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EXPLORATORY INVESTIGATION OF MOTIVATION, TIME USE, AND INTENT: THREE FACTORS OF TRAVEL TO BE INVESTIGATED

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ABSTRACT

The objective of this exploratory paper is to investigate the drivers of travel demand beyond the need to travel to destination; travellers may engage a trip for the sake of it, at least to some extent: travel includes a share of "primary utility". The paper focuses on two types of data and analysis: the primary utility of travel questions passed in the last French national travel survey, and eight dimensions of a trip proposed from a sociological analysis. The paper mixes these approaches and correlate survey answers to the sociological analysis, to define three principal factors. Finally, implications for survey design are proposed.

Keywords: primary utility of travel, undirected travel, travel survey, activity

1. OBJECTIVE: DRIVERS OF TRAVEL DEMAND BEYOND DESTINATION

Travel demand is traditionally considered as an entirely derived demand, since travelling from one place to another is necessary to carry out activities in different places. However, some theoretical or empirical investigations point out the intrinsic utility of travel (Hupkes, 1982; Marchetti, 1994). This concept originated in the observation that the "ideal" home to work commuting time does not tend to zero (Young, Morris, 1981). Indeed, some trips, though routinely performed, are not optimal (neither in travel time nor in mileage), which lead economists (Hamilton, 1982, King, Mast, 1987) to suggest the *excess travel* notion to name what was puzzling them. As a consequence, travel should have an additional utility, an intrinsic utility, besides that of the activity carried out at destination. In fact, between trips motivated only by their destination (*directed travel*) and trips made for their own sake (*undirected travel)*, there would not be a gap, but a continuum (Redmond, Mokhtarian, 2001, Mokhtarian, Salomon, 2001), which would render possible to measure the level of

"directedness".

The intrinsic utility would vary according to trips, from zero, for trips exclusively dedicated to join destination, to the total trip utility, for trips entirely performed for their own sake, such as a recreational walk, with most of the trips in-between, with some level of satisfaction provided by the travelling activity itself.

But to better understand the weight of positive and negative motivations of trips, it is necessary to overcome a strictly economic approach and to refer to the sociological study of constraints weighing on mobility (Kaufmann, 2006; Flamm, 2004; Rocci, 2007, 2008, etc.). Modal choice constraints are linked to multi-factorial factors: economic circumstances, social context, family, geography, transport supply, etc. They are also linked to perceptions of different transport modes, as well as to the knowledge of existing options and of the way they work.

After an analysis of user travel experience and feelings as well as that of the set of preferences and constraints, such works in particular show strategies implemented by mobility participants on a daily basis to reduce, get around or overcome the constraints weighing on their travel.

When extrinsic constraints (contextual constraints) have an actual impact on mobility potential, intrinsic criteria (feelings) make it possible to understand the emotional attachment to some transport mode, which will be then more often used. Thus, the same travel routine provides a varying pleasure from public transport (rather low) to car, walk or bike (rather high) (Ory, Mokhtarian, Redmond, Salomon, Collantes, Choo, 2004; Anable, Gatersleben, 2005; Turcotte, 2005). Lucas & Heady (2002) showed that even daily commutes to work or education are not necessarily stressful or painful. Meanwhile, sociologists and psychologists (Flamm, 2005; Steg, 2005) made similar observations: routine home to work trips (though derived from destination activity demand) could possess an additional own, intrinsic, *utility*, making it worthwhile to spend time on these trips. In particular, the daily commute travel time was much enhanced by the ICT development, as these technologies made it possible to value travel time as a full activity time (Lyons, Urry, 2005). The course of travel may sometimes provide time savings not grounded on speed enhancements. The idea is indeed that it is possible « to enrich our time uses by valuing transport time » (Crozet, 2011). This statement urged economists to reconsider travel time modelling with multivariate models (Ory, Mokhtarian, 2005; Handy, Weston, Mokhtarian 2005).

