators, the *Driver Behavior Questionnaire* (*DBQ*) developed by Reason et al. (*3*) is well known. It provides a general score, but also scores on 5 subscales: *1*) *slips*; *2*) *lapses*; *3*) *mistakes*; *4*) *unintended violations*; and *5*) *deliberate violations*. In addition, it supplies 3 subscales related to the accident risk: *1*) *no risk*; *2*) *possible risk*; and *3*) *definite risk*.

An adopted behavior in a precise situation may not correspond to the participant general behavior. For example, in driving simulators, the general driving behavior captured by the *DBQ* may not correspond to the participant behavior in the precise studied situation. Furthermore, the general behavior questionnaire is completed by the driver about his/her own behaviors. This adds a bias due to introspection.

This is why we created a questionnaire called *annotations*. This questionnaire is completed by a different set of participants. It avoids the introspection bias. Furthermore, having a population which is observing the situation allows us to collect situation specific information. The questions

are rated on a *Likert*-type scale (see Likert (*14*)). In our application to driving simulators, the questionnaire contains a question rated on a 7 points scale (and *no opinion*) from *no* to *yes* for each of the 5 *DBQ* subscales.

The 3 risk-related subscales are merged into a unique question named *accident risk* rated on a 3 points scale (and *no opinion*). We also add a question related to the perceived control on the same 7 points scale with the purpose of evaluating the main actors control in general. At last, a question asking if the main actor is a human or a simulated agent is added in order to compare how the behavior clustering and the annotators separated the participants from the agents.

Tendency and habit of immersion
To control whether the users' relation to immersion has an impact on his/her behavior and on his/her perception of the agents credibility, we evaluate how the participant reacts to immersion techniques and hence his/her ability to immerse him/herself in the virtual environment. In order to achieve this, we use a questionnaire of immersion propensity: the Immersive Tendencies Questionnaire (*ITQ*) of Witmer and Singer (*2*) which is divided into the following subscales: *Involvement*, *Focus*, *Emotions* and *Game*.

We also take into account the participant habit of immersion. For this we deepen the *Game* scale of the *ITQ*, which contains only two items, with a questionnaire about the involvement in video games to evaluate more precisely the gamer engagement typology. We use the Game Engagement Questionnaire (*GEQ*) of Brockmyer et al. (*15*) that defines the commitment level of the participant: *Absorption*, *Flow*, *Presence* and *Immersion*.

Evaluation of the device and behavioral credibility
The first questionnaire evaluates the presence effect of the participant during the experiment in all its facets. For this we use the Presence Questionnaire (*PQ*) of Witmer and Singer (*2*) which provides an overall score and scores based on its different subscales: *Realism*, *Ability to Act*, *Interface Quality*, *Ability to Examine*, *Self-Evaluation of the Performance*, *Auditive* and *Haptic*.

In order to deepen the evaluation of behavioral credibility, we have also elaborated two questionnaires:

- the first one aims at evaluating the perceived quality of agents' behaviors in the whole simulation. It contains a statement for each phase based on the following model: "Human beings can have the behavior performed by agents in this situation".
- the second one focuses on precise situations which occurred during the simulation. It is submitted during the replay step and contains one or more questions by phase.

Objective approach data (main actors logs)
In our traffic simulation, we collect from 8 to 13 variables each 300 *ms*. The variables shared by all the main actors are the time, the milepost, the road, the gap and the cap to the lane axis, the speed, the acceleration, and the topology. Specific variables to the driven vehicles are added: the wheel angle, the pressure on pedals (acceleration, brake and clutch), and the gear.

From raw data to high-level data
The road traffic experts chose the following indicators: some high-level variables like the inter-vehicles distance and time, the jerk (the derivative of acceleration with respect to time), the time

to collision (under the assumption of constant speeds for both vehicles), and the number of lane-changing (which is not a temporal indicator) ; as well as some low-level variables such as speed, acceleration, lateral distance and cap to the road axis.

HIGH-LEVEL BEHAVIOR & COMPARISON

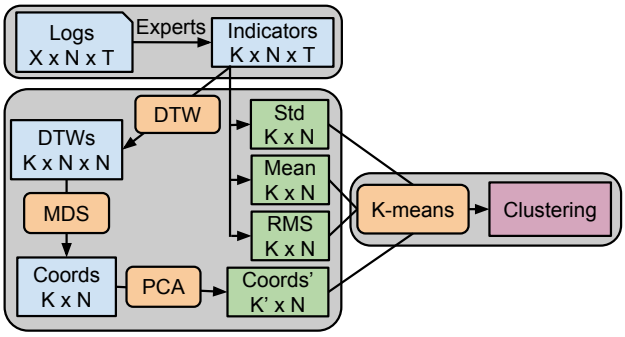

FIGURE 3 Logs preprocessing and clustering.

A cluster based analysis

To generalize the analysis of our logs to the tactical / strategic behavior level, we propose to use behavior categories. These categories serve as abstraction to the indicators by regrouping, within the same cluster, different logs representative of the same high level behavior.

Just as for the categories of the observed behaviors, we need a participant typology from the questionnaires scales and sub-scales. Independently from the application domain, using behavior questionnaires, we obtain qualitative data on *Likert*-type scales. The answers are transformed into quantitative data via a linear numeric scale. Scale scores of questionnaires are then calculated by adding the scale-related questions, and normalized between 0 and 1. Once data are processed, we classify the participants scores using the same clustering algorithm (as the one used for the indicators) to obtain drivers categories. This allows us to obtain clusters corresponding to how participants are annotated.

Chosen algorithm

We use the *Cascade K-means* algorithm which executes several *K-means* for $K \in \{1,\dots,N\}$. The classic *K-means* algorithm uses K random initial centroids. It then proceeds those two steps alternatively until convergence: *1*) The assignment step which assigns each main actor *ma* to the cluster C_i whose mean yields the least within-cluster sum of squares m_i at time t (see Equation (1)); *2*) The update step which calculates the new means m to be the centroids of the main actors in the new clusters at time $t+1$ (see Equation (2)).

$$\forall\ j \in \{1,\ldots,k\}$$

$$C_i^{(t)} = \left\{ ma_p : \left\| ma_p - m_i^{(t)} \right\|^2 \leq \left\| ma_p - m_j^{(t)} \right\|^2 \right\} \quad (1)$$

$$m_i^{(t+1)} = \frac{1}{|C_i^{(t)}|} \sum_{ma_j \in C_i^{(t)}} ma_j \quad (2)$$

The initialization of the clusters is done with *K-means++* (see Arthur and Vassilvitskii (*16*)) which allows a better distribution of clusters' centers in accordance with the data. To do so, the centroid of the first cluster is initialized randomly among the main actors. Until having K clusters, the algorithm computes the distance of each main actor to the last selected centroid. Then, it selects the centroid of a new cluster among the main actors. The selection is done randomly according to a weighted probability distribution proportional to their squared distance.

Finally, we must select the "best" number of clusters with respect to our clustering goal. This is done using the *Variance Ratio Criterion* created by Caliński and Harabasz (*17*) which takes into account the inter-distance (*i.e.* the within-cluster error sum of squares) and intra-distance (*i.e.* the between-cluster error sum of squares) of the clusters.

Preprocessings

Field experts are consulted to identify important indicators. Then we calculate the indicators from the logs for those that could not be collected.

In the context of a dynamic simulation, most of the indicators are temporal. The data to classify are thus ordered sequences of values for each main actor. In order to classify those data, two ways exist: we can use an algorithm taking temporal data as input or use flat data by concatenating temporal indicators related to a participant on a single line. The first solution significantly increases the algorithms' complexity because they must take into account the possible temporal offsets of similar behaviors. The second one ignores temporal offsets but permits the application of classic algorithms.

We choose a hybrid solution of data preprocessing which allows us both to have a single set of attributes for each participant and to take into account temporal offsets. To do this, we generate as many vectors as main actors (participants and virtual agents). Each vector contains the following information extracted from the indicators identified by the field experts: *a*) mean values; *b*) standard deviations; *c*) root mean squares; and *d*) temporal aggregations. Temporal indicators are compared with an algorithm taking into account temporal offsets.

The adopted solution for the preprocessing of temporal offsets is to use a pattern matching algorithm such as *Dynamic Time Warping* (*DTW*) or *Longest Common Subsequence* (*LCS*). We choose the *DTW* algorithm which calculates the matching cost between two ordered sequences (*i.e.* indicators ind^a and ind^b) in order to measure their similarity. Let T be the number of simulation time steps. The algorithm computes a $T \times T$ matrix. It initializes the first row and the first column to *infinity*, and the first element to 0. It then computes each elements of the matrix $M_{i,j} \forall (i,j) \in \{2,\ldots,T+1\}^2$ according to the distance between the two sequences at this time t and to the matrix element neighborhood (see Equation (3)). As *DTW* complexity is $O(N^2)$, we use an approximation of this algorithm: the *FastDTW* algorithm of Salvador and Chan (*18*) which has order of $O(N)$ time and memory complexity.

$$DTW[i,j] \leftarrow distance(ind_i^a, ind_j^b) + \\ min(DTW[i-1,j], DTW[i,j-1], DTW[i-1,j-1]) \tag{3}$$

As *DTW* calculates the similarity between two instances of a temporal variable. The less the instances are similar, the more the cost increases. Let *inds* be the set of indicators and $K = |inds|$ be the number of indicators. For each indicator $ind \in inds$, we calculate the $N \times N$ mutual distances matrix D_{DTW}^{ind}, where N is the number of main actors (participants and agents).

In order to include *DTW* similarities as new variables describing the main actors, we use a *Multi-Dimensional Scaling* algorithm (*MDS*) to place each main actor in a dimensional space. The algorithm assigns a point to each instance in a multidimensional space and tries to minimize the number of space dimensions. The goal is to find N vectors $(coord_1, \ldots, coord_N) \in \mathbb{R}^N$ so that $\forall (i,j) \in N^2, \|coord_i - coord_j\| \approx D_{DTW}^{ind}(i,j)$.

As *DTW* is a mathematical distance, the *MDS* algorithm applied to each D_{DTW} is able to minimize the number of space dimensions to 1 (*i.e.* a vector of coordinates). Then we have as many vectors of coordinates as indicators.

Indicators' coordinates may be correlated among each others but the *K-means* algorithm uses a dimensional space of which the axes are orthogonal to each other. In order to apply this algorithm, we need to project the data on an orthogonal hyperplane of which the axes are two by two non-correlated.

The *Principal Component Analysis* (*PCA*) calculates the non-correlated axes which give a maximal dispersion of the data. It is then possible to reduce the number of dimensions avoiding redundant information by compressing them. Data are represented in a matrix of coordinates C with K random variables $\{ind_1, \ldots, ind_K\}$ containing N independent realizations. This matrix is standardized according to the center of gravity $\left(\overline{ind_1}, \ldots, \overline{ind_K}\right)$ (with $\overline{ind}$ the arithmetic mean) and to the standard deviation σ of the random variables. It is then possible to calculate the correlation matrix: $\frac{1}{N} \cdot \widetilde{C}^T \cdot \widetilde{C}$. The *PCA* looks for the axis u which maximizes the variance of the data. To do so, it calculates a linear combination of the random variables in order to project the data on this axis: $\pi_u(C) = C \cdot u$. We keep the same number of axes K' for the projected indicators as for the indicators (K).

$$\widetilde{C} = \begin{bmatrix} \frac{ind_{1,1} - \overline{ind_1}}{\sigma(ind_1)} & \cdots & \frac{ind_{1,K} - \overline{ind_K}}{\sigma(ind_K)} \\ \vdots & \ddots & \vdots \\ \frac{ind_{N,1} - \overline{ind_1}}{\sigma(ind_1)} & \cdots & \frac{ind_{N,K} - \overline{ind_K}}{\sigma(ind_K)} \end{bmatrix} \tag{4}$$

Behavior clusters

Finally, we apply on the *PCA* projected indicators the clustering algorithm describe hereabove. We thus obtain behavior clusters of main actors, as shown in Figure 3.

Clusterings comparison

Now that we have *annotations* clustering and *behaviors* clustering on main actors, we want to compare the clusters composition between the *annotations* and the *behaviors*.

Hence, we need a similarity measure between two clusterings $\mathbb{C}_1$ and $\mathbb{C}_2$. We use the *Adjusted Rand Index* (*ARI*) of Hubert and Arabie (*19*) which is based on pair counting: *a*) N_{00}: the number of pairs that are in the same set in both clusterings (agreement); *b*) N_{11}: the number of pairs that are in different sets in both clusterings (agreement); and *c*) N_{01} and N_{10}: the number of pairs that are in the same set in one clustering and in different sets in the other (disagreement) and vice-versa. The *Adjusted Rand Index* $ARI \in [-1,1]$ is calculated using a contingency table $[n_{ij}]$ where n_{ij} is the number of agreements between instances i and j: $n_{ij} = |\mathbb{C}_1^i \cap \mathbb{C}_2^j|$ (see Equation (5)). It is a corrected-for-randomness version of the original *Rand Index* $RI \in [0,1]$ of Rand (*20*): where the expected value of *RI* for two random clusterings is not constant, the expected value of *ARI* is 0.

$$ARI(\mathbb{C}_1,\mathbb{C}_2) = \frac{RI(\mathbb{C}_1,\mathbb{C}_2) - E\left[RI(\mathbb{C}_1,\mathbb{C}_2)\right]}{1 - E\left[RI(\mathbb{C}_1,\mathbb{C}_2)\right]} \tag{5}$$

where

$$E\left[RI(\mathbb{C}_1,\mathbb{C}_2)\right] = \left[\sum_i \binom{\sum_k n_{ik}}{2} \sum_j \binom{\sum_l n_{lj}}{2}\right] / \binom{n}{2}$$

EXPERIMENTATION

The participants to our driving simulation experiment are regular drivers aged from 24 to 59 (44% female). Our experiment is carried out on a device comprising a steering wheel, a set of pedals, a gearbox and 3 screens allowing sufficient lateral field of view (see Figure 2). These screens are also used to integrate the rear-view mirror and the left-hand mirror. 23 participants used this device.

A first test without simulated traffic is performed for the participant to get accustomed to the functioning of the simulator and to the circuit. Then, the participant performs the scenario, this time in interaction with simulated vehicles. It should be noted that as the behavior of simulated vehicles is not scripted, situations differ more or less depending on the main actor behavior. The data are then recorded for the processing phase. A video is also made for the replay. Finally, the participant completes the questionnaires. For the situation specific behavioral credibility questionnaire, the video replay of the experiment is viewed by the participant.

After all the participants did the experiment, another population of 6 participants fills the *annotations* questionnaire, viewing the video replay of the first driving situation in order to evaluate the adopted behaviors of the main actors (*i.e.* 23 participants and 14 agents).

One participant had simulator sickness during the replay but was able to finish the experiment, and one annotator had dizziness and ceased watching.

Results

Annotations and behaviors

With the behavior clustering on main actors, we are able to analyze how many human (men and/or women) behaviors are reproduced by the agents, how many human behaviors are not adopted by the agents, and how many agent behaviors are not adopted by participants. We are also capable of making those behaviors explicit via the similarity with *annotations* clusters if relevant.

For the first driving situation, the domain experts advised us on the importance of the cap and the lateral distance to the road axis, and of the inter-vehicle distance. The *Variance Ratio*

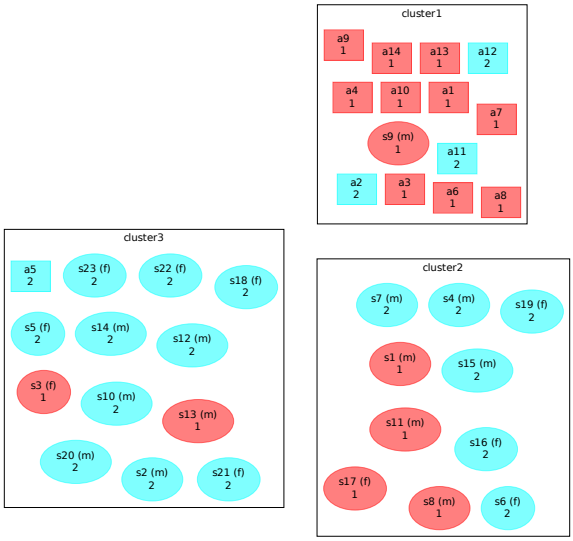

FIGURE 4 Comparison of main actors for the first driving situation between *behavior* clustering within rectangles and *annotations* clustering grouped together by color.

Criterion gives the maximal score for $K = 3$ for the indicators clustering (*i.e.* 3 behaviors) and for $K = 2$ for the *annotation* clustering (*i.e.* 2 driver categories).

The clustering is shown in Figure 4 with the *behaviors* clusters within rectangles and *annotations* clusters[1] grouped together by color (the cluster number is also written just bellow the main actors' names). The participants (named from $s1$ to $s23$ with gender information: M for male participant and F for female participant) are represented with ellipses, and the agents (named from $a1$ to $a14$), are in rectangles. The rand index is 0.59 and the adjusted rand index is 0.18.

- *cluster1* contains one male participant ($s9(m)$) and nearly all the agents (excepted $a5$). Most of its main actors are annotated in the same way (*i.e.* in cluster (1)). So, the main actors of the *cluster 1* adopted a similar driving behavior, *i.e.*: the lowest scores on risks, slips, lapses, mistakes, unintended violations and deliberate violations questions and the highest scores on the perceived control question. Therefore, they are judged as careful drivers. The participants of this cluster change lane very early when the vehicle at low speed is still far away. They then pull the car back in the right lane after overtaking. We can notice that they respect the first speed limitation and the second one at $70km/h$ due to coming turns.

- *cluster2* is only composed of participants (6 male participants and 4 female participants) which are mixed between the two *annotations* clusters. Those participants do not overtake the vehicle at low speed or only at the very end.

- *cluster3* is mainly composed of participants (6 male participants, 6 female participants, and the agent $a5$). Those participants are largely annotated in the same cluster (2), which

[1] All subscales were included except for the *human or simulated agent* question which is not directly related to the adopted behavior.

has the lowest score on the perceived control question and the highest scores on other questions, meaning that they are judged as unsafe drivers. We can note that the agent $a5$ is separated from other agents and judged as an unsafe driver because it changes lane at the last moment, overtakes but stays in the left lane. It also does not respect speed limitation with an average speed of $10km/h$ above limitation.

behaviors clustering composition

The Figure 5 shows the clustering composition for each driving situation (left to right). Clusters of each clustering c are represented within rectangles, and named $clusterc_{\#}$ with the composition details in terms of agent A, male M, and female F just below them. As for the previous figure, agents are names $a\#$, male participants $s\#(M)$ and female participants $s\#(F)$. We have regrouped the main actors who are together for all driving situation. As the first driving situation has been described in section *Annotations and behaviors*, we will now analyze the two other driving situations.

For the second driving situation, the domain experts indicate us to focus on the number of lane-changing, the lane number, and the time to collision. The rand index between the first driving situation clustering and this one is 0.74 and the adjusted rand index is 0.39.

- *cluster2.1* contains 8 male participants and 6 female participants. They all overtake the vehicle at low-speed after the second or the third oncoming vehicle.
- *cluster2.2* is only composed of one female participant who tries to overtake after the third oncoming vehicle, changes lane, but reconsiders the situation seeing another oncoming vehicle and cancels her move.
- *cluster2.3* is an agent only cluster: Those agents do not try to overtake the vehicle at low-speed and follow it at constant speed and constant inter-vehicle distance.
- *cluster2.4* is composed of 5 male participants and 3 female participants who do not try to overtake either or only after the fourth oncoming vehicle.
- *cluster2.5* contains 2 agents whose behavior is roughly similar to the one of the other agents.

For the third driving situation, the relevant indicators are the number of lane-changing, lane number, and the average speed. The rand index between the first driving situation clustering (respectively the second one) and this one is 0.50 (respectively 0.54) and the adjusted rand index is 0.02 (respectively 0.09).

- *cluster3.1* contains 5 agents, 11 male participants, and 7 female participants. It contains two main behaviors: not overtaking, and overtaking and then pull back in.
- *cluster3.2* is composed of 9 agents, 2 male participants and 3 female participants. Main actors have strong accelerations and decelerations. They stay on the left lane and overtake. The participant $s6$ do not overtake but her vehicle have important lateral oscillations maybe misinterpreted as overtakings by the clustering algorithm.

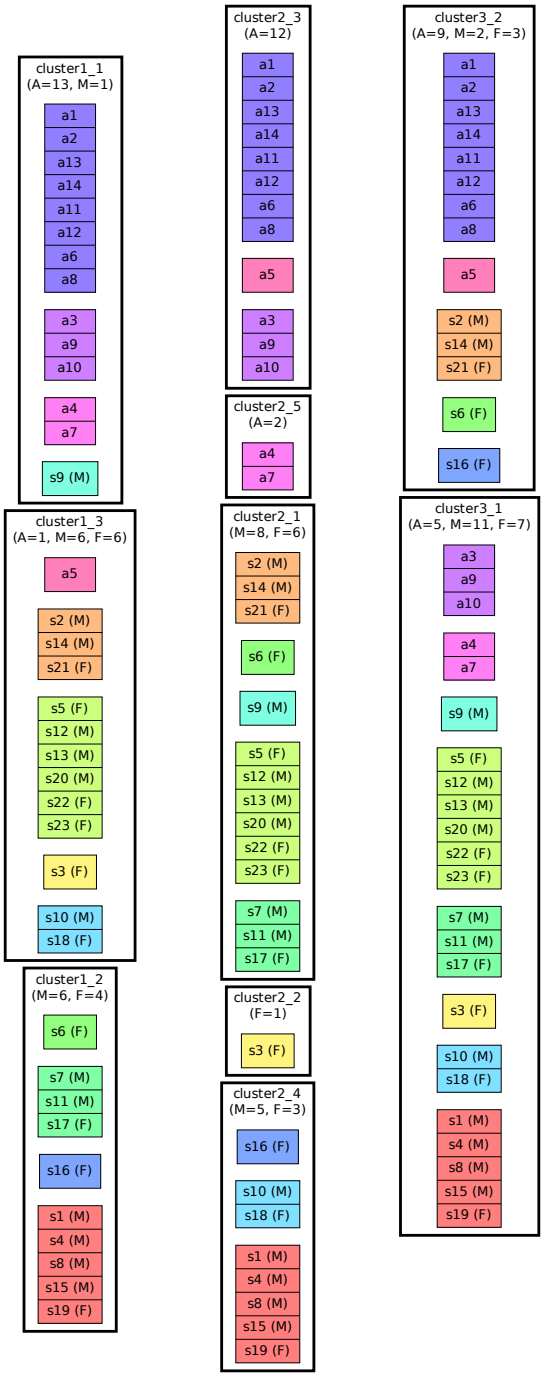

FIGURE 5 Behavior clusterings for each driving situation (left to right). Each cluster of a clustering is represented as a rectangle with the agent, male and female composition. The main actors who are together in all clusterings are grouped together within a cluster.