In fact, strategically, users would do the maths according to the total travel cost: time cost, money cost, activity cost (outside or during travel), feeling cost (pleasure, comfort, freedom, autonomy, etc.), social cost (belonged group norms), psychological cost or mental workload (stress, tiredness, choking, reliability, safety, etc.) but they would also take into account the likelihood of re-using transport time for other ends (on the train more than on the subway; on the bus more than in a car...) that depends on more or less random travel conditions (comfort, available seats...):

> "[We should] realize that so many people, for so much of their limited discretionary time, choose to spend it not just traveling to activities, but on traveling as an activity. (Mokhtarian, Salomon, 2001)"

Studying the primary utility of travel may require collecting specific data. For example, Mokhtarian & Salomon (2001) describe the results of an attitudinal postal survey sent to residents in three neighbourhoods in the San Francisco area. Richardson (2003) implements an adaptive stated preference experiment in Singapore to identify travellers with a zero value of time, which indicates the existence of some primary utility for the considered trip. However, large periodical travel surveys provide many data, and it is possible to use them to analyse primary utility by adding specific questions. That was done in the last national travel survey 2007-2008 (FNTS) in France.

After a literature review of attempts to identify this primary utility, in particular from specific surveys, the paper will focus on two types of data and analysis. First, a few questions about aspects linked to the primary utility of travel were passed in the last French national travel survey, and their analysis shows the correlation between the primary utility and the pleasantness of the trip, and the distinct role played by activities performed during the trip from the intrinsic utility of the trip itself. Second, from a more sociological perspective, eight dimensions of a trip can be proposed: time constraint, involvement in the course of the trip, routine affect, pleasant experience, sense of people, sense of space, decision timing, and environment use. Then, to reduce the complexity of this analysis, three principal factors will be identified and interpreted. Finally, implications for the design of travel surveys will be made.

2. PRIMARY UTILITY OF TRAVEL IN THE FRENCH NATIONAL TRAVEL SURVEY

2.1. The French national travel survey primary utility of travel inset

For the first time in France, specific questions about the primary utility of travel (PUT) were passed for randomly sorted trips, lasting 10 minutes or more, in the French national travel survey (FNTS) 2007-2008 (Table 1). The sample size is 13,119. This enables to relate this issue to all other questions that are present in the FNTS, many of them being linked in some respect to the PUT (Papon et al, 2008).

In addition, for all trips, a specific purpose "7.77 promenade without precise destination" was available for the first time in the FNTS to describe those trips not aimed at going to any destination.

Table 1: Specific questions in the FNTS on the PUT (for one random weekday or weekend day trip)

VARIABLE	QUESTION	MEASURE
MUACTI	Activity during trip	Yes/no
MUACTIVITE	Which activity	Max 3 answers in list of 10
MUACTIVAUT	Other activity	Open answer
MUINCIDENT	Trip without incident	No/yes
MUQUELINCIDENT	Which incident	Max 3 answers in list of 8
MUQUELINCIDAUT	Other incident	Open answer
MUSENSATION	Trip pleasantness	3 items
MUFATIGUE	Trip tiredness	4 items
MURAISON	Main reason for travelling	3 items:
The only important thing in this trip was to go from one place to another		
The activities during the trip were important for me		
The feelings during the trip were important for me		

One- and two- dimensional statistics of these specific FNTS questions, and cross tabulations with age and gender, trip purpose, and travel mode, are described in (Papon, 2012). Here, all relevant variables in the FNTS will be used to model the answers to some of these specific FNTS questions.

Each of the following PUT variables was explained through a binomial logistic model:

- Purely destination trip (MURAISON=1) (11,981 observations)
- Promenade (trip purpose 7.77) (11,981 observations)
- Performing an activity during the trip (MUACTI=1) (11,981 observations)
- Pleasant trip (MUSENSATION=1) (11,981 observations)
- Unpleasant trip (MUSENSATION=2) (11,981 observations)

The input variables are given in Table 2.

Table 2: Explanatory variables in the models

Household-related variables (hh.)	**Travelling individual-related variables**
Residence zone type (rural, periphery, suburbs, *reference* centre city)	Age group
Land development zone (wide regions "ZEAT", *reference* south-west)	Gender
Neighbourhood habitat type (multi- or *reference* single-family housing)	Handicap
Household type (*reference* single, childless couple, couple with children, single parent family, other)	Social category (*reference* higher)
Household owns dog	Has a job
Household owns car or van	Attends education
Household owns several cars or vans	Very good general health
Household owns bicycle	Health problems for the last six months
Trip-related variables	Obese
Rain during the trip day	Rode public transport*
Trip departure time (morning peak hours, evening peak hours, evening after peak, night, *reference* normal daytime hours)	Travelled on a train*
	Travelled on a plane*
Trip escorted by another person	Left for vacations*
Trip duration (20 to 39, 40 to 79, over 80, *reference* 10 to 19 minutes)	**During last year*
Trip lasting longer than expected (or less long, *reference* as long)	Regularly exercises
Total walking time during the trip: 1 to 5 minutes, 6 minutes and over (*reference* nil)	Walks over 30 min. per day
	Holds driving license
Public transport waiting time 6 min. and over (*reference* less than 5 min)	Regularly drives a car
Unwillingly standing in public transport for at least a part of the ride (*reference* always seated or standing with available seat)	Occasionally drives a car
	Likes driving a car
Trip drive on motorway (car or motorcycle)	Holds motorcycle license
Aggregated main travel mode (walk, bicycle, moped, motorcycle, car as a driver, car as a passenger, *reference* public transport (PT))	Drives a motorcycle
	Likes driving a motorcycle
Used several travel means	Drives a moped
Likes the main travel mode that he/she used (walks over 30 minutes per day proxy for likes walking, likes driving proxy for likes being a car passenger, holds public transport pass proxy for likes public transport)	Likes driving a moped
	Travels by bicycle
	Likes travelling by bicycle
Ordered origin destination trip purpose (work, education, shopping, visits, sport-promenade, *reference* other).	Holds public transport pass or discount card
	Is hindered in his/her trips

2.2. Importance of destination vs. promenades

In the FNTS, trips that are performed for their own sake are identified with the "promenade" trip purpose (less than 3% of described trips). Reversely, trips for which the destination is the only important thing are identified with the variable MURAISON=1, and they were described by 85% of all individuals. The following two models (Tables 3 and 4) explain these variables.

Table 3: Odd ratio confidence intervals bounds at the 95% level of significant effects on the item "The only important thing in this trip was to go from one place to another"

negative effects			positive effects		
trip mode bicycle vs. PT	0.2	0.4	trip standing in public transport	2.0	4.7
trip purpose sport vs. other	0.3	0.4	trip shorter than expected	1.6	3.8
age 0-5 vs. 35-49[1]	0.2	0.6	trip purpose work vs. other	1.5	2.2
trip in morning peak (7-9 a.m.)	0.5	0.7	trip waiting time over 5 min.	1.5	3.2
age over 75 vs. 35-49	0.4	0.7	hh. owns bicycle	1.4	1.8
trip duration 40-79 min.	0.5	0.7	trip mode car driver vs. PT	1.3	2.1
age 65-74 vs. 35-49	0.4	0.7	trip at night (0-7 a.m.)	1.3	2.9
trip duration over 80 min.	0.4	0.7	trip with several transport means	1.3	2.8
trip in evening (7-12 p.m.)	0.5	0.7	holds driving license	1.3	2.0
trip mode moped vs. PT	0.2	0.7	drives a moped	1.2	10.0
obese	0.5	0.7	hh. region west vs. south-west	1.2	1.7
hh. type couple with children vs. single	0.5	0.8	has left for holidays for one year	1.1	1.4
likes travelling by bicycle	0.5	0.8	hh. lives in suburbs vs. centre	1.1	1.5
age 50-64 vs. 35-49	0.6	0.9	trip mode car passenger vs. PT	1.1	1.8
trip purpose shopping vs. other	0.7	0.9	regularly exercises	1.1	1.4
has travelled by train for one year	0.7	0.9	drives a motorcycle	1.1	15.2
trip mode walk vs. PT	0.6	0.9	hh. lives on periphery vs. centre	1.1	1.6
trip with another person	0.7	0.9	likes mode used for that trip	1.1	1.4
hh. region Île-de-France vs. south-west	0.6	0.9	hh. region north vs. south-west	1.1	1.7
likes driving a car	0.7	1.0	holds public transport pass	1.1	1.4
social category independent vs. higher	0.6	1.0	heath problems	1.1	1.5
trip walking time over 5 min.	0.7	1.0	age 11-14 vs. 35-49	1.1	2.1
hh. type other vs. single	0.6	1.0	hh. lives in rural area vs. centre	1.0	1.4
disabled	0.7	1.0	trip purpose education vs. other	1.0	1.5
hh. region east vs. south-west	0.7	1.0	has ridden PT for one year	1.0	1.3
			very good health	1.0	1.3
			walks over 30 min. per day	1.0	1.2