Discussion

We have a significant similarity between *annotations* and *behavior* clusterings, meaning that we are able to classify our logs data into high-level behavior clusters which are meaningful in term of driving *annotations*. Nevertheless the two clusterings are not identical with regard to the clusters composition nor with regard to the clusters number. This could be due to the number of annotators.Furthermore, the behavior clustering is done on noisy indicators for human participants and on smooth indicators for agents. A solution might be to add a noise on the agents data or to smooth the participants data. This problem may come from the clustering algorithm which is a classic but basic one. We have to test with advanced algorithms like *EM* or a temporal algorithm.

In the comparison between *annotations* and *behaviors* for the first driving situation, one agent was in a mainly human composed cluster (with the same number of male and female participants, meaning that this behavior is common to both genders). An explanation is that it is able to simulate the majority driver's behavior of this cluster which is *unsafe*. If it is, we can then consider that this *unsafe* behavior is an agents ability. To verify this assumption, we would need a specific test in which the parameter set that was used for the agent $a5$ is confronted to different situations, and compared with logs and *annotations* of cautious human drivers. Conversely, one male participant was in the mainly agent composed cluster judged as cautious for a majority of them. This requires further study to understand what was specific in this subject's driving behavior that was similar to the agents' behaviors. A possible explanation is that the agents behaviors are closer to male drivers, or that a typically male behavior is produced by an overlarge number of agents. This will require a larger driver population to conclude. *cluster2* does not contain any agent, meaning that the agent's model is not able to reproduce this human driving behavior (*i.e.* this behavior is lacking in the agent's model).

In the second driving situation the agents do not overtake the vehicle at low-speed but follow it at constant speed and inter-vehicle distance. The fact that no participant is in the agent clusters (*i.e.* no participant adopted those behaviors) shows that those behaviors are inaccurate (*i.e.* are errors) and should be investigated further. Two clusters contain both male and female participants meaning that those two behaviors are common to both gender. One female participant is a singleton. With a larger population, if she is still alone, that would mean that she is an outlier. On the contrary if she is grouped with other female participants, that would mean that this behavior is female-specific and not reproducible by the agents.

In the third driving situation, the two clusters contain agents, male, and female participants. This indicates that the agents are able to reproduce the adopted highway behaviors. This might be due to the specific highway driving style which is more easily reproducible.

Questionnaires correlations

We have calculated the Two-Tailed Pearson correlation ($df = 21$) between *Driver Behavior Questionnaire* subscales, *Immersive Tendencies Questionnaires* subscales, *Game Engagement Questionnaire* and *Presence Questionnaire* subscales. Significant results (with $p < 0.05$ as in the works of Fisher et al. (*21*)) are shown in Table 1, for both age and gender.

We have found very few significant correlations between gender and questionnaire results. Men have lower scores on the *DBQ unitentional violations* scale, higher scores on the *PQ* performance auto-evaluation subscale, and lower scores on the *ITQ emotion* subscale.

As the scores are auto-evaluations, there is probably a bias due to gender since these three subscales are typically loaded with social representations. Men tend to report less emotions, and

	DBQ violations	mistakes	slips	PQ perf	HMI	ITQ Emotion	Implication
gender	-0.45 (p<0.05)	-	-	0.52 (p<0.02)	-	-0.47 (p<0.05)	
Age	-0.42 (p<0.05)	-0.47 (p<0.05)	-0.56 (p<0.01)	–	0.45 (p<0.05)	-	-0.44 (p<0.05)

TABLE 1 Significant correlations (Pearson, df=21, two-tailed).

to overrate their performance in tasks (see *e.g.* O'Laughlin and Brubaker (*22*)).

Interestingly, we have found more correlations between age and questionnaire results, wich show that younger generations have less problems with the human-machine interface and overall implication in the simulation. It is also seen in several *DBQ* subscales: mistakes, slips and violations.

Several hypothesis went unsupported. We have not found correlations between gender and game habits or game engagement. Concerning the virtual agents behavior, there is also no correlation between gender and virtual drivers credibility scores, although there is a correlation between age and virtual drivers credibility scores.

CONCLUSIONS

Although gendered differences in driving behavior are well-documented, our study through automatic clustering did not differentiate strongly men and women traces.

The presence questionnaire performance auto evaluation is correlated to gender, but also to the *DBQ* unintentional violations and mistakes; which may indicate that mistakes done in real life driving are also done in simulators. Confidence also plays a role in self evaluation, since the annotators did not separate their observation results strongly.

Although women tend to trust less automated systems than men Cottrill and Thakuriah (*23*), we did not find significant differences in their experience with the simulator, neither for presence scales, nor for virtual agents behavior credibility. From our results, age is a much stronger factor to differentiate immersion tendency, credibility annotations, and overall behavior.

One of our working hypothesis was that participants video game experience would impact the result of our study. Once again, no independent significant correlation were found from our data. However, age is indeed a factor. An explanation is that technology penetration is higher in younger generations, and since the gender gap is diminishing, video game experience is no more discriminating, especially between gender. This is counter intuitive since previous studies show that gaming is not yet past the gender divide Kafai et al. (*24*) (habits, types of games, platforms are still heavily gendered), although playing some types of games reduces some gender differences such as spatial cognition Feng et al. (*25*).

Our methodology proposes a set of tools and data processing units enabling inter-human and virtual agents behavior comparison. By using objective and subjective data, an in-depth analysis of observed behavior is enabled, while automatic clustering provides an objective viewpoint on the simulation results.

Concerning driving simulators validity, we found that in the case of the *Archisim* simulator, there is not significant gender bias either for the driving part or for the virtual drivers behavior. However, this kind of study should be conducted each time a simulator is validated for a use, in order to ensure that it is the case. Furthermore, we found several significant correlations with age, which calls for further studies on this dimension in the design and validation of driving simulators.

We also found two contradictory results: the virtual drivers tend not to reproduce human behavior, as automatic clustering does differentiate their behavior in several situations. Hence, the realism of their behavior is not high. However, the perception of this behavior by external annotators has been judged differently, since they scored the virtual drivers as being more human than the human replays. Hence, the credibility axis and the realism axis have opposite scores. One explanation is that humans tend to be less normative than virtual drivers which follow strict rules, while the social expectation is that humans should have a normative driving behavior, and deviance from the norm is considered as an error of the virtual driver.

Finally, we found out that the agents behavioral credibility was not correlated to the presence questionnaire results. This is due to the axis on which presence is scored in Witmer's and Singer's presence questionnaire, which is more a score on the device components quality than the immersion feeling or psychological fidelity. Hence, we recommend to use other presence questionnaires to study virtual agents credibility, such as Schubert (*26*).

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The construction of travel mode choice is complex, due to the combination of various factors influencing it. These factors include the context where the travel is performed, motivational factors and individual characteristics.

Through an Exploratory Factor Analysis and a subsequent Cluster Analysis, this project has two objectives: First, to identify latent variables from attitudes reported by employed residents in the inner ring of Paris, justifying the use of a selected transportation mode (public or private) to commute to work. Second, to segment the population into groups of users using the latent variables identified previously and to analyze their composition, taking into account tangible attributes of the trip and socioeconomic characteristics of the travelers.

1023 residents of the Paris inner ring answered a revealed preferences questionnaire about their transportation behaviour and attitudes during the seven days prior to the day of the interview. Questions about elements influencing mode choice, like trip attributes (travel time, monetary costs, parking availability and cost), characteristics of the trip maker (household structure, income, number of car per household); and subjective components (perception, norms and attitudes) were included in the questionnaire.

The identified latent variables refer to feelings of pleasure, physical comfort, and independence; environmental concern, and the need to improve time management. Three groups of travelers were identified based on the obtained latent variables, each one representing a unique combination of latent variables, socioeconomic components and trip characteristics. The groups differed significantly from each other in terms of occupational status, travel time, estimated cost of trip and number of vehicles per household. The information obtained can be used to target, on specific populations, the transportation policies and certain communication actions to promote sustainable transportation practices.

Title: Voices of expatriate and bus user womenin Abu Dhabi (UAE). Constraints and detour strategies

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Abstract

In the United Arab Emirate, urban development has followed the construction of a dense road network built to ensure economic development and better connectivity across the territory. However, an efficient intra-urban public transport system was lacking until the modernisation of the bus network, part of the Abu Dhabi 2030 Vision (UPC, 2007, DoT 2008). Abu Dhabi has grown being place of highest investments of benefits from oil and gas economy in a car-centric urban development model in a very highly socio-economic stratification.As a consequence, daily mobility is highly dependent on private and independent mode of transport.How the non local women population of Abu Dhabi use the network in a transit unfriendly environment? This article aims at investigating the constraints and the detour strategies of the expatriate women in Abu Dhabi using the limited informal qualitative tools available for research.

Key Words

Public transport –Commuting – Abu Dhabi – Choice – Constraints – Women – Expatriate

INTRODUCTION

The issues women may encounter in public transportation is a concern thathas been extensively researched by Americanscholars such as Rosenbloom in 1978 and Blumenberg in 2004; as well as by European scholars like Dupont-Kerlan and Fontaine in 2002 and Fagnani in 1984. The signs of a undergoing remodeling of the commuting systemprovided to women has been acknowledged in the USA by Rosenbloom.Furthermore, there is a real scientific interest to analyze the cultural differences that lead to specific accommodations needed forwomen in public transportation in a cosmopolitan city located in a country where the population is composed of 85% foreigners. On another level, the USA, has shown in the past the will totake into account the migrant population in her urban policies and the urban structure in itself (Sanderlock, 1998), whereas the United Arab Emirates has focused on segregating the actual population but rarely theurban mobility.

The present analysis aims at shedding the light on the non-local group of women in Abu Dhabi and considering the gender issues in the transportation service policy in the United Arab Emirates. Capital of the United Arab Emirates, located on the southern shore of the Arabian-Persian Gulf, Abu Dhabi is a very rich and powerful city, since most of the country's oil and gas production are under its jurisdiction (Heard-Bey). The objectives of this paper are to investigate the constraints and the detour strategies of the expatriate women in Abu Dhabi using the limited informal qualitative tools available for research. After exposing the background and the methodology, this paper will focus on the constraints that were listed in the interviews on social, timing, economical and psychological aspects. The following step will be to list how women have justified their experience on the bus and how they have dealt with the mentioned constraints.

BACKGROUND

- **Abu Dhabi is a sprawling citydeprived of a real public transport network**

Abu Dhabi urban planning stragegiesfavor modernist approach that gives more importance to car transportation. Because of the tropical climate with long summers and also because of the need to build transport infrastructures in a vast territory where the population is small in number, the use of a personal vehicle has appeared convenient, more efficientand comfortable to cover long distance trips. Indeed,in Abu Dhabi, driving your own car seems to be a key asset for the intra-urban mobility; thus, it also even defines a lifestyle. That is whyfor most of the daily commutes(grocery, school, workplace, leisure) driving your car around the city is the answer, hence an intensive use of private cars in Abu Dhabi. Having a driving license makes all the difference for the expatriate women, no matter if they are working or not. Major expenses are spent on transportation infrastructures, in order to build state of the art highways, tunnel, roads and flyovers for a car-oriented urbanscape. Incidentally, the urban mobility is directly linked to the growth of private cars number. The DoT figures reveal that the number of vehicles registered in Abu Dhabi has increased of 49% between 2006 and 2008 (DoT, 2009: 17). The needto rely on the car use has also increased accordingly. In 2008, more than 48% of the overall trips are done by car.

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Map1Abu Dhabi Metropolitan Area (CMontagne, 2013)

The architectureand urban design of the city has followed the same trend and has privileged development of detached villas. The suburbs are sprawling and form a landscape of undefined cities, as BaniYas, Khalifa City A, Khalifa City B (map 1). Commuting between the main island where most of the jobs are located and the other locations where more and more residents have to resettle has become a daily routine for most of Abu Dhabi population.The North-East of the city is dense and driven by a urbanite lifestyle in the neighborhoods called Tourist Club Area, Al Marzakiyah, Al Khalidiyah and MedinatZayed. There are some recreational structures (movie theater, bookstore, malls), grocery stores; specialized shops (house appliance, electronics); and diverse workplaces. But everywhere else in the city is made of a low rise and detached villa urban pattern. Middle rise and high rise building are less and less frequent once passed 15th street (map 2). For the majority of inhabitants, having an extended mobility thanks to their car is a must, for any of their daily needs. Consequently, only the driving licenseholders, wealthy enough to possess a car, have all the freedom of action to move and access the city. What Y. Elsheshtawy has written about Dubai that "[there is a] *feeling and an atmosphere of despair in the suburbs"* (2010) is palpable in the streets of Khalifa City B where the only way to reach the next suburbs is to take the only bus that passes by every hour.

Map 2: North of Abu Dhabi main island (CMontagne, 2013 after Cadène&Dumortier, 2012)

- **lacking a structured and modern public transport network until 2008**

More than a third of all the commutes are done through private company buses (DoT, 2009). As such public transport remained undeveloped until 2009 and was rather associated with low status, low paid Asian and Arab migrants. During the past 30 years, the city bus network had no schedule and was only operating on a very small area of the urban space. Only 100 old buses were on duty (table 1). This former public network gave a negative image of the service to the residents. It also led to the idea that public transportation was only suitable to the poorest expatriates.

Table 1 : Bus office statistics showing a passengers trips rise (DoT, Bus office, january 2013)

A recent transport policy was drafted in 2008 for the *Surface Transport Master Plan*, is an official document approved in 2009, by Sheikh Khalifa, ruler of the Abu Dhabi Emirate. The goals and the objectives pursued by the STMP insist particularly on "*protecting and enriching people's lives by maximizing safety and access to opportunities for all*" (DoT, 2008: 6). Today there are more than 500 buses in service, operating on 50 different routes in the Metropolitan Area of Abu Dhabi. The current system is offering a large choice of destinations to all the districts of Abu Dhabi, for the population deprived of car mobility. With constant improvement, brought by the Bus Office and a small team of transportation engineers, as well as urban and transportation planners and a couple of short term consultants, the network counts now more than 100 lines on an urban and suburban coverage; and also more than 50 million passengers a year (*The National*, 2013). The network is covering the main avenues and the most populated neighborhoods of Abu Dhabi. The two following maps describe precisely the areas served by this public transport network (map 3). The objectives are also to offer a minimal service of one bus every hour, while ensuring that on some of the main lines (100, 105, 405, 305) there is a 24 hours services (map 4).

Map 3: Bus Network Plan in 2013 in Abu Dhabi, Reem, Saadiyat Islands and the Metropolitan Area *(DoT, april 2013)*

Map 4 : Bus Network Plan in 2013 in Abu Dhabi (DoT, april 2013)

Immediate positive impacts have been noticed by all the residents who have been living in Abu Dhabi before the modernization of the bus network. One of them mentioned that when shewent from the Sport Zayed City bus stop to MussafahShabiyat 10 to pick up her laundry:

> "*before the new system, if I had missed the company shuttle, to go from my home to my office, I would have had to go there by shared taxi, which used to smell very bad, from Etisalat Tower (across Electra street and Airport road). From there, I used to take another shared mini-bus which used to take me to South BaniYas. Then, I had to take another shared mini-bus for the last 5 km to reach the neighborhood called, Al Neda Al Jadeeda. The total cost of my transportation was over 50 Dhs [10 euros]. As a matter of fact, I rarely missed the company shuttle. And I was lucky to have the company providing it*".

- **Abu Dhabi's multi-ethnic urban population and highly stratified on busses**

STMP is expected a success in the modernization of the bus network because "*at first this seems a big obstacle to overcome, but less so when it is considered that much of the expatriate population is accustomed to using public transport in their home countries*" (STMP, 2009: 22). Clearly, the argument refers to the vast majority of South Asian expatriates, namely, Indians, Pakistanis, Bangladeshis and Nepalese, but also to the East Asian migrants that are the Indonesians, Malaysians and Filipinos. Indeed, like other countries of the Gulf, the United Arab Emirates host a majority of expatriates. The capital of the Arab Emirates federation counts 75% of foreigners in its urban population. Indeed, according to S. Khalaf, the Gulf Oil City is "*a cultural kaleidoscope of urban lifeways and identities, all with their different nationalities, religions, physical types, dress, food, music, smalls, and even localized suburban environment*" (2006:259). This cohabitation of multiple nationalities is respectful of differences in ways of life and in attires. This can be observed in public spaces like the malls (Camelin, 2012), in the bus and in the streets.

The essential feature of the Gulf city is to be a "*highly stratified society"* (*op.cit*. :256) where "*laws and politic of exclusion maintain sharp economic disparities that favor nationals and render large numbers of immigrants susceptible to exploitation*" (*op.cit.*, :256). Consequently, there are strong socio-economic inequalities between residents. Disparities appear more clearly as the lower-class faces less opportunitiesto access the city. The working class ranges from the Filipino engineer to the Malayalam nurse whose respective salaries range from 1500 Dhs(300 €) to 5000 Dhs (1000 €). Wages are indexed on nationality (cost of life) in home country, which implies that for the same job (sale assistant, administrative assistant etc.) an Egyptian, a Chinese or a Filipino will earn a different salary that ranges between 3500 (700 €) to 7000 Dhs (1400€).A return ride between the suburbs and the city center costs daily at least 10 Dhs(2 €) on the public buses, between 20 to 30 Dhs(4 to 6 €) on private mini-buses and approximately 80 Dhs(8 €) for a cab ride. Besides, some workers are compelled to take the

bus, because of their contract where transportation fees are not included or because they cannot afford buying a car[1].

Although, an important fact is the overrepresentation of expatriate men in public places and public buses that reflects the unequal demographic balance in the UAE. Knowing that expatriates are hired to build infrastructures and skyscrapers, the immigration policies favor visa issuing for men coming from the Indian subcontinent. The immigration rules are not in favor of family reunification, and vary depending on the monthly salary and the size of the accommodation that is provided. Thus t is made very difficult for spouses to join their husband in the UAE (Camelin, 2012). Only one expatriate out of five are women, according to the UAE Statistic Center (2010). A great number are working in the service industry, principally in administration, retail or in the health sector. According to estimations, it means that about 250 000 to 300 000 foreign women live and work in the Abu Dhabi.

Given the policy framework and its objectives, the first surveys about customer satisfaction of CATI 2010 and 2012 (UAE, Al Ain University) that have been conducted on bus passengers' feedbacks show that less than a quarter are women – the same as in taxis – and that they are essentially young and single.[2]Women are underrepresented as bus users, since they only represent 10% of the passengers, which is only reflecting the socio-economic strata of the Abu Dhabi non local. Between 75 and 85% of the passengers are men, based on a group of interviewees of 1500 people during the 4 waves of the survey (figure 1). This strong presence of men in the bus, which only reflects the demographic unbalance of the UAE, is a social constraint for women, who would rather hesitate to take the bus and sometimes be discouraged to use this transportation system.

Figure 1: The nationality distribution in the public transport network (taxi and buses) in Abu Dhabi *(DoT, CATI, ARA Research survey in 2010, data collected in 2013)*

- **Similarities and differences with other Gulf countries**

Contrarily to what A.Le Renard observed and reported about Riyadh (Kingdom of Saudi Arabia), there is no such thing as strict gender segregation or Islamic laws implying that women are banned from driving or that they cannot take the bus and subway with men (Le Renard, 2006: 184). In the United Arab Emirates, there is no religious police that monitors and controls women's access to the public space. Arab expatriates and locals young women have their family still closely controlling their daily commuting, although legal, social and

[1]It is important to underline that national policies regarding the employment of Emiratis usually place them in the highest position; therefore, they do not take the bus. The Westerners benefit from higher wages and then do not ride on city buses.It is rare to see any of them taking the bus, since they can afford higher expenses (owning a car etc.).

[2]This survey has been conducted by CATI, a consulting office managed by a sociology professor from United Arab Emirates University base in Al Ain. It is a survey that has been requested by the DoT, one year after the implementation of the modernization and which mainly aims at a satisfactory survey, though we are using some of the output in framing our research. Based on 2802 interviews with 2521 users of public transportation means and 283 non users, meaning just standing next to a bus station, the survey has proceed with most of the questionnaire where done face to face in public areas in a 3 months length period. The questionnaire is mainly focused on the used transport and on the detailed satisfaction questions.

cultural environment allows women and young adults to drive and be independent, according to their age.In Abu Dhabi, the situation most Muslim women do not work outside their homes, so their movements are limited. There are little occasions for them to go out, for grocery shopping, to drop and pick up their kids or to visit their friends. Nevertheless, A. Le Renard pointed out the social status and the nationality as an important factor of the possibility of mobility or the accessibility to public spaces in the urban space (Le Renard, 2006: 34).