Table 4: Odd ratio confidence intervals bounds at the 95% level of significant effects on the trip purpose being a *promenade without precise destination*

negative effects			positive effects		
hh. owns several cars	0.3	0.6	trip duration 40-79 min.	3.6	8.6
hh. region Ile-de-France vs. S.W.	0.2	0.6	hindered in travel	2.4	7.8
age 15-17 vs. 35-49	0.1	0.7	female	1.8	3.2
hh. owns bicycle	0.4	0.7	trip with another person	1.6	3.0
trip on rainy day	0.4	0.8	trip mode walk vs. PT	1.5	8.8
region Mediterranean vs. south-west	0.3	0.8	trip duration 20-39 min.	1.4	2.7
trip shorter than expected	0.1	0.8	trip duration over 80 min.	1.3	3.9
hh. in multifamily housing area	0.4	0.8	hh.t. couple with children vs. single	1.2	3.5
regularly exercises	0.5	0.9	trip mode moped vs. PT	1.2	35.3
age 11-14 vs.35-49	0.1	1.0	holds motorcycle license	1.2	3.8
hh. region Paris basin vs. south-west	0.4	1.0	travels by bicycle	1.2	3.7
social category lower vs. higher	0.5	1.0	regularly drives a car	1.2	4.8
			hh. owns a dog	1.1	2.1
			trip at night (0-7 a.m.)	1.1	12.3
			trip walking time over 5 min.	1.1	3.3
			hh. lives on the periphery vs. centre	1.0	3.022

[1] Although in theory the sample should not include tripmakers younger than six years old, post-hoc data cleaning activities generated a small number (53) of such cases

Consistently, recreational trips, active travel, and long trips are less often purely destination trips. Surprisingly, so are trips in morning peak hours. Conversely, powered two-wheelers and car trips, as well as uncomfortable public transport trips, are more often purely destination. So are commuting trips, and trips performed by persons not living in centre cities.

2.3. Activities during travel

Table 5: Odd ratio confidence intervals bounds at the 95% level of significant effects on an activity during travel

negative effects			positive effects		
trip mode moped vs. PT	0.00	0.03	age 18-20 vs. 35-49	2.9	4.6
trip mode motorcycle vs. PT	0.1	0.4	age 15-17 vs. 35-49	2.4	4.2
trip mode car driver vs. PT	0.3	0.4	trip with another person	2.1	2.5
trip mode bicycle vs. PT	0.4	0.6	age 6-10 vs. 35-49	1.6	2.6
trip purpose work vs. other	0.5	0.6	trip duration over 80 min.	1.5	2.3
trip mode walk vs. PT	0.4	0.6	has left for holidays for one year	1.4	1.7
hh. region east vs. south-west	0.5	0.7	trip on motorway	1.4	1.8
hh. owns a car	0.6	0.8	hh. type couple with children vs. single	1.4	1.8
hh. region Ile-de-France vs. S.W.	0.6	0.9	hh. type childless couple vs. single	1.3	1.7
age 65-74 vs. 35-49	0.6	0.9	trip walking time over 5 min.	1.3	1.7
trip with several transport means	0.6	0.9	hh. region centre-east vs. south-west	1.2	1.6
hh. owns several cars	0.8	0.9	age 21-24 vs. 35-49	1.2	1.7
has travelled by train for one year	0.8	0.9	hh. region west vs. south-west	1.2	1.5
trip purpose education vs. other	0.7	0.9	trip walking time 1-5 min.	1.2	1.4
social category lower vs. higher	0.8	0.9	hh. lives in suburbs vs. centre	1.1	1.4
age over 75 vs. 35-49	0.6	0.9	social category independent vs. higher	1.1	1.5
regularly exercises	0.8	0.9	has ridden PT for one year	1.1	1.4
heath problems	0.7	0.9	age 25-34 vs. 35-49	1.1	1.4
trip purpose shopping vs. other	0.8	0.9	hh. owns bicycle	1.1	1.4
female	0.8	1.0	trip duration 40-79 min.	1.1	1.5
trip on rainy day	0.8	1.0	hh. region north vs. south-west	1.1	1.5
trip in morning peak hours (7-9 a.m.)	0.8	1.0	walks over 30 min. per day	1.1	1.3
			trip shorter than expected	1.1	1.8
			regularly drives a car	1.1	1.7
			trip in evening peak hours (5-7 p.m.)	1.1	1.3
			has a job	1.1	1.4
			occasionally drives a car	1.1	1.7
			likes driving a moped	1.1	4.5
			holds public transport pass	1.0	1.3
			hh. lives in rural area vs. centre	1.0	1.3
			trip in evening (7-12 p.m.)	1.0	1.3
			has travelled by plane for one year	1.0	1.2
			obese	1.0	1.3