METHODOLOGY

While very few research were conducted about the United Arab Emirates, lately more and more ongoing works and papers are written from the point of view of different disciplines including anthropology, social history, gender studies and urban planning on the matter. Yet, the question of the dependence on public transport on a daily basis for expatriate and local women in the capital of the United Arab Emirate Federation has not yet been extensively researched.

The methodology followed for this paper was on three steps process. At first I have gathered all information available on gender studies in public transport in Abu Dhabi, I have carried out then an open survey with a limited number of accessible women and at last I have proposed a plan for further more rigorous and in-depth research.

This paper reflects an exploratory qualitative research, conducted in February 2013, in Abu Dhabi, based on 12 interviewees and several observations of women with different educational backgrounds, social status, age and nationality; and who are short or long-term residents in the city (i.e. the table 2 below). This is done trying to respect a significant sample of bus users regarding nationality and social status, changing the suburban and urban destinations.The interviewed women were met at bus station. We shared a bus ride, a meeting, a coffee, a lunch.

This study exclusively sheds the light on some expatriate women in Abu Dhabi, since they are often less wealthy than Emirati women, thus theyrely on public transportation.The items include a set of generic questions regarding their backgrounds, their daily and weekly mobility patterns, the time and money cost. The set of questions was quite wide to allow the interviewees to answer spontaneously "*how did you make the commute in Abu Dhabi when you arrived*?" "*how do you go from one place to another today*"? "*how much do you spend"*? "*what is your feeling about the network*?" "*how do you feel in the city*?".

Table 2 List of interviewees (life feature, age, place of interviews)

The limits of this study are due to our very little understanding of the Arabic language and to the need of digging more with the non-English speakers. Also, the little information about the Emirati women makes this study hard to compare with our findings on women.

WOMEN EXPERIENCE OF COMMUTING IN ABU DHABI

SOCIAL AND PSYCHOLOGICAL CONSTRAINTS

- **"*I always see men [*in the bus]" (Ese)**

As one said, if it took her so long [almost 2 years] to try to ride the bus it was because "[she] *always saw men* [in the bus]" (Ese). She meant South Asian labor men. Ese mentioned that between 2006 and 2008, she had to endured a lot of constraints in moving around her home, located on Mina Road, in Tourist Club Area. Until the introduction of both Silver Taxi and DoT buses at the end of 2008, she was "*initially skeptical*". She thought "*I can't use this bus"* because of the overrepresentation of men in the public buses has been surveyed by several studies commissioned by the Customer Satisfaction division of DoT. The strong presence of men in buses, at the bus stops and bus stations are most certainly a reflection of the mentioned unbalanced demographic along with nationalities and socio-economic differences. This is why the Department of Transport has enforced special section at the front of the bus for the women.

This presence of men in the bus gives a feeling of uneasiness to the women bus passengers because they are in massive numeric superiority and also because of their living conditions, far from their families, only amidst men and co-workers. Persistant gazing, the incomfort feeling of waiting for the bus surrounded by men, the lack of lights near bus stops create a feeling of unsecurity because of a numeric insecurity. The gaze of some men can lack respect and express a need for women company, as a result of their condition of living far from their family for long years without possibility of travelling back home or having them visiting.

- **« *if you're a lady, you need to sit in the front* » (Clairol)**

Indeed this uneasiness felt by most women, due to the unbalanced gender distribution of the resident population acts as a constraint for most women, especially in insecurity feeling.Private mini-buses are another mode used as mitigation against the slowness of the DoT buses: operated from the same very central location that is the Al Wahda bus station and from MedinatZayed bus stops. They are privately run and they connect southern suburbs (Mussafah, BaniYas, Shamkha) for the labor that lives downtown, in cheap but conveniently located accommodations, in the dense and busy city center. These private mini-buses are very convenient, more flexible than the bus; they are also faster and can drop at the exact location of the final destination.

Though for women, it is not as safe as the public buses. Indeed, when one of our interviewees had to go to Mussafah for a job interview, she could not wait for the public buses to drop her, besides they are packed full during peak hours be it morning or evening. As Clairol told us "*It is also hard to take the sharing taxi. Because it is full in MedinatZayed – Murror Road*". But she had no other choice than taking the private mini-buses, and she followed very simple and obvious rules according to her: "*Of course if you're a lady, you need to sit in the front, because you'll go with the Pathan, like that. That is the thing, this is the problem. That is why some of the Filipino, even some other nationalities, don't take the sharing taxi. Because they are afraid of those Pathan".* As she told me, "*That's what my cousin advises me even I'll take sharing taxi. It is better to sit in the front*". Sitting in the front next to the driver, where there

can be only two passengers is the unsaid rule that applies to women to avoid unwanted physical contact. The fear that Clairol mentioned has nothing to do with physical aggression, or so she told me, but "*just the problem is the way they will look at you. Just that thing. They are very sensitive. You don't want to go near them*".

- **"*Better to be safe than to be sorry*" (Shalini)**

Some fears are linked also with the fact that the expatriate women spend a long time in their house so they feel very long time outsiders of the city. If they are housewives, they have very few options in going out of their home and if their husband is not connected a lot with social network from work or from the community, they can have a hard time adapting to their environment. One of our interviewees, although very likeable and friendly, had not visited any of the touristic places after nine months living in Abu Dhabi.She had never left her neighborhood called Manasir, near Mushrif Mall and she feared the city center. She once told me "*you know, being new to this place, I am being extra cautious,because I don't want to get lost,because it is again difficult to talk to people and ask them the right direction".* She was afraid that if she got lost nobody would be there to help her find her home again. She does speak fluent English and is very well educated. Being born and raised in Bangalore, India, from a middle class family, she used to drive a two-wheeler, she describes herself as "*independent*", because "*I drive*". She told me, "*but here we are totally dependent on the public transport. So I am extra cautious on them".*

- **"*Dependent on public transport*"**

As Shalini says, living in the UAE mean being less free in one's daily life. For example, as most of the urban population come from the Indian subcontinent, South-East Asia or East Asia, their common mode of transportation is a two-wheeler. But as it is either very difficult for men to get the driving license and very dangerous to ride a motorcycle on most of the road networks in Abu Dhabi, most of them become captive users of public transportation. They become here "*totally dependent on the public transport*".

Most of the interviewees are praising the current network, even the women who have not really understood how to use other lines that the routes between their home and their places of work, study or leisure (visiting family, retail shopping, grocery shopping, cultural or sport activities). "*It is so much better now*", tells us Ese, every time we ride the bus with her or that we meet for an interview about her fine knowledge of the several bus routes of the northern part of Abu Dhabi Island. Indeed for her and for all the intervieweeswho were residents in Abu Dhabi prior to 2008 and the modernization of transit:

> "*Before we had then the white and gold taxi. The drivers are so arrogant. Most of time there are cheats. Sometimes the meter will give you a different price. Sometimes you pay your fare and they don't want to give you change. And most it is difficult to get a taxi, you see people standing on the road waiting for a taxi. It was difficult, very very difficult. Very. If you have to go somewhere you have to come out early. Like if I go to groceries shopping at Abu Dhabi Coop sometimes I can wait for hours to get a taxi to come home and my place is very near to the Co-op. but because I can't carry all my shopping so I have to wait for the taxi*".

TIME CONSTRAINT

- ***"Schedules and time length"***

One of the main constraints raised during the interviewees by the women is the lack of frequent schedules which is the main constraint either for the ladies who are housewives or for the working ladies. It means indeed that they have to plan ahead all their movements, to be back home in time to take the children, or get the meal ready for their husbands.

As Hendang, an Indonesian, who is 55 years old married to an American, whom I met during my survey at Marina Mall, dressed in sport wear, told me, she just left the yoga classes at the Sport Club of Marina Mall and she had to take the bus coming in 10 minutes to be on time and be there when her husband comes back for lunch. As she told me, she can avoid using the luxury of taking a cab and waiting for the bus because she "*prepared lunch this morning before leaving the house*". The same discourse is shared by Rania, a Jordanian lady met just after a book club coffee at Marina Mall. She likes to come and go with the bus to save some money but mostly because she has time and she finds the bus very comfortable compared to what she used to ride in Amman. She enjoyed riding the bus and taking time to travel across the city, for a very cheap price, "*only 2 Dh*" and "*I am back home, instead of paying 50 to 60 Dh*" and "*it is direct*".

Nevertheless Hendang, Rania and Ese mentioned the slowness of the bus as one of the constraint that they have to cope with to still use the bus. Rania says "*the only disadvantage is that it takes a long while".* Indeed the several stops, the driving conditions of the bus in dense road traffic and the spread out urban morphology make the bus quite slow when compared to the so called fast and efficient silver taxi which are unaffordable for most of the unemployed women, housewives, and whose imperative is to save money.

- ***"I take sometimes the taxi"***

Some young working unmarried women, like Nabila, who came from Khartoum five years ago to work as a sale officer in a shop in Marina Mall, are claiming that they take the silver taxi, because they are "*always late*". The real reason is rather that she is hosted by her aunt and she spends the money saved this way in fast transportation. She tells me "*even my family prefers that I travel with taxi*". Indeed it shows that she is not that free and independent, besides her work place, her neighborhood and the coffee shop she goes with her cousins, with the family car, she does not go out often alone. On the contrary to Nabila, the story of Ming is very different. Being only 22 years old, she came to Abu Dhabi by herself to work in the sales 2 years ago, and she wants to shift now for an office job. During her day off, she always pays a visit to her boyfriend who lives in Mussafah. Because she told me "*I am losing time waiting for the bus 52, I am always hiring a cab to reach the bus station and from there I wait for the suburb bus 115, which takes me to Shabiya 12*". In this case, the constraint that is the valuable time of her day off is more important than the 12Dh paid between her accommodation on Hamdan street and the bus station.

Indeed most of them mentioned that when and only if they are "*in a hurry, they take a taxi".* But "*it depends on your finances too*", says Ese. "*It depends on how much you have. If I have time I go by bus, if I have the time. If I am not in a hurry I can use the bus. But when I am in a*

race, I have to be home, like my boys are coming back at 3 [pm], I can't be patient enough to take a bus. So I use the taxi." [3]

Because a taxi stays an expensive mode of travel, when it is used daily, it is not obvious that it is the only way of commuting for most of the population living in Abu Dhabi. Hiring a cab is indeed costly, in a city where wages are certainly higher than one could get back home, but still all the other expenses aren't cheap either. Taking a taxi remains a luxury.

ECONOMIC CONSTRAINTS

- ***"You got to move according to the money in your pocket"***

In the discourse of middle-income expatriates it is very clear that financial issues as purchasing, insuring, maintaining a car is a high constraint to their individual mobility. An interviewee, working as a sale officer, born and raised in Kenya told me once "*if you got no money, you got not choice, but to wait for the bus, dear".*The budget allowed to their mobility is a large motivation to their mode choices.

As this middle-age Kenyan told us, "*you got to move according to the money in your pocket*". Indeed it is the major constraint to the daily mobility and made her dependent on the bus, waiting for hours at the Al Wahda Bus Station, when there is only one bus an hour and because her company does not provide shuttle to cover the mobility between different offices across Abu Dhabi Island. She was recently fired from a first job, had to buy her visa to remain in the country and start working for this new company. The distances she has to travel and the difficulties that she has to face since the public buses are not taking her where she needs to go in the Mussafah Suburbs becausethere are no public bus connections, she spends more in private mini-bus "*they rip us off*".

- **"*having another other option than taxi*"**

Sienna, a Filipina and Selma, an Ethiopian, both working for a famous shop, told me that they preferred to save their money and use the bus since they "*had another option than using the taxi*", "*which was not the case in 2006*". Ese, whom we have met at several occasion tells us that the public transport in Abu Dhabi is so "*great*", it is passing under her home and taking her straight to "*Marina Mall with only 2 Dirham*" in about 30 minutes of driving in an air conditioned bus. She finds "*that it* [is] *effective, cheap and very convenient".* She goes on and

[3] For example, even holding a car driving license from Nigeria, and having the possibility of transferring it to an Emirati Driving License, Ese, has never felt the need for a car driven mobility. Indeed, even when she left Nigeria for the first time to settle in Malaysia, "*in 2002. We had a car. But I wasn't driving. Just my husband was driving the car".* She used to use only taxi to commute for her grocery and her retail shopping, *"So there was this time in Malaysia, you had the phone number of the taxi and the taxi will come and pick you. So I was using that for close to 2 years".* Her mobility was suddenly getting better when she "*got a maid and then she introduced me to public transport system and it passes right next to my home; the main road".* She found it *"so efficient and conducive. Very net and very efficient."*Drasticchanges occurred when she came to UAE in 2006 that she sums up in "*initially it was terrible*".

describes herself as someone who *"like[s] going out. I am not a house person. I like going out. What is the cheapest way of going out? It is the bus. So I use the bus".* Going out of her place for a cheap price is the main utility of the public transport network.

Money is the reason why so many of the expatriates are living in Abu Dhabi. When Clairol realized that she was not saving enough, at the beginning of her stay in the UAE, she took drastic measures. She told me "*when the times passes, OMG, oh my money it is suddenly gone because I always took taxi. So we try to walk also*". During her day off, Clairol, (27 years old, an engineer who landed in Abu Dhabi 18 months ago from Manila) and her friends and flatmates very often go to "M*arina Mall and this Heritage Village, near Marina. We always go to the Park. Whenever we go to the park, we take a car with our friends, and when going to the bar, we take our car. Whenever we are going to Corniche we take taxi. I know bus going there, and taxi coming back. Even in fish market, there is a bus also. So we take the bus".* There is a real need for coping with the expenses and the new regulations[4].

WOMEN AND THEIR COPING STRATEGIES

DETOUR STRATEGY: CHOOSING WHERE TO LIVE OR TO WORK

- **"*Tourist Club Area is a lively nice place to live*"**

Among the constraints dealt with by the women of Abu Dhabi City with the public transport, there are the difficult connection with their final destination and the length of the commuting. Indeed, an interviewee told us how she and her flatmates spent in average 2 hours and a half to 3 hours a day in the bus commuting and around 20 to 30 Dh a day. But when she is asked why she would not rather live closer to her office in the area called "Bain Al Jisreen" (between the bridges), on the main land, she answers "*here, in nice, you can see a lot of people that you know, there are a lot of buildings, and your friends are here, your colleague are here, but in Bain Al Jesrain, it is quiet, and then, still now, I feel that in that area when it's dark I won't feel safe".*

For Selma, the most important expenditure budget goes into housing, she prefers to live far from her job, a tiny room, but on her own. As for travelling across the city and commuting to work, she rides the public buses and walks to the Corniche or along the main streets, "*Khalifa, Hamdan or Electra Street*". Sienna shares a similar daily commuting but chose to live with her "*kabayan*", her compatriots, in a large room, in which some partition has been done but where she beats up homesickness. But for the two young working girls there is a choice for saving money and using the bus.

This discourse was surprisingly the same with Ese and her family, as she told :

[4] Indeed parking places available have shrunk and fines applied are expensive on the Corniche had become more and more difficult, so it is advised not to take a car to reach there.

> *"When I came to this country, initially a friend of mine was looking for an apartment for me in Manasir area. So I did like that she lived there too. I would like to live around there. I noticed it was difficult to find a taxi in this area at that time [in 2006, only Gold Taxi were operating] and the bus has not yet started operating. So very difficult. Oh, my husband told me it is better if 'we stay here in the Tourist Club Area. It is a location where you can move to any part of the city'".*

- **"*Workplace easily accessible by bus*"**

As for Sura, a Yemeni young woman, born and raised in Abu Dhabi, aged only 19, she had no other choice but to find a work, preferably near her newly married sister's home, near Al Wahda Bus Station. So she can work and save money with the hope of entering a university in Abu Dhabi. So that when she prefers staying at her sister's place, because she is tired and does not want to take the bus again, she can just stay in the city, which she rather prefers.

DETOUR STRATEGY: CONVINCING HERSELF BUS IS MUCH BETTER HERE THAN IN THEIR HOME COUNTRY

The mobility offered by public buses is although carried by contradictory discourses. In this matter, some of the interviewees, like Ese, are exaggerating the freedom that is given by the bus, and forget that a few weeks ago they emphazised on the slowness and on the economic conditions that were ruling her choices, and announce that "*even, during the night, I want to go to the meat market in Meena [the port], I can leave my house at 8 o'clock, buy the meat I need for the dinner, and take a bus back*." This is indeed a quality of the network to be operated in a city where outer spaces are entirely under surveillance and closely monitored by cameras almost everywhere. In the case of the fish or meat market, it is very lively during the night, where it is used as an open air restaurant where to buy and make the meat or the fish barbecued, and then eat it in one of the parks of the city.

Another interviewee told me that she found interesting that in the bus there "*is a lot of preference to women. They want to make sure that women are safe. And then, this is something I found quite safe, when I am travelling alone so I am sure it would not be too much of a pain*"; In brief, the public transport is nonetheless acknowledged as a much improved public transport compared to the one back home, and as such most of the interviewees express their gratitude to the system and accept the challenges and the difficulties raised by the bus utilization.

DETOUR STRATEGY: BUS AS A FREE WAY TO EXPERIENCE THE CITY

Riding a bus, understanding the map network give the women met on bus and at the bus stop the freedom to experience the city and to become familiar with Abu Dhabi, Ese told me « *now I know all buses and I can go everywhere* ». Most of the housewives I have met and interviewed, Hendang, Rania or Mariam were insisting on "*how cheap*" is the public transport and how "*easy*" it is to move around if "*you have time*". All of them would afford taxi but they prefer to save and still wait for the bus. The advantage of going out more often and more freely is a major tool to appropriate and learn how to move in the city. This is giving them a better understanding of the city even if they usually use only one or two bus lines, with

experience of the network and more opportunities offered they can use more lines. Once lived a constraint the bus is also understood as an opportunity, a "*free*" way to experience the city.

Even if it not an option but often the only affordable more of transport, bus riding can be also presented as a way to see the city, to travel for nothing and getting to see the buildings, the architecture and the organization. Shalini[5] told me once, while we were talking about the bus network in Abu Dhabi that she liked that it could take you anywhere across the city, that it was as good as volvo buses of Bangalore Municipal Transportation Corporation. She enjoyed much her first ride, as she told me "*the first time I took the bus, it was a nice feeling because I could see the buildings; and it was a right hand drive, whereas in India it is left hand drive. So I mean, the road, it is the opposite. It was different, it was a good feeling and I learnt a lot".*

Indeed most of the women we talked about, because they had to make a bigger effort in knowing the city, the bus network and the way to get from one point to the other, have started making Abu Dhabi their own home, and this is a detour strategy in coping with economic, time and social constraints. The better they know the city through the bus network, the easier it is for them to extend their radius of weekly trips. As an example, Ese has started social working at the catholic church Saint Joseph since she understood how to get there with the bus 32 or 52 depending on where she was in the city. She told me once, "*it is easy. I am familiar. I know where I am going. I know the bus routes now."*Knowing the bus routes helps beating up their loneliness of staying home due to economic issues.

DETOUR STRATEGY: HOW TO BE INDEPENDENT?

As an interviewee told us, most of her colleagues prefer to live in Tourist Club Area, which is a nice and vibrant neighborhood in the north of the Island. As most of them had their office moved out and settled on the main land, either on Al Ain Road in Mohammed Bin Zayed City or in Mussafah, they organized themselves with a paying car-sharing. One of them had to pass her driving licence and bought a car, to drive workmates for a limited monthly sum. This is paying car sharing, it is better to organize it with friends and colleagues rather than with strangers for "*safety*" reasons. That is the solution found by Clairol, "*I will share. There are some Filipino. You know there are some people, who are living in AD, here in AD, and they work in Mussafah, so they go with them every morning and they just pay 200 Dh a month. It is a private car. They have a renting contract".* This contract is not written, it is "*just verbal. Like everyday you'll take me to Mussafah*".

Some other students have organized a diversified commuting mode. Two Sudanese, both 20 years old, Fatema and Nour, explained how they commute 3 days a week between BaniYas, a southern suburb of Abu Dhabi, and their private college located in Satwa. One member of their family drops them to the bus station in BaniYas, they change bus in Al Wahda Bus Station and once they arrive at World Trade Center stops, another friend who has a car comes and picks them up. Most of the time the same friend drops them back to the bus stop in Jafiliya Seaside and most of the time they ride back with the bus to BaniYas. This commuting

[5] 32 years old, post graduate in Health and Social Studies from a University in Bangalore (Karnataka)

is possible because there are two of them, so they are authorized by their parents to have this much freedom.

Another woman, from Mumbai, living for the past 10 years in the UAE, just got married to an Indian man.She is the mother of a 3 year-old girl, Neena, and told me that after working a very long time in a saloon, she chose not to work anymore. But then because she lives in Shahama[6], she needs a car to travel across the city. So, once a week she takes the only bus route that crosses Abu Dhabi southern Metropolitan Area to take her driving classes. She hopes to get a driving license soon "*Insha'Allah*".

CONCLUSION

This article describes and analyses how expatriate women of Abu Dhabi use the modernized public transport and acknowledge the improvements in mobility of this car-driven city. There isn't a "*quiet revolution*" in women's travel in Abu Dhabi because of the unbalanced demography. Studying the public transport of Abu Dhabi has shown that there is a paradox in the public transport being a source of constraints for the working women – because of schedules and time length of trips – but also a source of mobility freedom for some expatriate housewives. Indeed, the bus network has great adaptability to the local urban fabric in this city based on road infrastructure construction. It has succeeded in widening mobility choices from the individual car, which is an expensive option, almost not affordable to most of the large Abu Dhabi working class.

The recent rapport written for the United Nations on the situation and the legal framework that protects women in the United Arab Emirates is unsurprisingly apologetic for the government and its many efforts towards better opportunity chances and also its recent investment in the urban and public space for a better living environment quality. These improvements have been noticed by all the women who can finally access to work or to more freedom across the city because of the betterment of the public transport network.

Although the STMP lack measures specifically addresses for gender issues of the populations. During interviews operated inside the scope of the PhD thesis since septembre 2011, with planners and engineers appointed at the Department of Transport, the Urban Planning Council, at the Abu Dhabi Municipality and at the Bus Office, officials are not commenting and criticizing their work but always recollect the improvements made in few years. Few planners have although emphasized on the very little public expenditure on busses, with a lack of staff, lack of technical and financial means to implement the plan and a decreasing . Although with a very limited staff at the bus office, most of them worked prior to the economic crisis to modernize the bus network in Dubai between 2004 and 2008, the improvements done are very important.

Many transport and urban policies planned in the Abu Dhabi Vision 2030, have been put on hold in the revision of the Master Plan Abu Dhabi 2030 and STMP in 2012 and 2013. It

[6]Shahama is a city 30 km on the Dubai highway from Abu Dhabi, mostly made out of villas, it is difficult to reach via buses.

seems that in spite of all these 2008-2009 policies, the new transit mode as the metro, light-rail, bus rapid transit have not yet been granted fundings.

With a new bus master plan coming to accommodate all the new transit modes, the planners would benefit an in-depth research where the voices of the users are heard even if it is critical. This research shows that dedicated and extensive studies should be made on the status of feeling of safety in buses for women, with a more qualitative surveys perhaps on a smaller sample of bus users but on a more refine scope. The current studies as the CATI about customers satisfaction do not give information about bus riders experiences. As a consequence, officials and technicians are not aware of the bus riders' experience, so they cannot improve the service and the network.

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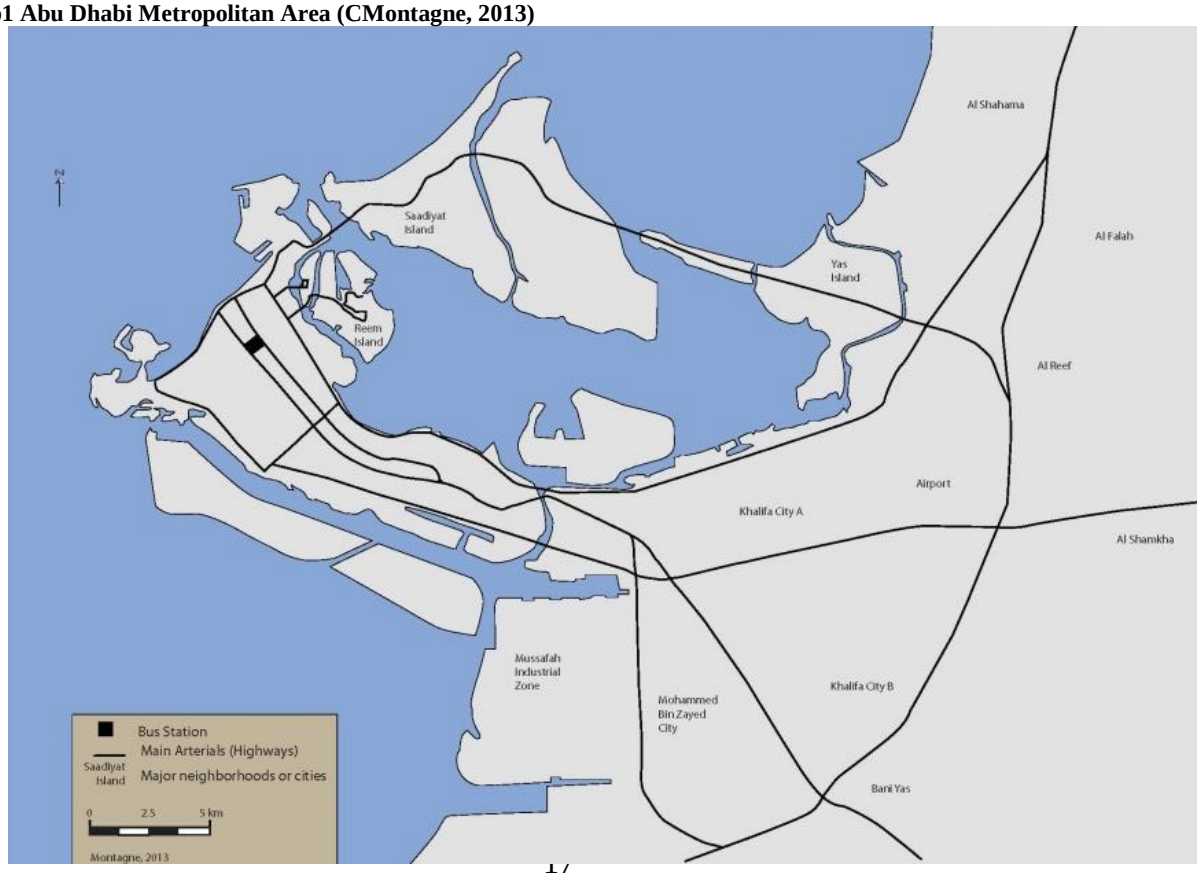
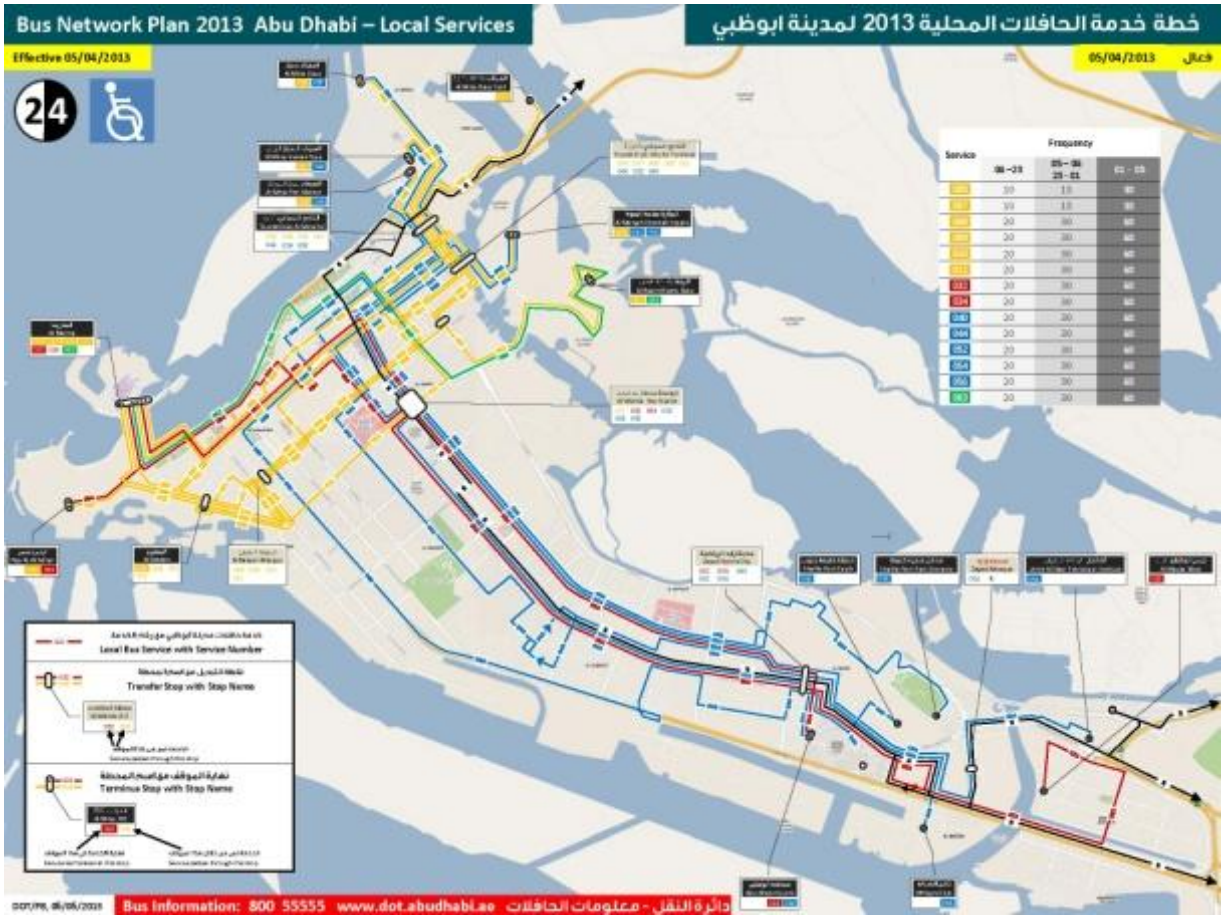


Map 2: North of Abu Dhabi main island (CMontagne, 2013 after Cadène&Dumortier, 2012)

Map 3: Bus Network Plan in 2013 in Abu Dhabi, Reem, Saadiyat Islands and the Metropolitan Area *(DoT, april 2013)*



Map 4 : Bus Network Plan in 2013 in Abu Dhabi (DoT, april 2013)

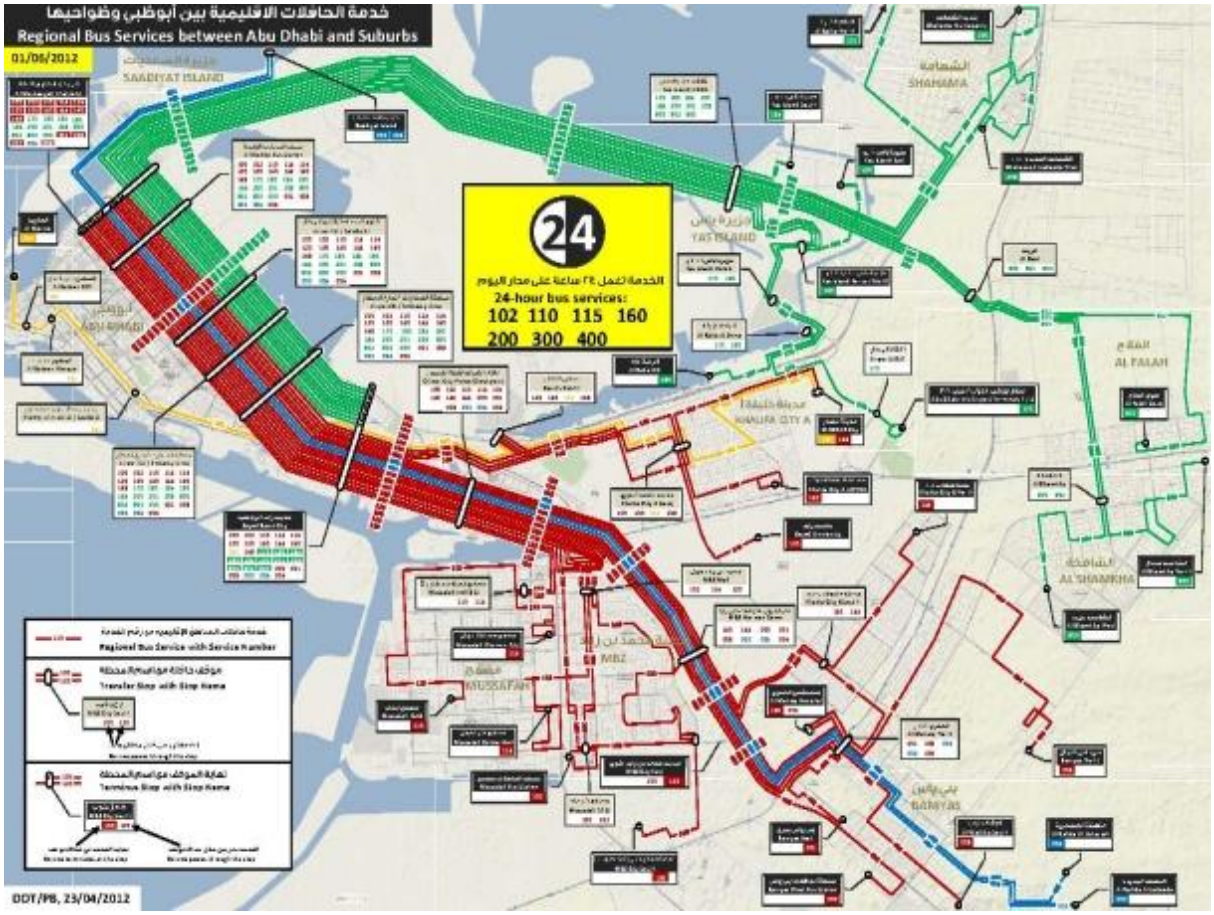


Figure 1: The nationality distribution in the public transport network (taxi and buses) in Abu Dhabi *(DoT, CATI, ARA Research survey in 2010, data collected in 2013)*

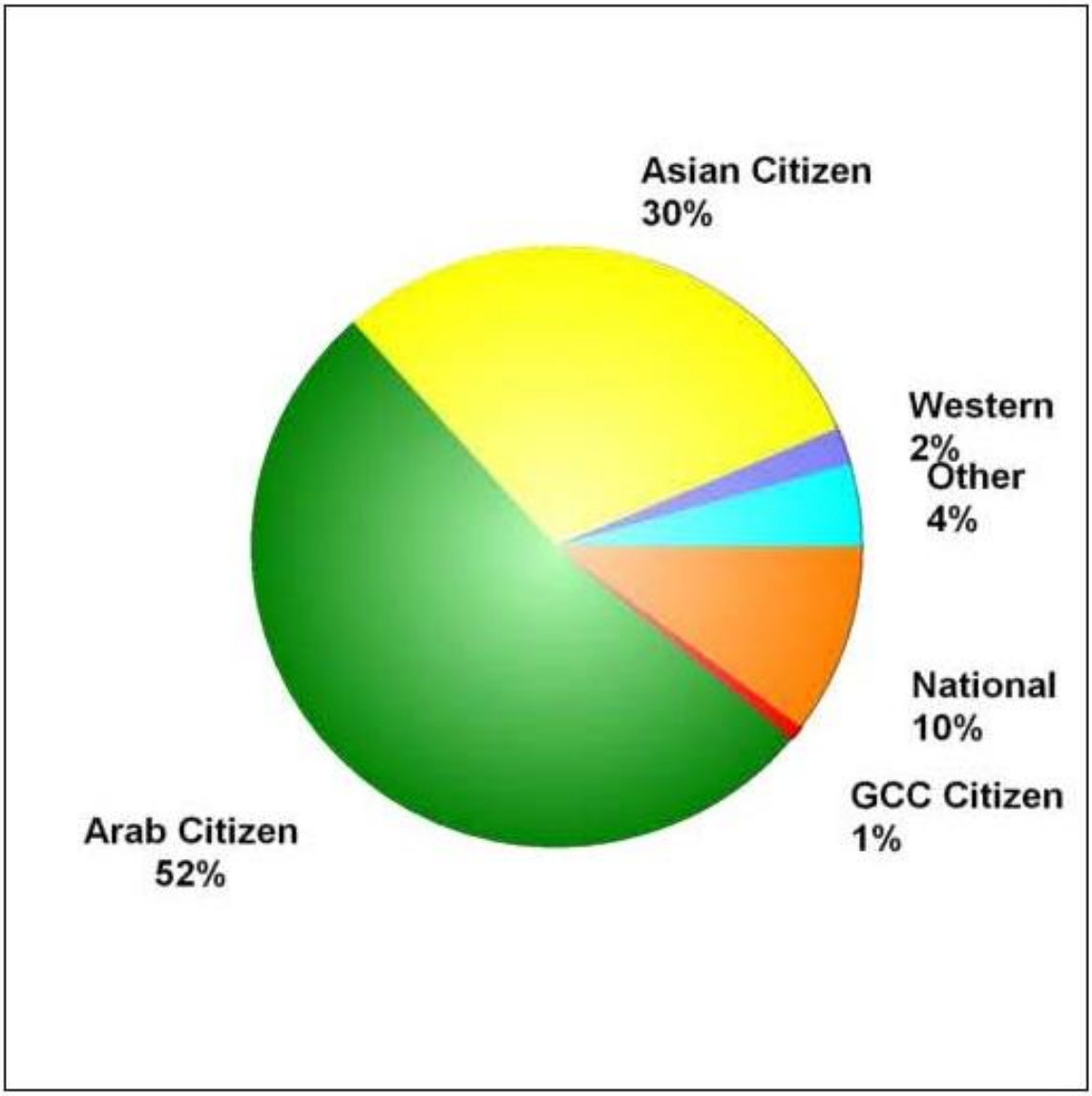


Table 1 : Bus office statistics showing an increasing passengers trips rise (DoT, Bus office, january 2013)

	2009	**2010**	**2011**	**2012**
Number of bus passengers	33 000 000	58 000 000	64 000 000	67 000 000

DoT operated bus routes in Abu Dhabi	25	35	40	51
Number of in service buses	615	615	630	575

Table 3 List of interviewees (lifefeature, age, place of interviews)

		Nationality	Family status	Neighborhood	Age	Life trajectory	Place of interview	Length of interview	Shared Ride on bus
1	Clairol	Filipino	Single administrative assistant	Tourist Club Area, Hamdan Street,	27	Born and raised in Manilla province	In her shared room	1 hour	Between Zayed Sport City and Lifeline hospital
2	Amal	Egyptian	Single Sale Assistant	Mussafah, shabiya 12	35	Born and raised in Cairo	In her shared room	1,5 hour	From Dubai to Abu Dhabi, from Mussafah to Mohammed in Zayed City
3	Ese	Nigerian	Married, 2 boys Housewife	Tourist Club Area, Mina Road,	38	Born and raised in Lagos, lived in Kuala Lumpur	In her flat (Mina Road, TCA)	2 hours	Between Abu Dhabi Mall and Hamdan Street, Electra and Mina Road, Mina Port and Marina Mall
4	Hendang	Indonesian	Married, 2 children who are adults Housewife	Al Khalidiya	55	Born and raised in Jakarta, lived in the USA	At the bus stop of Marina Mall	25 minutes	None
5	Rania	Jordanian	Married, 2 boys Housewife	Al Marzakiyah	32	Born and raised in Aman, lived in Damascus	At the bus stop of Marina Mall	20 minutes	None
6	Shalini	Indian	Married, no child Housewife	Manasir	34	Born and raised in Bangalore	In her home (Manasir, Muroor Road)	1 hour	From Al Wahda Bus Station to Al Muroor and 25th street
7	Nabila	Sudanese	Single Sale Assistant	Al Marzakiyah	22	Born and raised in Kharthoum	At the bus stop of Marina mall	30 min	None
8	Ming	Chinese	Single Sale Assistant	Tourist Club Area	21	Born and raised near Beijing	At the bus stop and during the ride	30 min	to Mussafah Industrial Area (bus 115)
9	Mariam	Algerian	Married to an Emirati Housewife	MedinatZayed	56	Born and raised in Algeria, lived for 9 years in Abu Dhabi	At the bus stop on Baynouna	20 min	From Al Bateen (Baynouna and Falah Street) to Khalidiya Mall
10	Nour	Filippino	Married to an Emirati Housewife	BaniYas	22	Born and raised in south of Philippines	In a café at Al Wahda Mall	45 minutes	None
11	Fatema and Nour	Sudanese	Single Students	BaniYas	21 and 20	Born and raised in Abu Dhabi	At the Al Wahda Bus station	20 min	From Al Wahda to BaniYas (405).
12	Sura	Yemeni	Single Working in a nursery	BaniYas	19	Born and raised in Abu Dhabi	At the Al Wahda Bus station	20 min	None
13	Mignon	Filippino	Single Fitness trainer	Muroor	30	Born and raised in Manilla province	At the Al Wahda bus station	25 minutes	From Al Wahda to Mussafah Industrial Area (bus 116)

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About the author:
Dipl.-Ing. (=MA) Dr. (=PhD) Bente Knoll works as a self-employed landscape and transport planner and consultant. The focus of her professional work as managing director of B-NK GmbH Büro für nachhaltige Kompetenz (Consultancy for Sustainable Competence) is to integrate gender and diversity perspectives in urban and transport planning, architecture, mobility, Together with her interdisciplinary team (landscape planning and architecture, sociology, gender studies, geography, environment and bio resources management) she carries out research and consulting projects on the Austrian federal and state level. As a gender consultant Bente Knoll works on the European and international level. She also holds various teaching assignments at Austrian universities in gender studies as applied to engineering and the technologic sciences.

Title
Gendered Mobility Surveys – Practical Experiences by an Austrian transport planner and consultant

Abstract
Using examples of completed Austrian travel surveys, the gender analysis shows that not only the interpretations of the data, but also the questionnaires reveal bias and simplifications, which veil crucial aspects in the behaviour concerning mobility, particularly the behaviour of caregivers in their everyday lives. Using the common "travel purposes" the paper stresses this argument and proposes gender-sensitive approaches. The paper is based on Bente Knoll's doctoral thesis (2004-06) as well as the practical work experience as a researcher at B-NK Consultancy for Sustainable Competence (B-NK GmbH), in Vienna. This paper can be understood as an example on how to implement gender and diversity aspects into applied mobility research.

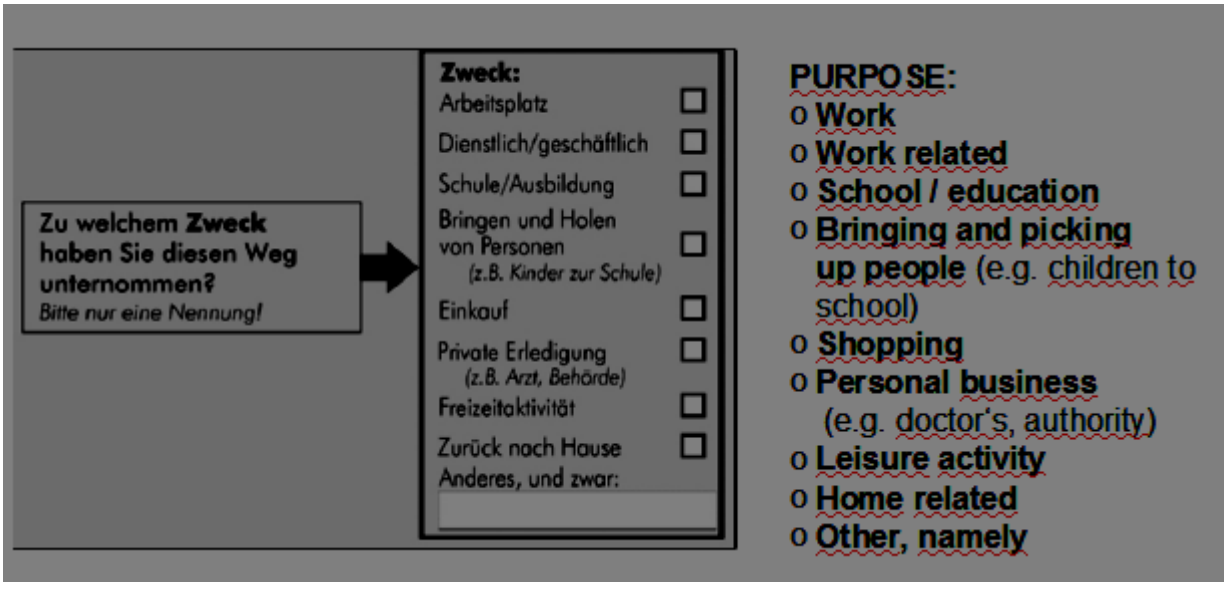
Manuscript text

INTRODUCTION

Within transport planning, different parameters, such as distance, vehicle ownership and availability, means of travel and trip purposes, are used to describe people's mobility behaviour. These parameter are also used when transport planning related political decisions are made. To gain data, public administrations as well as public transport providers carry out standardized household travel surveys *(1)*. Questioning is carried out by means of PAPI (paper-and-pencil), CATI (computer aided telephone interview) or CAWI (computer aided web interview).
Using the examples of completed travel surveys (Austrian-wide survey 1995; Lower Austrian survey 2005 and 2008) the author wants to provide an insight of these procedures as carried out in Austria:
The surveys focuses on travel behaviour, defined as the external-domestic activities and trips, of all people living in a household. All examples mentioned above provided pre-defined weekdays to document all trips that have been undertaken by household-members older than the age of six. The travel surveys define "trip" as every stationary change for an unequivocal purpose which takes place within the public sphere regardless of the modes of transportation used. A journey starts at a certain place, at a certain time and has a certain travel purpose. A trip can also be taken by several means of transportation. A trip ends when the person has achieved their purpose and/or the place reached at which an activity is made.

GENDER ANALYSIS OF TRAVEL SURVEY METHODS – FOCUSSING TRAVEL PURPOSES

The question related to the travel purpose provides the following answering-fields "work", "work related", "education", "bringing and picking-up people", "shopping", "personal business (e.g., doctor's, authority)", "leisure activity", "home related" or "other, namely" (this is a free field). Only one out of these possibilities is to be marked ("Please, only one naming" or "You may tick one travel purpose"). This caused a focus on "single-purposes" trips being made.



From a gender perspective it has to be stated that the categories reflect current gender stereotypes and clichés. *(2)* Purposes that are related to re-productive activities, e.g. domestic work or care-giving, are not questioned in their entire dimension and kept obscure within travel surveys and their results. Accompanying journeys or questions on trip chaining are also not provided. However, travel purposes that are related to paid

work and the economic spheres do have at least two answering-fields ("work" and "work related").
Within the questionnaires used in Austria, the trip purposes are mainly seen as activities related to a particular destination. Being on the move as an activity (e.g. going for a walk with the dog, strolling, walking – apparently without purpose) is not illustrated.
Thus, the common methods of mobility surveys do not adequately examine short trips, trips taken to accompany others, or complex combinations of single distances. The categories available under so-called "travel purposes" reflect patriarchal life concepts: trips made in connection with domestic work and care-giving are either under-represented or fully hidden. The analysis shows that crucial information on people's mobility behaviour cannot be surveyed, analysed, or interpreted with the usual methods.
The separation of the travel purposes and subsequently the planners' division of "rush-hour traffic" and "shopping traffic and leisure traffic" correspond to the patriarchal primate of productive work and hence under-represent travel purposes related to child-care and other issues of reproductive care work. *(3, 4)*

Day-to-day trip chains

To strengthen the argument, the portray of a 32-year-old man is to be brought up: He is a father on part time paternal leave who carries out several activities and purposes always in the company of his 2-year-old son and his 6 month-old daughter: the playground, the pharmacy, further to the chemist's shop, bakery, grocery store. When filling out the trip questionnaire, what should be the option for such travel purposes?

- Work? As a father in part time paternal leave he spends the working day at home. Is his current flat his working place? Finally, with his work at home he covers the expenses to care for his children.
- Bringing and picking-up people? No, because the son was not brought to a child care facility. Or perhaps this could be an option because the father has brought his son to the playground and has looked after him?
- Shopping? Yes partly, but what about time spent at the playground?
- Personal business? No, not by any means! The father did not carry out any personal business; neither at the playground, nor at the chemist's shop (medicine for the son), nor at the bakery (bought a snack for the hungry child). However, maybe the grocery store was for the purpose "personal business" because the father has also bought a newspaper for his personal pleasure.
- Leisure activity? Yes, this is the last but the only possibility to be marked. The very last possibility to be marked ("back home") is used for the next way.

Also, the father will not mention person XX whom he has met along his way back home from the playground because the purpose of this trip was not to meet person XX. Additionally, the fact that his journey back home lasted longer due to chatting and children playing along the way by half an hour or longer than normal – these are issues that transport and urban planners' should be more focused on.

Another example: A person with care duties accompanies his/her children to their regular sports training and waits at the gym for an hour until the training is over. Which trip purpose should s/he mark?

- Bringing and picking-up people? What to do then with the hour-long waiting period?
- Leisure activity? This leisure time related only to the children, however, the waiting period is, from the adult's perspective, without recreational value and recreational assets.

Quantitative results and their limits

Travel surveys in Austria and their results show that differences within the mobility behaviour between women and men can be empirically shown. Appropriate literature and data evaluations repeatedly indicate the following results: *(5)*

- The number of trips per day of women is higher than for men.
- The road length of trips per day of women is shorter than for men.
- Women use more often public means of transportation and walk more often than men.
- Women connect their activities and that leads to their complex trip chains.

Concerning these figures it is crucial to point out the shortcoming of those statements and figures stemming from the results of limited or biased questionnaires. The analysis points out that for everyday trips, the complex and differentiated trip chains with different purposes undertaken by people with child care duties or care responsibilities for the elderly still remain unrecorded. In Austria the unpaid housework and care responsibilities are still mainly assumed by women however, the trips related to these purposes remain invisible. Therefore not all relevant basis information is available in transport and urban planning.

GENDER SENSITIVE APPROACH IS NEEDED

A way to make up for this deficiency is to develop new surveying methods. During several research projects, carried out by B-NK Consultancy for Sustainable Competence, gender-sensitive methods have been developed and put into practice. Our work is based on the following hypothesis: Due to common quantitative mobility survey methods, travel habits and mobility patterns of those providing child care, care for the elderly are underestimated.

Within the scope of research projects the author has already developed various gender-sensitive methods for mobility surveys.

Experience from the research project "Women's trips – men's trips"

Based on results of the project "Women's trips – men's trips" (commissioned by the Austrian Federal Ministry of Transport, Innovation and Technology, 2006-07) *(6)* as well as the gender analysis of Austrian common travel survey methods *(2),* a new gender-sensitive quantitative questionnaire was developed. The innovations of those questionnaire included the provision of categories to capture data covering more diverse family living arrangements of those being questioned including response options for those persons not living in a household on a permanent basis. Since it has now become possible to focus on the mobility behaviour of adults according to such living arrangements, evidence can now better reflect the mobility patterns of patchwork families. Questions for individuals with regular care-taking responsibilities became more revealing of mobility patterns for those escorting children, the elderly or people with impediments. One main change on the questionnaire was the question concerning travel purpose which was provided as open question. Respondents were asked to write down in their own words, the answer to the question "Why or for which purpose have you undertaken this trip?" To make accompanying trips visible and additional question concerning "other people with whom the trip was undertaken and the number of the children respectively number of the adults" was asked. For testing and validation purposes, the gender-sensitive questionnaire was compared with a "traditional" questionnaire, both of which contain similar samples in terms of socio-economic and regional variables. An equal number of the traditional and gender-sensitive questionnaires were distributed to various sample groups.
Regarding the trip purposes the results reveal the importance of each open question. Each response given to this question was recorded. After two steps, the clustering of 21 different categories were arranged. Besides the well-known pre-defined categories of trips made for purposed of work, work related, education, school, shopping, pick up/drop off other people, home, the other pre-defined trip categories were collected in more detail: doctor's, health care, visiting friends, visiting relatives, meeting someone, going out for sports, going for a walk, further lessons e.g. music, dance, further training, honorary office, theatre, cinema, church related trips.
Other differentiated statements can provide a quantitative assessment of the mobility patterns of other groups of individuals.

"Mapping everyday trips" – a qualitative approach

In her doctoral thesis (2004-06) *(2)* the author developed the method **"mapping everyday trips"**, a gender-sensitive qualitative method for surveying people’s everyday mobility that combines elements of surveying spatial structures of the built environment. At the start of developing the methodological process, the

following questions were first been given focus: Where does a person typically start when setting out on a trip? Which trips are to be undertaken to cope the daily needs? What kinds of modes of transportation are used? What kind of activities take place within a residential area, what kind of activities take place farther away? The aim was to develop a method which indicates that, as mobility is varied, day-to-day trips can be made for a variety of reasons. This method is aimed quite consciously at the qualitative aspects of a person's mobility pattern and travel habits. "Mapping everyday trips" is carried out on the one hand by a face-to-face interview and, on the other hand, by mapping the person's everyday travel habits, trips and the relevant everyday places on a city map that the respondent is accustomed to. Thus, the everyday trips and the modes of transportation used could be visualised using various colours schemes on a map.
This method is applicable for surveying people's everyday mobility that combines elements of surveying spatial structures of the built environment AND the day-to-day mobility modes and travel purposes of women and men. Using visual representations the manifold mobility patterns and trip combinations of women, men, and youth can be mapped out. The method demonstrates that people cover a great number of distances in their everyday lives based on a diverse set of travel purposes that sometimes need to be combined into a single trip.

Experiences from on-going research

With the scope of three research projects, the author was able to carry out qualitative mobility surveys based on the method "Mapping everyday trips" containing face-to-face interviews and mapping of everyday trips. Within the project "Mobility4Job – Gender-appropriate mobility solutions for better working opportunities in rural areas" (commissioned by the Austrian Research Agency and the Federal Ministry of Transport, Innovation and Technology, 2012-14) the goal of the project was to identify obstacles within the mobility system which hinder people from obtaining gainful employment. Furthermore, preconditions and mobility services in rural areas will be defined in order to enable women and men who are responsible for the care of family members as well as their own household to have fair opportunities to participate in workforce. Within the working package "qualitative mobility survey", conducted by the author, 15 in-depth interviews in a rural area (Triestingtal and Schneebergland, both located in south-west region of Lower Austria) were conducted.

The project "Gender Module" was commissioned by the Federal Ministry of Transport, Innovation and Technology in addition to the recent Austrian-wide representative quantitative mobility survey (2013-14). Within this piece of research, five regions with various (public) transportation and geographic pre-conditions in Austria were defined and face-to-face in-depth interviews were carried out with individuals responsible for (unpaid) day-to-day care of their (own) children, parents, in-laws etc. The five selected regions are:

- Inner city districts of Vienna with a dense public transportation system and huge infrastructure facilities;
- City of Graz, the second largest city in Austria;
- City of Eisenstadt which serves as an example for middle size towns in Austria with a lower level of public transportation service that nevertheless serves a high-level of public infrastructure, such as public authorities, secondary schools etc.;
- The region of Waldviertel as a peripheral rural area with wide spread villages and smaller cities;
- The region of Defereggental as a peripheral alpine rural narrow valley with three municipalities with approximately 500 meter of altitude distance from one point of the built-up area to another.

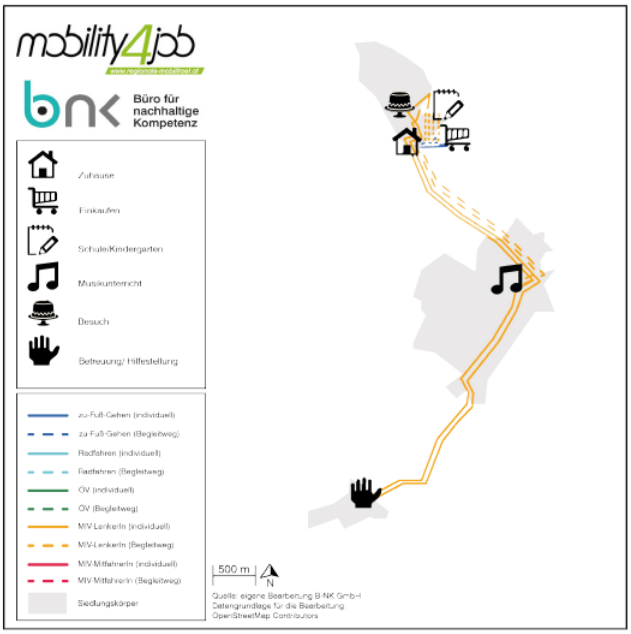
In addition to these five regions, another peripheral rural region area in the south of the Burgenland is also investigated (commissioned by the Office of the Provincial Government of Burgenland).

INTERIM RESULTS

Within the scope of these three research projects, approximately 130 in-depth interviews of about 45 to 90 minutes each were carried out by the author and her team between March 2013 and January 2014.
The central questions of the interviews focus on, on the one hand, the respondent's personal attitude towards family, household, employment and the division of paid and unpaid work among family members. On the

other hand, information concerning the day-to-day mobility patterns and travel purposes was also questioned.

The trips of the "day before" were mapped to visualize the trip-chains and their relations.
The example provides highlights the various destinations and numerous trips that were undertaken. (The dashed lines symbolise accompanied trips.) During the interview the respondent stated: *"And then, at about half past eight, or a quarter to nine, I went by car with my two boys to bring them to the kindergarten. They got off, I continued my travel and met my friend [x]. And afterwards I drove that way to my grandmother's house, like I usually do on Tuesday. I am assisting my grandmother, which means I work there without charge."*



This study also surveys the needs and forms of mobility used by those people who are responsible for family-members' care as well as their existing mobility obstacles. Interim results show that the following issues characterise the mobility patterns of care-givers:

- Responsibility: *"As long as the kids sit in the baby carriage, you can handle the situation. But when they start walking by their own, approximately at the age of three, you bear a great responsibility. You have to keep your eyes on the kids and look after them, so that nothing happens. For me, that is the big difference."*
- Steadiness and flexibility: *"These are two counter-parts. On one hand we have got a well-structured agenda of the week and well-organised work-days. But on the other hand you have to keep flexible. There are so many odds and ends that force you to change your plans."*
- Time as a determining factor: *"One has to schedule more time for everything when accompanying kids. There are no just-for-fun-trips. And that does not change even when the children get older."*
- Needs of accompanied people get more important: *"When accompanying my walking impaired father, I have to look out for a parking-lot with enough space at the passenger's side form him to get out of the vehicle. I have to help him out of the vehicle. Everything goes very slowly."*

In accordance with the qualitative paradigm, this study will then provide a detailed understanding of those processes, mobility and travel (purposes) and the connection with a person's daily life and care duties. It should then become apparent that one can generate even more information about everyday mobility and trips rather than by simply focussing on just five to six pre-defined categories of "travel purposes".
This approach enables a multi-disciplined perspective for mobility of people who are care-givers, specifically

through the study their day-to-day responsibilities and also tackle gender roles and gender stereotypes as well as the social intercourse of individuals and assumed patterns of behaviour within their social systems. The first preliminary results show that women mostly take responsibility for accompanied trips at the expense of their own mobility needs. Preliminary results of the maps of everyday trips of care-providers show differences between the travel behaviour of women and men: Whereas, women tend to have more complex path routes with stops and multi-purpose destinations, they also tend to cover their own trips more often in the accompaniment of others, mainly with children.

CONCLUSIONS

In general, one has to point out that compared to quantitative mobility surveys with standardised questionnaires the qualitative and gender-sensitive approach provides several benefits. Due to the face-to-face setting of the interview the respondents are actively encouraged to reflect upon their actions and habits in consideration of their own personal mobility patterns. During the interview, attempts will be made to recall with each individual respondent, the chain of their entire trip journey, including those stops made between trips that cannot be compiled in an accurate way using quantitative methods. Secondly, it is conceivably possible that there might be instances in which a respondent will not be able to accurately recollect certain segments of a trip. Researchers participating in this study, could also enquire and determine why a respondent decided in favour of or against a particular mode of transportation. With the qualitative approach, the respondent's actions and habits can therefore be better "understood" rather than just simply "explained" *(7)*.
An inter-sectional approach, therefore, takes gender and diversity aspects into account which should provide a deeper insight into research questions and their corresponding results. When describing interview partners and their mobility patterns, the "Four Layers of Diversity" *(8)* are used to enable a multidimensional perspective. Mobility patterns and people's needs concerning mobility and transportation are no longer understood based on typical socio-economic attributes likes age OR gender OR regional allocation. Rather, due to an approach that takes the inter-sectional and multifaceted relationship between gender AND age AND care responsibility AND regional allocation into account, more qualitative and reliable information can be provided as basis for transport and urban planning decision makings.

ACKNOWLEDGMENTS

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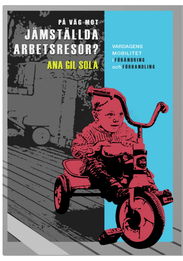
Creating work trip differences between women and men
The role of gender contracts within the household



This poster is based on the PhD thesis (Gil Solá 2013) *Towards gender equality? Women's and men's commuting under transformation and negotiation* (original title *På väg mot jämställda arbetsresor? Vardagens mobilitet i förändring och förhandling*).

The thesis is available at https://gupea.ub.gu.se/

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Background and aim

In Sweden the policy of regional enlargement – i.e. promoting the geographical extension of labor markets and associated longer commuting distances – is embraced as a means of stimulating economic growth. However, since women generally and historically commute considerably shorter distances than men do, in Sweden as in other countries, a critical issue is whether women and men can participate in this process of enlargement at the same extent. Furthermore, the role and consequences of still longer work trips in people's daily living are seldom highlighted in this political discussion.

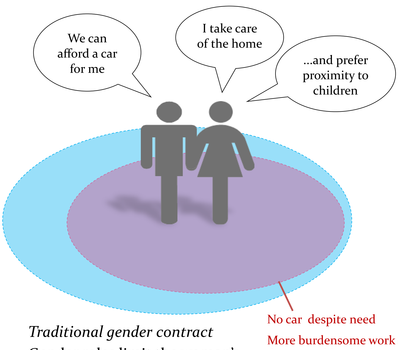
How do cohabiting women and men negotiate and respond to needs and claims for longer work trips? This poster highlights the role of *gender contracts* (an analytical concept developed by Hirdman 1990, 1993, 2003) within the household in the understanding of work trip differences, as well as their consequences in daily life of women and men. In current research, aspects related to the home and household, such as being married/cohabiting and the presence of children, have shown to affect the commuting of women and men differently, as well as how the consequences of work trips are evaluated. However, most studies are statistical explorations, and do not investigate how existing differences are created, negotiated and practiced among the household members in the context of everyday life.

Data and methods

This study is based on 20 in depth interviews with parents with small children living in the Gothenburg urban region, being highly skilled with specialized labor markets, and recently having moved to a new residential location. Special attention is paid to women's and men's everyday activities; their wishes and values concerning housing, work, mobility and family life; experienced restrictions in relation to the work trip; and decision processes within the household. The study also investigates consequences of the work trip for individuals and households.

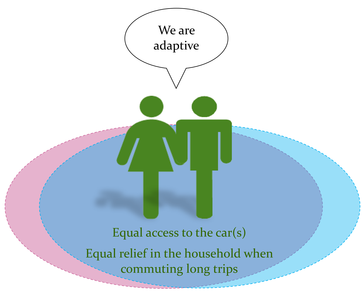
Theoretical approach and concepts

Discrepancies in actual mobility between the sexes are seen as an expression of the relationship between women and men found in the homes, places of work and in the transport system. Focusing on the role of the household, the concept of *gender contract* is used in order to understand existing mobility choices and decisions made within households. The concept implies an agreement between women and men containing mutual commitments, liabilities and rights regarding how the individual is expected to be and act, in this case as regards travel-related issues. The agreement is understood as having advantages for both parties. In this particular study the agreements concern, for example, who has the "right" to use the car, or who should leave the children at the day-care center in the morning.



Traditional gender contract
Gender roles limit the woman's activity space

No car despite need
More burdensome work trips due to workload at home
Looks for job close to home/ day-care center



Equal gender contract
Gender roles do not limit the woman's activity space

Main results and conclusions

Overall, the study shows that the role and implications of the work trip for individuals (and their households) on everyday life and welfare are shaped by surrounding structures such as conditions on the labor market, the housing market and the design of transport systems. This shaping appears in slightly different ways for women and men, to a great deal depending on the (explicit or silent) gender contract that defines their room to maneuver. The analysis highlights two distinctive and contrasting types of gender contracts: the *traditional gender contract* and the *equal gender contract*. The traditional gender contract describes women and men as different, expresses an unequal (male dominant) power relation between female and male attributes and roles, and leads to the man limiting the woman's activity space and range on the labor market. The equal gender contract, on the other hand, assigns women and men different roles within the household as well, but the roles are not taken for granted to the same extent. Furthermore, power relations between the roles are not distinct, and the man does not limit the woman's action space.

In the interviews these gender contracts are clearly expressed as regards: 1) The use of the car: In many families who own one car, car-driving is equally distributed. Still, in more traditional households, women's need of the car is not perceived important motivating the economic cost that a second car constitutes (though the same argument is seldom applied to men). In this case, both women and men argue in terms of a "taking for granted" of men dominating, or women *not* dominating, the use of the single car of the household; 2) Household responsibility and proximity to children: While households with equal gender contracts distribute household responsibilities largely according to direct needs and restrictions, traditional households have the woman taking most responsibilities, even when commuting long trips or difficult hours, resulting in a more burdensome commuting. Furthermore, in some cases the woman wishes to be close to the children and chooses to work comparatively near their day-care center, reducing her reach in the labor market. 3) Career: In some traditional households the woman's wish to pursuit a better work opportunity is not considered a valid reason for the household to support her – for instance with a car or to have reduced household responsibility, if this is needed – even when she is overqualified for her current job.

In sum, results show that gender contracts within the household influence the consequences of regional enlargement for the individual. The consequences depend on how the household succeeds in handling existing restrictions, as well as making use of possibilities, imposed by surrounding socio-spatial structures. Households with equal gender contracts show a greater variety of possible solutions in their negotiations, while households with traditional gender contracts more easily get stuck in traditional solutions. Continued progress towards gender equal work trips thus depends on how gender contracts within households are negotiated and further re-negotiated as well as how future societal structures support household's decision making in a more equal direction.

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March 3, 2014

To the scientific committee of the Women's Issues in Transportation – Bridging the Gap:

The review comments for my paper Bus Stop Matters: How Functional Health Became Marginalized (10731) have been acknowledged. The purpose of this letter is to respond to the comments elicited and point out recent modifications made to my paper. I have divided my response into three categories: organization and language, gendered perspective, and mixing methods. Each will be addressed briefly below.

1. Organization and language – I have made significant changes earlier on in the manuscript regarding the concepts of functional health, gendered approach, and the navigational process.
2. Gendered perspective – My approach understands genders as differences; while still acknowledging genders are in relationship to one another, I use the gendered perspective as a method to see differences and these differences reveal underlying social constraints that potentially affect both genders unjustly.
3. Mixing methods – I attempt to follow a mixed research as explained by Amaratunga et al. (2002) and Bernard (2006), in which almost all qualitative data has the capacity to be quantified and that each method can connect the data to enhance the other data.

To conclude, I am very grateful for all suggestions provided by the reviewers to help this article be scientifically strong and communicated well. Although, I have not completely addressed all of the reviewers' comments, I plan to continue revisions. In particular, the section titled Description of Phenomena will more clearly illustrate the main arguments I want the reader to understand. I look forward to the conference and to fully engaging my difficulties of communication in order to grow as a writer and a scientist.

Thank you,

Anne Victoria

Bus Stop Matters:
Exploring the Gendered Perspective of Functional Health

5th International Conference on Women's Issues in Transportation
Paris, France
April 2014

Bridging the Gap

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ABSTRACT

National health initiatives continue to recommend that everyone get a daily amount of moderate physical activity. The close connection between increased physical activity, weight loss, and well-being became the official discourse applied to multiple arenas. Recently, transportation entered this discourse on physical activity and health. This study demonstrates that these are potentially, but not necessarily, linked processes. Based on ethnographic fieldwork from a phenomenological perspective, this study explores the bus users' lived experience of navigating the bus stop during the implementation of the *Bus Stops Only* policy at Knoxville Area Transit (KAT) in Knoxville, Tennessee. It does this by disaggregating the ethnographic and survey data by gender then examines the different ways the genders talk about the bus stop and physically maneuver around the bus stop. Proper contextualization of active transportation from the bus user's own gendered perspective may be able to identify other measurements needed for health, such as functional health. This awareness fills the gap toward a more effective program of active transportation and guides improvements in transport policy, such as the importance for a better bus stop design.

The US Surgeon General's Report *Physical Activity and Health* officially declared that everyone should get a recommended thirty minutes daily of moderate physical activity (U.S. Department of Health and Human Services 1996). Of primary concern is the link between growing sedentary life-style trends and various forms of chronic diseases and obesity (Pate et al. 1995). Subsequent studies introduced transportation into the discourse on physical activity and health (Lachapelle 2011; Sallis et al. 2004; USDOT 2004). Active transportation refers to any form of travel that is non-motorized as in walking, bicycling, skateboarding, pushcart, or scooter (Sandt et al. 2012). Further studies estimated that public transit users, as compared to those who depend on a car, walk 30% more steps; therefore, making bus users more likely to meet the national recommendations (Edwards 2008; Besser and Dannenberg 2005). But research on transportation and health tend to ignore the bus stop and its navigational process except where it deals with pedestrian safety in relation to sidewalks, crosswalks, vehicular speeds, and location of bus stops (Pecheux 2008); criminal activity and perceptions of fear (Trumpeter and Wilson 2013; Sanchez 2010; Loukaitou-Sideris 1999); or traffic congestion and air toxins as in living next to or while waiting at the bus stop (Hess et al. 2010). Furthermore, most studies do not take into account the lived experience of bus users. Notable exceptions include Stangl's analysis of phenomenology and pedestrian transportation (2008) and the different viewpoints between transport policy and the lived experience of bus users examined by Raje` (2007). The collection of bodily senses in the navigational process of the bus stop - getting to the bus stop, waiting at the bus stop, and using multiple bus stops – add to conventional models of health by providing a more complete understanding of movement/non-movement and health (Csordas 2011).

Initiatives of active transportation appear to provide a more complete model of transportation and health (Litman and Burwell 2006). However, functional health is rarely mentioned. Functional health pertains to the structure and function of muscles and joints (Pandy and Andriacchi 2010). When addressed, functional health is often placed into the context of chronic disease prevalence or its relationship to the growth and development of the muscles and joints. Maintaining the physical condition of muscles and joints is generally not examined. This mechanical well-being of the human body, although not readily recognized as a preventive measure in health and transportation, plays a prominent role in the experience of navigating the bus stops. Some scholars suggest that these earlier measurements of health can be enhanced by analyzing how bus users bodily sense this reality (Middleton 2010; Dora 1999; Franklin 1995). Law (1999) noted that the human body is an ideal point where the different genders feel, as in sensory, their practices and meanings of movement. A focus on functional health provides a method to collect this bodily sense of navigating the bus stop.

This study uses the focus of embodiment within the phenomenological perspective. In which the body is both an object of study as well as the focal point of experiencing the natural world (Csordas 1994). Phenomenological approaches provide a technique to collect observable data that is not fully conceptualized. It does this by collecting the subjective meanings produced by people actually experiencing the phenomenon. The different attitudes individuals display have a way of expressing the different ways individuals are actively engaged with their own social and physical realities (Desjarlais

and Throop 2011). For example, Seedat et al. (2006) introduced phenomenology into the study of women and transport by looking at female pedestrians in an Asian and African city. The females' experience of walking went beyond the reductive measurements of steps walked. As a result of the descriptive thematic data, the complex social constraints faced by women might be understood by policy makers working in transportation. Hanson (2010) observed that no matter how well-intentioned a practice appears on the outside, understanding what the numbers mean to the different genders experiencing a phenomenon requires the context of choice or constraint. Therefore, by understanding the various ways the different genders navigate the bus stops, the different meanings attached to the different bus features, and the different ways each gender solves the navigational problems may help to understand contexts of health and movement from a different viewpoint, whereas a combined gendered voice may hide an equally legitimate subjectivity (Fernando and Porter 2002). Implications from these results should help fill the gap toward a more effective active transportation program, such as the importance of a better bus stop design. Otherwise, a program might appear to succeed, but actual better health may not be obtained.

BACKGROUND

On August 16, 2010, the Knoxville Area Transit (KAT) activated the *Bus Stops Only* policy. This directive means that buses will no longer be allowed to pick up or drop off passengers at just any safe location or corner. Buses will only stop at the designated bus stop. Furthermore, fifty percent of the existing bus stops were relocated or completely eliminated. The location of bus stops after the new policy (Fig. 1) shows prominently on schedule maps as white dots after the new policy. This initiative is becoming a more common occurrence within transit agencies as an economical way to increase both vehicular efficiency and passenger ridership. The goal is for on-time performance meaning buses arrive and depart on schedule.

FIGURE 1 - 22 Broadway Bus Route – Bus Stops.

Bus stops are vital to using public transit. Bus stops are the point where pedestrians become passengers. This navigational process encompasses many experiences. At the bus stop the bus rider experiences the act of carrying packages, standing at the bus stop, and hot, cold and wet weather conditions. A comparative list from the medical literature includes elementary school children and backpacks (Mackenzie et al. 2003; Hong et al. 2008), posture stress and firefighters after series of repetitive movements (Gentzler and Stader 2010), and reactions to brief cold exposure (Lintu et al. 2006). Predictive

indicators of functional health suggest that actual poorer health may result in the form of shoulder joint dysplasia (packages), weather effects (cold, heat, and rain), and fatigue (standing). Furthermore, the outcomes often covertly accumulate in small doses over an extended period of time versus from one acute incident. This scenario is similar to how some medical practices have begun to look at and treat low back pain. The implication is that the result has an impact on all ages and may not seem to matter if the bus user was in a state of good health or bad health to begin with. Therefore, a valid marker of future health would measure shoulder strain and the effects of weather and standing.

News media frequently report the bus users' concern with the lack of adequate shelters and benches. Categorized as amenities, the bus stop design is allotted a lower budget priority by transit agencies. Moreover, the placement of a bus bench or a shelter is primarily justified on ridership counts or length of waiting time between buses. This technocratic approach excludes health criteria. Recently, studies have emphasized the bus stop design (Guttenplan and Reynolds 2012; Fitzpatrick 1996). The introduction of urban and transport planning concepts, such as complete streets, multi-modal planning, and the built environment, enhanced the value of the bus stop design. These conceptual designs take into account the effects that structures have on human social and physical health. The primary objective is to create an environmentally-friendly community. More studies looked at these models' effect on personal health as it relates to physical activity and travel behavior (Handy et al. 2002). Some anthropologists are analyzing the small-scale street design and the social process of "valuing" these features. For example, ethnographies examined the absence of street curb design (Patton 2007) and crosswalks (Levinger 2002) from the pedestrian perspective. Studies that apply a gendered perspective within a framework of functional health to the bus stop can reveal areas for amenity construction that go beyond a pedestrian perspective, since the different genders experience space and place differently.

METHODOLOGY

This research is exploratory and descriptive. This analysis is the result of a larger thesis project carried out during the implementation of the *Bus Stops Only* policy at KAT in Knoxville, Tennessee and is designed to reveal the bodily perception of using the bus system within the current structures and policies. The data collection included participant observations with three groups of bus users in the Knoxville area -22 Broadway Bus Route, Summit Towers, and Downtown Knoxville Transfer Point. In addition, from these three sample areas, a total of 26 bus users completed in-depth semi-structured and structured (Likert-type scales, sentence-completion, and demographic) interviews.

Research Participants

The source of the participant population was current bus users in Knoxville, Tennessee between June 2010 and September 2010. This study used purposive sampling methods. Bernard (2006) states that this type of non-probability sampling can be useful in situations in which in-depth narratives are collected in order to identify a cultural phenomenon, such as the ways that cultural values frame the bus users bodily experience of using the bus stops.

22 Broadway Bus Route

The six participants (four women and two men) were all adults who rode the 22 Broadway bus route either traveling toward downtown or away from downtown between the hours of 6:00 a.m. and 9:45 p.m. The primary times of participant observation occurred during the hours of 9:00 a.m. to 12:30 p.m. and 6:00 p.m. to 9:00 p.m. There were two main reasons for choosing those hours and route. Knoxville public transit records indicate these are the peak times for ridership. In addition, the 22 Broadway is one of four core routes (Fig. 2) out of a total of 25 routes KAT operates daily during the weekdays, as shown by high monthly ridership reports. Since the study collected experiences from any bus rider who used the bus stops, I simply contacted these participants by regularly riding the bus route then asking individual passengers' on the bus permission to interview them at a later date regarding their perceptions of using the bus.

FIGURE 2 – Route Systems Map

Summit Towers

These nine participants (three women and six men) were all adult residents from the Summit Towers Apartments who typically rode the 22 Broadway bus route. Summit Towers, built in 1979, is a high-rise apartment complex located in the central downtown business district of Knoxville. The primary importance for selecting these residents is twofold. This is the only multi-unit rental building located within the gentrified housing restoration of downtown that is also affordable to low-income individuals. In addition to their position downtown, Summit Tower residents actively participate at the Knoxville Transportation Authority (KTA) monthly public forums as compared to other rental properties, and according to the monthly KTA reports. The Summit Towers Activity Coordinator provided me with a list of residents I could contact, after I led their popular Bingo event held weekly.

Downtown Knoxville Transfer Point

Participants on this route were eleven (five women and six men) adults who were positioned at the downtown Transfer Point on Main Street either waiting to board the bus

or who had alighted the bus anytime between the hours of 6:00 a.m. and 9:15 a.m. Downtown is the location of the central transfer point – where all bus routes meet and where most passengers make transfers. I gained access to these participants by waiting at the bus stop on Main Street.

Participant Observation

Participant observation is a primary method of doing ethnographic research. This technique can best be described as acquiring insight into another group by taking part in the group's everyday activities along with observing and recording those activities as an outsider. For this study, participant observation included talking with and observing people while they rode the bus, waited for the bus, boarded the bus, or after they alighted the bus. By regularly riding the bus, I was able to engage in more informal discussions and identify important areas in the bus user's lived experience that needed further examination. The actual number of individuals I conversed with during the numerous participant observation episodes far exceeded the number of interview sessions, as these unstructured interviews can occur essentially anytime.

The field notes and interviews (described below) were transcribed by the primary investigator and all the interviews were transcribed in their entirety or word for word. The content analyses for the participant observation field notes as well as the interviews began with open-coding by themes that emerged as a result of this inductive research process (Emerson et al. 1995: 150). This allows the significance of a phenomenon to become visible. Next a text analysis was conducted according to the phenomenology inquiry described by Creswell (1998) and thematic narratives presented by Emerson et al. (1995). The strength of this process involves systematically noting points of concern or events as presented by the bus riders while setting aside one's own prior assumptions. Then demonstrating their situated effects such as how the narrator reports, evaluates, constructs meaning of, and critiques the event. From these initial categories, sub-themes were identified for further analysis. The set of themes offers a qualitative arrangement of the data and fits with the exploratory aims of examining the ways that bus users see and experience their world (Ryan and Bernard 2003). To better the validity of the results, the thematic structures were then reviewed with many of the participants.

Interviews

The interview process did not take place while riding the bus. Instead, the questions were asked at a local coffee shop, restaurant, participants' place of residency or while waiting for the bus. All individuals I met in the course of research were told upon introduction that I am a graduate student working on issues regarding perceptions of mobility and transportation downtown, in particular, public transit, as part of my thesis project. All people I met in the course of this study then had the choice as to whether or not to interact with me directly.

Semi-structured

The questions for the semi-structured interview served as a guide to an open-ended, informal conversation. The questions were chosen from the literature review on transport planning, riding the bus myself, and the unstructured interviews. Typical questions

included the following: How did you hear about busing? Tell me about your experience getting to the bus today. What do you like most about busing, but on the other side what do you like least? This broad form of inquiry encourages the participants to communicate their perceptions on mobility and transportation in their own way and allows features of the bus stop to emerge that are not initially perceived; since how bus users bodily experience it are in relation to the materials and values already in place. Two forms of record keeping took place – audio recording and note taking. Some observations were documented as headnotes while in public, with a notepad, and later written up as reflections.

Likert-type Scales

Researchers describe Likert-type scales as a systematic way to collect and compare both the weight of particular meanings and underlying meanings to discourse and behaviors. The survey was administered with the same words to each participant. The five words chosen were identified as common features within the bus system that bus users must navigate in order to complete their bus ride – bus stop, bus fare, bus destination, bus schedule, and bus ride. The five items selected came from transportation and public health literature, and from observations I collected while using the bus system. I used a 7-point judgment scale – very handy, quite handy, slightly handy, equally handy and unhandy or neither, slightly unhandy, quite unhandy, and extremely unhandy. This scaling is useful at finding how individuals' feelings differ on things. Furthermore, using adjectives of evaluation, "handy" to "unhandy," allowed systematic comparisons on the value placed on the selected bus concepts.

Sentence-completion

These interviews were administered with the same fragmented sentence and each participant was asked to complete the end of the sentence. The part of the sentence administered should be meaningful phrases to bus users. Example of sentence frames included the following: The perfect bus ride would be like, (what)? The worst bus ride would be like, (what)? If you did not use the bus, a typical day would be like (what)? Three people that should ride the bus are (who)? These phrases were selected by riding the bus myself and listening to the different conversations taking place and by reading the literature on public transportation and public health with an emphasis on the concept of active transportation. This open-ended technique can systematically collect the attitudes bus users have toward the bus system in a non-threatening manner. Furthermore, collecting participants' thoughts on "the best" can reveal the subjective experience of constraints and possibilities and how the different aspects of the bus system are valued or not valued.

Demographic

The demographic survey supplied a technique to collect demographic information such as age, gender, features of the bus system used, and socio-economic background. It provided an additional way to examine different behavioral groupings. This information was collected at the end of the interview in order to maintain the informal or conversational quality of the interview session. Face-to-face administration took place in order to enhance a more complete response.

FINDINGS

The mixed method research connects the quantitative and qualitative data sets to produce answers unable to reach by using a single approach (Amaratunga et al. 2002). The data analysis shows commonalities in the results of the survey and variability in the description of the phenomenon. Survey results indicate that both genders feel fares are "handy" but schedules are not. The thematic descriptions suggest the genders' experiences are different. Initial themes show – *holding on*, *I'm invisible*, and *wearing down*, and suggest the incomplete conceptualization of transport planning, such as active transportation measures.

Illustration of Phenomena

Likert-type Scales

The Likert-type survey exhibited variance is significant between at least one concept. For both genders, bus fare is more "handy" and bus schedule is less "handy." Results show p=0.042. A pairwise comparison was performed with an adjustment for multiple comparisons via the Bonferroni test. Exact statistics was used due to the small sample size of 26. The particular concepts, fare and schedule, suggest the group identified similarly to how others perceive bus users. In addition, results indicate bus stops do not matter as much.

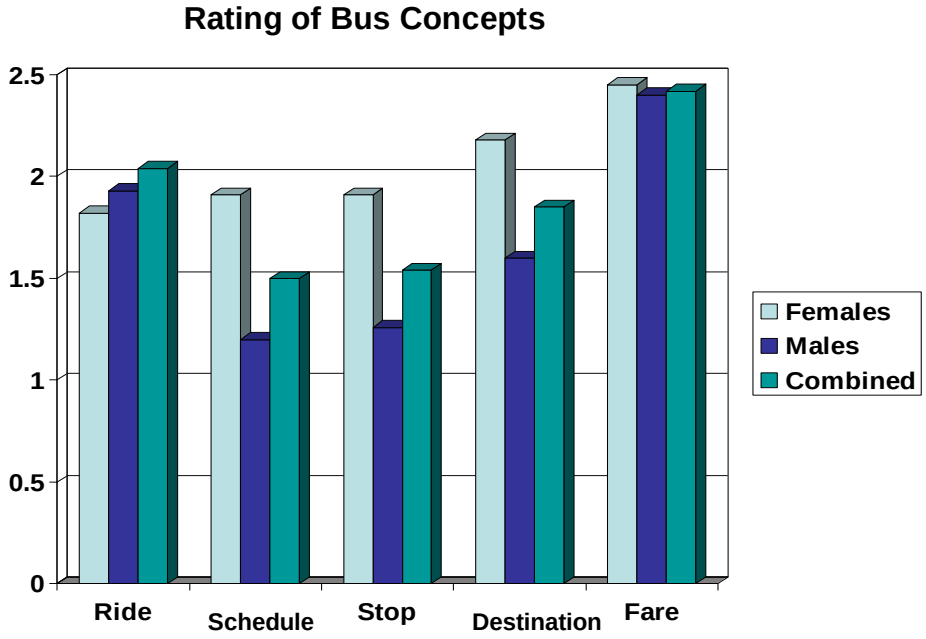

FIGURE 3 – Rating of Bus Concepts

No gender significance was noted with the bus concepts. However, the rating importance of "handy" or "not handy" is similar for combined genders and male genders only (Fig. 3). Whereas, the scaling exhibited by the female genders is similar except for the concept of Ride is positioned the least handy of the bus concepts. The ride is emphasized as "time

for myself" by the female gender, while for the male gender, "getting there" figured more prominently in the contextual analysis. The fact that the bus stops are the point in which pedestrians become passengers and that bus stop consolidation programs have proven that buses will be on time and that bus users will not have to wait long, suggest a bodily disconnect in the use of the bus stop.

Sentence-completion

The Sentence-completion survey provided further examination of the Ride concept. The Perfect Ride results are shown below (Fig. 4 and Fig. 5). Segmented responses identified three themes: (1) Smooth = unnoticeable, feel of the ride, (2) Location = convenience, reference to a car, and (3) Opportunity = opportunity, occasion it provides. Figure 5 displays comments as coded within its context. A smooth ride appears proportionally higher for the female gender than the male gender, suggesting how the meaning of movement is bodily sensed.

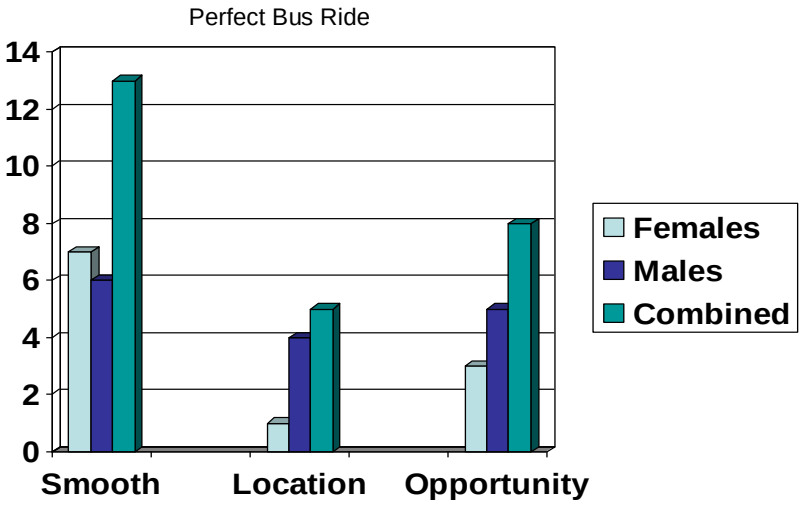

FIGURE 4 – Perfect Bus Ride

Female Gender	Male Gender
A smooth ride (1) Air conditioned in summer, friendly drivers, on-time service, clean bus (1) You could go out your *door* get in then go to your place get right back on & go right home (2) Pick me up at the end of my street, exactly at 730 & drop me off not later 750 & not overcrowded & not only one, so interesting to come with others (1) It's right there (1)	Good air, nice driver, quiet (1) That you don't have to stay (2) Friendly drivers, no potholes in road & air condition (the little buses too) (1) Oh, lord, comfortable seats, air… (1) Not too far – walk it (3) Air conditioning; without anyone getting mad with the driver (1) It would be like you were on rails – instead of bump, bump, bump & no hard stops (1) Fast with limited stops (2)

90B like how goes (3) Unnoticeable (1) It would be like heaven because I haven't been out in so long (3) Get to go to the mountains (3) It would have something outside to hold packages (1) Comfortable seats, quiet bus, got one where I needed to go (1)	Either quiet enough to read or interesting enough to talk to somebody (3) Pleasant courteous driver & pleasant & courteous passengers (1) Express to Wal-Mart (3) I would catch a bus at the terminal & it'd take me directly where I am going (2) Fine. Chapman Highway (3) It would be pretty much like my car ride but I would not be driving (2) Had it, it was great (3)

FIGURE 5 – Perfect Bus Ride

Demographic

The initial and final health questions for the demographic survey are shown below (Fig. 6).

Health Conditions
_____Respiratory
_____Cardiac
_____Musculoskeletal
_____Neurological
_____Endocrine
_____Visual
_____Hearing

Specify, any of the above Conditions_____
_____

(A)

Health Conditions
Do you have a disability that limits your use of public transit?

_____Yes
_____No

(B)

FIGURE 6 - Sample Health Condition Demographic Survey Question. (A) initial format, (B) final format

The initial format (A) was interested in comparing types of health conditions (or no identifiable health conditions) with non-bus riders. On preview for the fieldwork, the Summit Tower Manager stated that specific health questions are not allowed under the American Disability Act (ADA). A general health statement, phrased with a yes-no response was permitted. Six out of the twenty-six replied "Yes" to having a disability that limits transit use. Five of those six were in the process of claiming disability benefits. All but one currently uses the public transit system without any assistive device. This one participant stated "I kind of, but not limited;" "sometimes hard time getting off and on." The majority that answered "No," six did require an assistive device and received disability compensation. Female genders reported four with a disability and seven without. Male genders answered two with and thirteen without a disability. Constricted to the notion of health as a disability, the female bus riders identified self more with a disability while male genders did not. This differential, along with the qualitative descriptions, suggest the added need felt by the female genders to legitimize a disability.

Description of Phenomena

A thematic analysis was performed from the descriptive field notes, jottings, and journal entries. Systematic coding occurred. This involved identifying repetitive topics and areas that seem to be significant to the bus users; then sorting these topics into thematic categories for further analysis. The following themes are similar for both genders but the meanings and the expressions are different.

Holding On: *Everyone Knows You Can't Hold a Bus*

Bus stop consolidation measures claim that bus users will not have to wait long at the bus stop because buses will be on time. This scenario generally holds true. However, another component to this on-time performance is that buses will not wait for you if you are not at the bus stop; you have to be there. But this being there is more complex. The following scenario is between a potential bus passenger and a bus at the bus stop:

> The bus was pulling off at the Transfer point and this guy was running down and he tried, tried to hold the back of the bus and hold it, he fell down on the street on his face, I know it had to hurt but for the people who was watching it, it was sort of comical because you can't hold a bus with your arms you know; but that bus was going to leave without him and he was going to hold it; but he went down in the street; that had to hurt; but everybody that saw it they had to laugh, you know, even though we felt sorry for the guy.

Without amenities, the decision to maneuver to the bus stop is weighted. The numbers valued by transit planners impact the bus users. There is a difference in viewpoint toward "buses will be on time" and the bus user "times herself exactly" before the next bus:

> I time myself exactly seven minutes before the arrival of the next bus. Then I leave my place. [I] don't want to be out long because hot and humid or rain plus there is no where to sit; so, I leave just those one to two minutes extra because [I] may be held up by traffic light, waiting to cross [at the crosswalk]. [Lives approximately 300 meters from the bus stop]

The first sends a message that amenities do not matter and the latter indicates a bench and a shelter certainly do matter. The bus user is placed in a holding-on position because their schedule must work around the bus. There is a reaction not to stand and wait but to get out there "just at the right time." A bodily sense is a swoon. The meanings for the female gender reveal - give me a break, no one to help, and I can do it (how bus user sees self). She stands after work waiting next to and like the post (how others see the bus user). In contrast, the male gender, it is okay to stand idling.

Wearing Down: *Ten Minutes is a Long Time to Wait*

The cumulative effect of brief waits outside wears the body down. Reports of recuperation taking two days to a week abound. Bus users are observed to be wearing down – how hold self, how dress, and how engage in conversation – rub shoulder, toss packages, hands undershirt, and legs fidgeting or locked in a standing position.

> If the grass is dry we sit on the grass if not we need to stand in the rain, lean against the pole…we've both leaned against telephone poles to wait on a bus.

The bus stop is a structure that allows the deleterious physiological effects of increased pressure to the lower extremities and leg edema, hyperthermia, and mal-aligned shoulder joint.

> I'm paying for it. I tell you, I'm probably going to have to have shoulder surgery…carrying all those groceries
>
> It was safer for me to keep walking to the transit center [and sit], five plus minutes, versus stand at the bus stop; hey I lost a lot of weight but it didn't help my body. It was tiring on my body and hurt my legs.
>
> My legs got stronger and I did lose weight but my body just wore down.
>
> I got to a different bus stop. I felt relief thinking that I was not too early or too late. The lady there commented that she uses this bus stop a lot after she gets off work. Last night the bus was early and she hopes the bus will be early again tonight. The weather bites, strong winds and freezing temperatures. We stand together exposed.

Bodily is sensed as awkward, bits and pieces of body parts versus one solid unit. Getting on the bus [then home] is a big smile. It is an opportunity to just sit somewhere. The female gender must look composed, proper and not draw attention to self to the fact that I can't do this well, no one can (how bus user sees self). Has nobody, poor thing. Do you want a ride? (how others see the bus user). The male gender's breakdown is more medically legitimized. I got a bad back.

I'm Invisible: *You Call That a Bus Stop!*

Bus stops are invisible. Often it is just a stick in the ground with a small sign on top. The structures and the people that use them sometimes appear as afterthoughts. Put in place

and given permission to move within an infrastructure designed for the car. Buses were common place in the past.

> Someone was already waiting at the bus stop. You have to be at the bus stop or they won't stop. We sat twenty feet from the bus stop. We could see the bus stop clearly. The brick wall was about knee-high with some shade trees. I don't run too fast; I'll have to walk over there. Standing 5 minutes plus and the heat can hurt you.
>
> I'm invisible. They didn't see me. Said I wasn't trying hard enough so the bus didn't stop. [There's a lot of traffic and the bus stops are not across the street from one another]
>
> Does this look like a bus stop to you, jokes the bus operator after picking up a passenger at the designated stop. Have you noticed they strategically located these bus stops at intersections right where the water pools the highest. It is raining hard.

The bodily sense is nothing (not validated). The whole body is disengaged and voiceless. The thing that is not seen is the body that is slowly breaking down. The message the female gender receives is don't stand there, careful. Not seen is the errands she must do for all those people who do not ride. The male gender essentially walks and stands almost anywhere.

RECOMMENDATIONS

This limited analysis showed the impact of bus riders as pedestrians before they become passengers. By emphasizing the perception as a pedestrian, the qualitative term, accessibility versus access to services made more sense. The material aspect of mobility was particularly evident at the bus stop. As a result of the bus stop focus, other elements within the participant-observation and interview data that focused on the bus stop were examined. Through the lens of specific health status markers – such as excessive fatigue, chronic shoulder joint strain, and the metabolic insult from adverse weather conditions - the priority of the bus stop design became visible. A gender analysis introduced meanings into understandings of health and structures.

Change Language to Mobility

In order to maintain or increase the current health status of bus riders the basic language for transit performance measures needs to change. The language needs to express the ability to be and to remain mobile. Not words that depend exclusively on quantitative distance, such as getting from point A to point B or ridership counts.

Add Functional Health to Transport Performance

Functional health status can be a robust measurement of transportation equity and performance. Markers should register the effects of adverse weather conditions, shoulder joint dislocations, and circulatory mini-shocks from repetitive walk-stand positioning.

The aim is to change the viewpoint and prevent other maladies that are currently invisible.

Require Standard Structures to Bus Stops

Modify the bus stop policy to include minimal structural requirements. Shelters and benches should be located at every other bus stop regardless of the ridership count. To date, most bus stops are only a narrow sign post.

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COVER LETTER

Final Paper for the 2014 conference, "Women's Issues in Transportation: Bridging the Gap."

By Amy Dunckel Graglia

Responses to the comments raised and changes incorporated

Comments Frequently Raised	*Changes Incorporated*
Data and methodology There was an overall consensus that one of my sources of data – online comments posted by consumers of Mexico's media – were bias and complicated.	I addressed this issue by: **1)** Not using the online comments as a primary source, but rather a secondary source that could enrich the more statistical data with qualitative comments.
Contextualize the paper more My first drafts attempted to make global generalizations about violence against women in transportation while using Mexico City as a case study. It was suggested in the comments that the paper would be much better if the data was placed just in the context of Mexico and not to try to make it generalizable.	I addressed this issues is two important ways: 1) Referenced only a few examples from other countries and made sure to draw from previous studies, highlighting their conclusions **2)** Brought in much more data on the case of Mexico specifically, in order to demonstrate how violence against women in Mexico was specific to this case.
Ready for implementation by practitioners and useful to researchers This paper probably struggles the most with the ability for other researchers to use this data in future research. This is partially because this paper makes a theoretical argument on why we should consider less focus on differences in men and women's travel behaviors, and instead look at how mobility as a gendered resource.	I tried to address this issue in two ways: 1) By simply making a case for an alternative perspective: one that looks at transportation as a gendered space, where long-term inequality between men and women is maintained and reproduced. **2)** In the conclusion I try to give a gender format for how trying to understand gender-based violence in transportation can lead us to more insight on how gender inequality is produced and reproduced in the urban context.

Gendered Nature of Women's Mobility: A gender perspective for analyzing women's issues in public transportation in Mexico City, Mexico

Amy Dunckel Graglia

ABSTRACT:

In the past few years we have been bombarded with news on violent attacks and the gang raping of women that took place on a moving bus or subway. While these attacks have created substantial debates on how to immediately address problems of violence, we still have very little explanations as to why they are occurring and if those solutions get at the root of the problem. Previous research has tended to focus on men and women's differences in physical mobility, which tells us a great deal about gender inequality in terms of travel, but very little as to how violence reproduces this inequality. As an alternative perspective, this paper asks, "*why* does gender-based violence in public transportation occur and how does it demobilize women?" To explore these questions, this paper looks at the case of Mexico City, drawing data from public opinions, surveys, and police reports that can help explain the persistence of violence against women in public transportation. In analyzing this data, this paper finds that places of transit are highly gendered spaces that function like institutions, constantly reproducing differences between men and women. In short, public transportation promotes men's mobility over women's, using gender-based violence as a social tool to reproduce and maintain gender differences in mobility. This paper concludes with a discussion on violence against women in public transit within the context of gender inequality and the use of women-only transportation as a solution.

Key Words: Gender perspective, masculinization of public transportation, women-only transportation, gender-based violence

This paper explores the relationship between the gendered nature of mobility and violence against women in public transportation in Mexico City. It is well documented that women often face sexual harassment and violence during their daily commutes, particularly in countries with extreme levels of gender inequality (Chesney-Lind 2013, Ghatak and Abraham 2013, Mitra-Sarkar 2009, Neupane and Chesney-Lind 2013). The violence that women must endure has created several mobility differences between men and women, including women's avoidance to travel alone or at night, as well as the recent trend of segregating transportation, giving women their own taxis, buses, and subway cars. But why are women stuck in vicious cycles of immobility?

Scholars unanimously agree that women are less mobile than men (Babinard and Scott 2009, Mitchell 2009, Romano, Keller-Baker, Torres 2009). What is debated, however, is why these differences persist (Oxley, et al 2009), or how gendered violence in public transportation is related to them (Loukaitou-Sideris and Fink 2008). Some argue that women are less mobile because they are taught to fear traveling alone or during certain hours (Hsu 2009). Others however, focus on how women have just not learned to overcome this fear by acting in bold and confident ways that could break down these barriers (Koskela 1997). In any case, none of these studies have taken an in-depth look at real violence against women, and how that violence is used to reinforce traditional gender roles that demobilize women. To address these issues, this posits a slightly different question, focusing on the role that violence against women plays: *How does gender-based violence in public transportation reproduce gender inequality, creating a persistent barrier for women trying to increase their mobility?*

At first glance this question may seem different from questions that we have previously asked, particularly when it comes to gender inequality and transportation. However, upon closer inspection one can see that it is an old question posed in a new context. We have seen this question, for example, when it comes to other social institutions: how does sexual harassment in the workplace reproduce gender inequality? And, how does sexism in the education system limit women's opportunities for success? This paper proposes that transportation acts similar to other institutions, which reproduce gender inequality. Only instead of limiting women's economic, social, or educational opportunities, it directly affects her mobility.

Asking this question of transportation, therefore, simply means that we must think of public transit as a highly gendered space and not a gender-neutral one. Feminist geographers and architects tell us that this is not such a difficult task, explaining how all gendered spaces are really just the product of ideologies that embed themselves in geographical locations. The kitchen, for example, is often seen as feminine and a 'woman's place,' whereas the sports field is more commonly thought of as masculine (Spain 1990). Each gendered place, be it feminine or masculine, has the power to reproduce inequalities by embracing gender differences.

The rest of this paper considers public transportation as a highly masculine place, which: 1) embraces an ideology of the traditional role of the woman as a household figure; 2) allows violence against women to be used to reinforce gender differences; and 3) discriminates against women specifically by discouraging them from being more mobile.

METHODOLOGY

To understand the masculinization of public transportation space, data was taken from three places. First, real statistics gathered by police reports, surveys among women which quantified the level of violence and sexual harassment against women within public transportation. The second was from short informal interviews conducted among women commuters in Mexico City. The third source was taken from 418 online comments that were posted in response to the media's coverage on the implementation of women-only transportation as a solution to violence against women in buses, taxis, and on the metro.

Statistics

The National Board for the Prevention of Discrimination (CONAPRED) and the National Institute for Women (INMUJERES) are two of Mexico's largest Federal institutions responsible for the collection of statistical data on violence against women. The statistics on the levels of violence against women is largely taken from the surveys and studies conducted by these two groups (see Bucio Mújica and Fix-Fierro 2011, and Zermeño Núñez and Plácido Ríos 2010 for more information on the details of the data collection methodology). These statistics are supported with testimonies from women who were sexually violated while taking a bus, metro, or taxi, giving a more personal and in-depth look at the levels of gender-based violence in Mexico City's public transportation system.

A second source of data came from a small survey conducted specifically for this paper and was designed to accumulate the following information from women riders: 1) What are women's attitudes towards public transportation? 2) How often and for what reasons do they choose women-only transit over mixed transportation? This survey was given to 125 members of our target audience, defined as female riders of public transportation in Mexico City. The participants were randomly selected using a convenience sampling approach. Around 20-22 participants were selected across 6 different transit points throughout the city, including bus and subway stops.

Short informal interviews

The second indicator used in this research paper looks for differences in women's travel behaviors as they are specifically related to the masculinization of public transportation. This data is taken from two sources. The first is from long-term collection of ethnographic data, where I rode public transportation for 4 years and conducted short informal interviews with other women travelers. I conducted short informal interviews with 20 women and follow-up interviews with 5 of them.

One of these latter interviews, that involved a follow-up session, is used here as a case study. This case study demonstrates the complexities that many women in Mexico face between their roles as a wife and mother and their limited mobility.

Media's coverage on women-only transportation and the public's response

Lastly, a supplementary source of qualitative data was collected from online comments posted by Mexico citizens on the topics of gender-based violence in Mexico City's public transit system, and the use of women-only transportation as a solution. Mexico's media did a vast online coverage on topics of women-only transportation and violence against women between the years 2007-2011, when Mexico City was increasing the number of women-only buses and taxis in response to the growing levels of violence. The newspapers in particular, including *El Universal, La Crónica, Animal Politico,* and *El Milenio* posted their online and created debate forums for readers to write in the comments and opinions on the topics.

I found that the comments reflected the same language and attitudes towards women's mobility as in my interviews among women riders. For this reason the comments are used as a form of supplementary data, giving more depth to the feelings and attitudes towards gender-based violence in transportation and women's mobility.

While these comments are used as supplementary, there are several methodological issues with the online data that should be addressed here. First, these comments were taken from people who have access to the internet and who read the news. It is likely that lower-class voices or more marginalized groups are not apart of the population sample. Additionally, these comments are not independent of one another, but rather each thread tended to work like a focus group, where one comment led others to make similar comments or responses. It is for this reason that these comments are primarily used qualitatively, in order to show feelings, opinions, and cultural justifications for violence against women in public transportation.

THEORETICAL OVERVIEW: GENDERED SPACE

While the data helps show the levels of violence and how that influences women's behaviors, a deeper understanding of the masculinization of public transportation needs a theoretical framework that explains spatial inequality. Spaces are gendered through a process called, the *socialization of space*, where each place is defined by cultural norms (Lefebvre 1992, Soja 1996). In this perspective, places are considered equally as social as humans beings and therefore need to be included in any social analysis. Lefebvre gives us the tools to include places in our social analyses by refuting the notion that space is a strictly geometrical concept, arguing instead that 'space, is also a social concept constructed from human relationships' (1974), where the culture of place has the power to control people's behaviors and inform society. Each place is filled with cultural ideologies that are protected by the way we behave in each place. And, the *socialization of space* is a way of analyzing those ideologies. It gives meaning and an explanation, for example, why we do not play rugby in a church.

In the 1990s feminist geographers applied this same logic to public places, creating an alternative perspective for analyzing the gendered spaces (Bondi 2005, Pain 2001, Valentine 1992). In this research traditional gender norms define men and women's uses of each place. Women are taught to fear walking alone at night, because they are taught at an early age that women should be at home during this hour and not in the street. The gendering of places, also referred to as the *spatial representation of patriarchy* can be found in women's fear of public places. Women's fear of rape and violence causes them to change their behaviors in places, either refusing to go into feared places alone –particularly at night– or to avoid them altogether. Women's inability to use public spaces in the same way as men creates a type of spatial exclusion, where women have less access and freedom in public places than men.

MASCULINZATION OF TRANSPORTATION AND MOBILITY AS A CONTESTED RESOURCE

Considering that transportation is a highly gendered place that fosters inequality between men and women, then we must consider how mobility as a resource can be controlled by one group at the expense of another. This section looks at a few ways in which traditional gender norms have become embedded in places of transit and consequently have given men control over mobility.

Traditional gender norms define places of transit

Rarely do we consider a private car to be a highly gendered place. Yet, a handful of studies around the world have shown that men still control the purchasing and use of a family owned car, including in Pakistan (Odufuwa 2007), South Africa (Venter et al. 2007), and India (Anand and Tiwari 2006). These studies elaborate the relationship between car ownership and traditional gender roles (Babinard and Scott 2009), where men are still the primary decision makers and users of the household vehicle. Likewise, Tim Schwanen focuses on persistent inequalities in car uses between men and women in the Netherlands. He argues that women's household responsibilities, employment, affect her access and need for a car differently than a man. Additionally, that car use is tied to middle-class norms of 'being a good mother' (Schwanen 2011).

In Mexico specifically, family and marriage shape women's mobility. Although married women are not outright banned from places of transit (like in Saudia Arabia) they are expected to use it different than men, particularly a woman who has a *familia*. In Mexico, to say 'she has a familia' means that she probably has a husband, but definitely has children. The word implies responsibilities in the home, emphasizing her job in the house as a wife and mother. From a more feminist perspective the familia can also confine women to a stricter set of gendered rules that do not apply to men. Women do almost all of the housework, but they are not traditionally considered the decision makers in the house (Navarro Ochoa 2010). Women with *familia* are likely to be renounced in the labor market than women without (Terán Covarrubias 2012). And, as this paper shows, women with *familia* must negotiate their mobility with their husbands, especially when it interferes with her role in the home. In fact, a study conducted by the National Board for the Prevention of Discrimination (CONAPRED) released studying in 2010, revealing that 40 per cent of women in Mexico must ask their husband for permission to leave the house alone at night (Bucio Mújica and Fix-Fierro 2010: 72).

Gender-based violence or women's fear of violence

In addition to traditional gender norms defining each place, the spatialization of masculinity is also (re)produced in gender-based violence that occurs in each place. Violence against women in places of transit reinforce gender differences when it comes to travel, where transportation is not only defined by gendered perceptions of women, but also by the ideologies of masculinity. “Violence,” writes

Michael Kimmel, “is often the single most evident marker of manhood. Rather it is the willingness to fight, the desire to fight” (1994: 215). Matthew Gutmann, an anthropologist who studies masculinity in Mexico calls this being macho. In his study on the “machismo culture” in Mexico City, Matthew Gutmann defines macho as “...a man who is responsible for providing financially and otherwise for his family” (pg 221). He goes onto say that while macho o machismo, both of which can connote different images for describing men, often manifest themselves in forms of violence against women.

Women's fear of public transportation and their altered behaviors

While gender-based violence produces a hyper-masculine culture, it also simulteneously isolates women, creating a culture of fear and avoidance. Women's fear of rape and violence causes them to change their behaviors in places, either refusing to go into feared places alone –particularly at night– or to avoid them altogether. Women's inability to use public spaces in the same way as men creates a type of spatial exclusion, where women have less access and freedom in public places than men. Women's fear of public transportation not only limits women's access to mobility, but it also challenges her sense of freedom to pursue other opportunities.

In an article called, *The Gendered Nature of the Urban Outdoors*, Jennifer Wesely and Emily Gaarder show how women's fear of gender-based violence in public parks limits women's ability to use outdoor recreation to build their confidence. Wesely argues that outdoors and recreational activities have been heralded as empowering for women. Yet women's feelings of vulnerability to sexual assault limits women's ability to places where she access natural spaces, such as parks, “temper[ing] the benefits and rewards of outdoor recreation for women” (2004:645). Denying women equal access to the urban outdoors disempowers her, which then of course can be extended into other aspects of her life.

The rest of this paper discusses the masculinization of public transportation, showing how both traditional gender roles frame women's mobility as well as gender-based violence in buses, taxis and in the metro. It then goes on to discuss how women change their behaviors in transportation based on these factors, essentially putting themselves in a position of limited mobility.

TRADITIONAL ROLE OF THE WOMAN

There is a persistent perception in Mexico that women are household figures and not public ones. Jocylen Olcott, historian of Mexican feminist movements quotes from the newspaper of Mexican's ruling party in 1931, “"But while she prepares herself and organizes herself, we men prefer to continue ceding our seats on the buses, finding the soup hot in the household olla, and listening to the broom dancing under conjugal songs, than to hear falsetto voices in Parliament or to entrust the suffragist ballots to poetic hands"” (2005: pp 5).

Eighty years later, women continue to be praised for being a mother, wife, or daughter, but not as mobile or working woman. Nancy explains, “There are two sides to the machismo culture. One that seeks to protect 'the virgin,' 'the mother,' or the 'idealized Mexican women.'” She brings her shoulders up to her chin, while running her hands from the top of her head down as if to wrap a scarf around her face, and explains, “as long as you look like 'the good woman' then men will protect you when you are coming home late at night or something like that. But if you don't embrace that image, then you are very likely to get harassed and no man will stick up for you if that happens.”

The case Josefina and her husband Poncho

On the outskirts of Mexico City, lives a small low-income family. The mother, Josefina is a

young women with indigenous roots, from Guerrero: a state just west of Mexico City. She lives her with husband Poncho, a short trim man who works hard, sometimes two to three jobs at the same time, and her two kids Brian and Celeste: a 16 year-old boy and a 5 year-old daughter. Josefina's mom –no longer married– lives a few blocks down the road, and her in-laws live a 15 minute bus-ride away.

Josefina relies a lot on the help of her mom and her in-laws, but she also finds herself in the same position of most women with a familia – caught between a world which demands mobility and another binds her to the home. These forces keep her in constant state of negotiating the two worlds, which manifest themselves in arguments with her husband, which always come down to two main factors: being at home to cook and care for the family, and generating income.

A woman in Mexico is viewed as a the parent with the skills to raise children, whereas the man is largely seen as the one with the skills to financially provide for them. However, these roles do not fit neatly into reality. Consequently, Josefina's world is built out of contradictions, where what is expected of her is not always what she should be doing. On the one hand she must work. "We cannot survive on one income," she says. "The money that my husband makes is not enough (el dinero no alcanza)." But on the other hand, she is expected to fulfill the social role of primary caregiver, putting her the emotional care of the *familia* above everything else.

The result is compromised mobility, where her ability to travel is directly shaped by her need to be at home. The negotiation largely takes place between her and her husband. Her arguing for more mobility and him taking the side of less. "Any job that goes late I have to discuss with my husband." Says Josefina, "To me, it's not a big deal, because my mom can pick-up Celeste from school and make her dinner. And I think that it's ok. I don't see anything wrong with my mom making Celeste her dinner and putting her to bed. "My husband and I fight a lot about it. He says it's not good for me to have my mom do that. That Celeste needs her mother."

The two always settle on the same time frame which allows Josefina to work during the day, but be home in the mornings and at night with the children. This means that Josefina turns down jobs that require mobility outside of this framework. And consequently follows a pattern that many women in her position tend to take after children, moving from the formal labor market (where working hours are stricter) to the informal work sector.

The constant emphasis that mothers do not need to be mobile in Mexico also creates a space for arguing against women having their own transportation. This perception is particularly well noted when men are asked if women should have their own transportation for the purpose of providing women with a safe and secure way to increase their mobility. As Alejandro notes:

"No, because the woman has other important responsibilities, which include the education and care for the children, running the household, etc. - the woman should not replace men, but rather complement them – the woman has her sacred rights, but it is not her role to replace or substitute the man – this is the natural order and we shouldn't change it."[1]

Likewise, Raul says, "[Women should] stop breaking balls. They should stay in the kitchen, and let that be that. If they have to go out, they should go with their husband, boyfriend, lover, brother, or

1

Comment posted online 10/11/2010, during a conversation on the use of women-only transportation in Mexico City.

cousin. Soon there is going to be lanes or avenues just for the Pink Taxis [women-only transportation]."[2]

And when asked if women-only transportation is a good idea, Alfredo responds, "No. Because I don't want to contribute to the further destruction of the role of the woman as mother and caregiver of the children, which is her primary and natural role in life."[3]

While gender norms are strong enough in Mexico to deeply influence views on the use of transportation, they are not enough alone to prevent women from increasing their mobility, and the current problem in Mexico City's transportation is a rise in gender-based violence as a way of further excluding women from equal access to mobility. During an interview with Sara, a single mother of two, she told me that ideally she would tend bar, because it gave her a chance work while her children were asleep and be there for them while they were awake. And in the past she had tended bar. She only quit when she was repeatedly harassed after closing when trying to return home. She said that she was afraid to take a taxi that late at night because men perceived her differently, they looked at her as someone with loose morals and deserving to be attacked.

The next sections go into greater detail on the issues of violence against women in public transportation and how it affects women's equal access to places of transit and control over her own mobility.

VIOLENCE AGAINST WOMEN

According to INMUJERES, because more women entering the workforce and because they are still largely in charge of all the family work, including shopping, dropping-off and picking-up the children, that women are spending 2 hours a day on transportation than men. The increased presence of women in public transportation seems to be accompanied by an increased level of gender-based violence against.

In the 1990s, the Mexican National Institute for the Protection of Women, including the federal women' s body INMUJERES and the Federal Institute for the Eradication of Violence Against Women (Comisión Nacional para Prevenir y Erradicar la Violencia contra las Mujeres CONAVIM) took part in two important global discussions on women' s rights. These were the UN Fourth World Conference on Women held in Beijing in 1995; the Convention of the Americas on the prevention and eradication of violence against women, held in Brazil on 9 June 1994 (Convención de Belém Do Pará); and the CEPAL regional conference on gender inequality in Latin America and the Caribbean (Undécima Conferencia Regional sobre la Mujer de Améica Latina y el Caribe). At this time, the violence as considered worrisome, but had not yet reached a level that would provoke political action.

Political recourse is reconsidered, however, in 2008 after a study conducted by the National Institute for the Protection of Women (INMUJERES) reveals that nearly every single woman (90%) is a victim of some type of sexual violence while using public transportation in Mexico City (Zermeño Núñez and Plácido Ríos 2010). Additionally, the study found that in one year alone, 8 out of every 10 women had been sexually violated. Among the 80% of women who had been violated in past year, 43.8% reported having been attacked 4 or more times, and 10% reported being subjected to 7 or more sexual attacks while using public transportation (Zermeño Núñez and Plácido Ríos 2010:13).

The women that I interviewed as well as the women who wrote in comments online all shared

[2] Comment posted online 8/10/2010, during a conversation on the implementation of Pink Taxis in Mexico City.
[3] Comment posted online 9/8/2010, during a conversation on the implementation of Pink Taxis in Mexico City.

stories of extreme violence that is taking place while using public transportation in Mexico City. The following are just two of hundreds of quotes from women who posted their story of being attacked while using public transportation.[4]

"When I was going to school at the Escuela Comercial Cámara de Comercio, famous because then it was an all girls' school, I boarded the metro (underground train) at the station Centro Médico, where in this particular station there was a lot of abuse towards us women. This station was already famous for the large number of women who boarded there and with a lot of strength everyday we had to get on the metro. Everyday you could see women getting to the station crying because some guy had already stuck his hands down her pants, or because when she was taking the escalator they've already reached out and started grabbing you. A very good friend, and I cannot even image how disgusting this man must have been, but he got behind her when she was going down the escalator and I guess started to masturbate. I don't know if he already had his penis out or that it was hidden behind his case, but before they got off, he came all over this poor girls skirt and stockings!!! She noticed when she felt something wet on her backside and when she turned the guy had a sweater in front of him. She screamed, of course, the the guy took off running and the police never got him."[5]

"Of course I have been a victim, and not just once, but many times. But the one time that stands out the most is this one day in the metro, San Cosme. I started to feel on my back something weird and hot and upon turning around to my surprise was a man behind me with his penis out. I could not believe it! There with so many people around and him doing this, to let go unpunished just because nobody cared, no. I went to the police and the only thing that happened was them saying, TELL ME HIS CHARACTERISTICS. I headed to work and just had to deal with the uncomfortable situation. Should I have to miss an entire day? All because, although a lot of people still don't know, we live in a shit country."[6]

Table 2.1 Reported Violence Against Women in Public Transportation, 2008 Survey by CONEPRED.

While using transportation in Mexico City have people....	Per cent of women who responded "yes"
directed offensive and disrespectful words to you in relations to your gender?	63%
stared sexually at your body?	74%
touched or manhandled you in sexual ways?	48%
touched their genitals or masturbated in front of you?	36%
pushed their body against yours in a sexual manner?	73%

* Source: CONAPRED study on gender-based violence in Mexico City's public transportation (Zermeño Núñez and Plácido Ríos 2010: 100).

[4] These two quotes come from one specific online forum that was created by El Universal. During this forum there were 168 comments posted. Be it in this specific forum or in the other comment threads that were created online by the media, in total over a 100 women posted a story about being sexually violated while using public transportation in Mexico City.

[5] Posted online on November 25, 2010 by Linix during an online forum created by El Universal asking if you have ever been manhandled while using public transportation in Mexico City.

[6] Posted online on November 25, 2010 during an online forum during an online forum created by El Universal asking if you have ever been manhandled while using public transportation in Mexico City.

The extreme level of violence has sense provoked political changes that include, legal reforms and the implementation of women-only transportation. The violence has also been shown to have significant affect on women's fear of traveling (Dunckel Graglia 2013). Specifically, women are have expressed a lower levels of confidence in being available to travel late at night, alone, long-distances, or their willingness to confront an attacker and report crimes to police. Take for example an interview I conducted with Alejandra who, like most women I talked to, told me that you must not try to confront an attacker:

"This one time I was on the metro. It was almost empty. But this guy across from me was staring for such a long time. I was just ignoring him, but he kept doing things to get my attention. Then I see that he has his pants unzipped and is touching himself. You couldn't see anything, but it was obvious what he was doing. And he just stared right at me."

"So what did you do?" I asked.

"Nothing. I ignored him. I waited until the next stop. And then I got off the train and waited for the next one. There is nothing that you can do. The best thing is just to exit the situation."

Demobilization of women

While traditional gender norms seem to justify gender-based violence –where men see transportation and mobility as something belonging to men and not women– women's travel behavior is not directly shaped by them. In fact, men see the violence as far less serious than women do:

Table 3.1: Perception of the seriousness of gender-based violence, comparing responses between men and women.

		SEX			
		Men		Women	
		Number of respondents	Per cent	Number of respondents	Per cent
Using offensive and disrespectful words in relations to your gender.	Serious	24	41%	101	77%
	Not very serious	19	33%	22	17%
	Not serious	14	24%	8	6%
	Don't know	1	2%	0	0%
If they stare sexually at your body.	Serious	24	47%	149	74%
	Not very serious	19	33%	35	18%
	Not serious	14	20%	10	5%
	Don't know	0	0%	1	1%
If you are touched or manhandled	Serious	36	68%	116	95%
	Not very serious	5	9%	4	3%

with sexual intentions	Not serious	9	17%	2	2%
	Don't know	3	6%	0	0%
If they touch their touch their own genitals in front of you.	Serious	34	61%	85	90%
	Not very serious	8	14%	5	5%
	Not serious	14	25%	3	3%
	Don't know	0	0%	1	1%

* Source: CONAPRED study on gender-based violence in Mexico City's public transportation (Zermenño Núñez and Plácido Ríos 2010: 199-120).

Women on the other hand are rethinking the way they travel. In general, women reported that their gender attracts violence during their daily commutes. During a public opinion survey, asking women if they feel safe while traveling, more than half (66%) of the women surveyed reported no, claiming that women-only transportation is safer because the men are not there to harass them. Among the 44% who did not unwaveringly agree with this statement, 48% made a special notation on the side of the survey saying that they disagreed only because they felt that women-only buses and subway cars in particular were not well guarded. That is, they believe women-only transit to be safer, but only if the men were forced to respect it. Some of these comments included:

"It is still safe, even though sometimes men board the women-only sections and try to intimidate the passengers."

"It's supposed to be for women-only."

"There are many times when the women-only sections are not respected [by men]."

Table 3.2 Safety Opinions of Women Transit Users

	Agree		**Disagree**		**Neutral**		**Total**
	N	%	N	%	N	%	N
I feel safe in normal transportation	19	16%	83	70%	17	14%	119
Taxis driven by women are safer than taxis driven by men	59	53%	30	25%	16	13%	116
Streets are more dangerous for women than for men	63	53%	30	25%	16	13%	119
Women-only transportation is safer than regular transportation	76	66%	25	21%	15	13%	116

* Survey taken in 2010 among women transit users. N=Number of respondents

The violence and women's fear of travel has had detrimental consequences on women's

opportunities in the city, limiting them to highly gendered roles. In more than half of the interviews that I conducted, women told me that they have turned down jobs because they require traveling during precarious times, such as late at night, long distances, or in unfamiliar places. And, in 2010, the report on violence against women in Mexico City's public transportation condemned this violence as a form of gender discrimination, calling for the political protection of women in public spaces (Zermeño Núñez and Plácido Ríos 2010).

Conclusion

At the time of the report, from 2008-2012, women's voices on violence and their oppressed mobility began to be heard. New campaigns were formed, pink transportation was implemented and women-only buses, taxis, and sections in the underground metro have become platforms for campaigns to de-gender transportation and free women from the constraints that immobilize them.

Carmen Serdán Alatriste, for example, is one of dozens of women revolutionaries painted on the sides of pink buses running throughout Mexico City. Next to her profile is a short bio describing her role in the Mexican revolution against the dictator Porfirio Díaz. Right above her majestic portrait hangs, *Homenaje a Las Mujeres del Bicentenario* (Homage to the Bicentennial Women), standing as visual reminder of women's great importance in the country's foundation and success.

Pink transportation in Mexico City is the spatial embodiment of a women's movement, liberating women from a cage of invisibility. In normal public transportation women practice survival tactics, hiding their bodies and responding to the violence with passive behavior. "We painted the buses pink," says Mercedes, a spokesman from INMUJERES and leader behind the implementation of the bus line Athena, "in order to give women visibility."

While pink transportation did make women more visible, this research found that the Athena buses and the program Viajemos Seguras actually do much more. Pink transportation is the spatialization of Mexican feminism values that is an urban tool specifically designed to combat the hyper-masculine culture. Through visual iconic images the Mexican feminist movement is re-establishing women's image and therefore their role within the city. Specifically, pink transportation carries two important messages that embody the feminist ideologies that are being used to change women's relationship to the capital city. The first, Viajemos Seguras literally meaning "We Women Travel Safe," embraces the message that it is women's *right* to travel safely, not their *responsibility*. The program maintains public campaigns that promote woman's right to equal mobility. These messages are distributed throughout all public transportation in Mexico City, particularly in the subway, are posters, phone numbers, booths, and by spokeswomen handing out information that explains to women the laws against violence and discrimination. It has also played a central role in changing the legal structure, clearly defining what constitutes discrimination and increasing penalties for these crimes. These laws are also widely publicized, encouraging women to report any violence that they experience. Their central message to women is that the violence that they face has nothing to do with weak or strong, but rather is a criminal act of discrimination based on gender.

Teaching women their rights as citizens is accompanied by Athena, which promotes the identity of women as powerful public figures. The images painted on the Athena buses are taken from an established feminist discourse that women are revolutionaries, founders of Mexico, and important public figures. Each bus is filled with visual images expressing women's courage, strength, and ability to go fight for their country at anytime: an image traditionally reserved for men. Also, each one is also dedicated to a woman revolutionary, showing her picture and role in Mexico's Independence. These buses are in direct opposition to normal public transportation, which emphasizes the narrative that women are too weak to participate in public life and should remain in the house taking care of the

family.

Both the violence against women and the rise of women-only transportation tells us a great deal about the gendered nature of transportation and how it affects men and women's mobility differently. This paper uses the case study of Mexico City and its hyper-masculinized public transit system to argue that places of transit are not gender-neutral, but rather are shaped by highly gendered social systems, including women's traditional role in the home and public violence against women. As Martha Zermeño Núñez and Elizabeth Plácido Ríos note:

Among all public spaces, public transportation is the place where women must face the greatest levels of violence. It represents a grave problem of discrimination that limits security, freedom to travel, and mobility for women in urban spaces, all of which affect their capabilities and opportunities for success. (2010, 12)

This paper concludes by suggesting that both urban planners and transportation scholars take a more detailed look on how gender shapes the culture of mobility. In doing so, we will be presented with a more complex and detailed picture of how differences between men and women's mobility cannot be resolved through simple changes to the transportation system. Rather these solutions need to be considered as part of an entire system of gender differences whose ideologies have become embedded in places of transit. Of which, manifest themselves in forms of gender-based violence and harassment and demobilization of women.

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Harassment and Public Transportation in Los Angeles: Designing effective transit policies that meets the needs of female identified riders

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Introduction

Women and men experience public spaces differentlyand in particular transportation, which has a significant impact on their mobility through the city(Loukaitou – Sideris and Fink, 2009). However, currently the City of Los Angeles lacks comprehensive transportation policies that prevent sexual assault and harassment on its public transportation system. Given the lack of data on sexual harassment that occurs on public transit, this poster highlights the need for effective policies that prevent crimes against women,such as sexual assault and verbal harassment, in and around Los Angeles. It also critiques current public transportation policies in the U.S. that fail to incorporate a gendered approach tourban planning. In doing so, it provides a comprehensive understanding of how the absence of anti-sexual harassment policies in public transportation impacts the travel behavior and mobility of women in the City of Los Angeles.

Research for this project consists of an on-board survey of female identified passengers on the 720 Rapid, one of Metro's busiest lines in Los Angeles, as well as ethnographic research examining the experience of being a woman and riding subways at night and in the early morning hours. The resulting data will offer a more nuanced understanding of how, when, and where sexual harassment occurs on both the bus and rail system. Such information can be utilized to implement a system-wide sexual harassment policy for Metro in the City of Los Angeles that includes a task force of grass roots community organizations that can administer the program and monitor its efficacy. Due its size and dynamic demographic profile,Los Angeles is an illustrative case study forbetter understanding how other cities might deal with similar issues of sexual harassment, public space, and transit planning.

TOPICS FOR FURTHER RESEARCH

1. Investigate the efficacy of sexual harassment policies that transit agencies have implemented around the U.S.
2. Develop metrics to evaluate sexual harassment policies on transit
3. Examine the differences in the transportation needs of female identified service workers: those employed in the restaurant industry are more likely to travel late at night. Los Angeles has the largest restaurant industry in the U.S., most service workers are women.

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