Only 39% of individuals described an activity performed during the selected trip, and for 28% of individuals the activity consisted in chatting with other people. This model (Table 5)

explains the answer MUACTI=1.

Thus, the modes requiring driving a vehicle or being physically active are unfavourable to the performing of an accessory activity during travel. So are commuting trips or a traveller's old age. Reversely, young people, persons travelling with other persons, or long trips favour it, which is rather rational as the first reported activity was to chat with other persons.

2.4. Pleasantness of trip, key driver of travel demand

Nearly 46% of individuals found their trip was pleasant while only less than 4% found it unpleasant. The majority (51%) found it neither pleasant nor unpleasant. Another modelling with two separate binary logit models for pleasant and unpleasant trips is proposed in (Mokhtarian et al, 2012). Here (Table 6 and 7) are the results of two binary logit models, with different variables than the ones in (Mokhtarian et al, 2012), but with consistent results.

Table 6: Odd ratio confidence intervals bounds at the 95% level of significant effects on the trip being pleasant

negative effects			positive effects		
drives a motorcycle	0.1	0.5	trip mode motorcycle vs. PT	3.4	9.1
age 15-17 vs. 35-49	0.3	0.6	follows education course	2.3	3.8
age 18-20 vs. 35-49	0.4	0.6	trip purpose sport vs. other	2.3	3.1
trip purpose work vs. other	0.5	0.6	trip mode bicycle vs. PT	2.1	3.6
trip waiting time over 5 min.	0.4	0.7	age 6-10 vs. 35-49	1.6	2.7
trip standing in public transport	0.5	0.7	trip shorter than expected	1.6	2.7
trip mode car driver vs. PT	0.5	0.8	trip purpose visits vs. other	1.4	1.8
age 21-24 vs. 35-49	0.6	0.8	age 65-74 vs. 35-49	1.4	2.0
hh. region north vs. south-west	0.6	0.8	age 0-5 vs. 35-49[2]	1.4	3.3
social category inactive vs. higher	0.6	0.9	likes driving a motorcycle	1.3	4.7
holds public transport pass	0.7	0.9	trip with another person	1.3	1.5
hh. in multifamily housing area	0.8	0.9	age over 75 vs. 35-49	1.2	1.8
age 25-34 vs. 35-49	0.7	0.9	trip mode walk vs. pt	1.2	1.8
hindered in travel	0.7	0.9	trip duration over 80 min.	1.2	1.9
hh. type couple with children vs. single	0.7	0.9	likes driving a car	1.2	1.5
hh. owns a dog	0.8	1.0	trip duration 20-39 min.	1.2	1.4
has travelled by train for one year	0.8	1.0	trip purpose shopping vs. other	1.2	1.4
age 11-14 vs. 35-49	0.6	1.0	travels by bicycle	1.1	1.5
hh. type childless couple vs. single	0.8	1.0	trip walking time 1-5 min.	1.1	1.3
regularly exercises	0.8	1.0	trip duration 40-79 min.	1.1	1.4
heath problems	0.8	1.0	hh. lives in rural area vs. centre	1.1	1.3
			has ridden public transport for one year	1.1	1.3
			trip in evening (7-12 p.m.)	1.0	1.4
			very good health	1.0	1.2
			trip at night (0-7 a.m.)	1.0	1.4
			hh. owns bicycle	1.0	1.2

Beyond problems that prevent trips from being pleasant, teens and young adults, as well as

[2] Although in theory the sample should not include tripmakers younger than six years old, post-hoc data cleaning activities generated a small number (53) of such cases.

car drivers, enjoy the less their trips. Conversely, motorbike riders, active travellers, persons travelling for non-compulsory purposes, children, seniors, and persons performing a long journey, feel the most their trip as pleasant.

Table 7: Odd ratio confidence intervals bounds at the 95% level of significant effects on the trip being unpleasant

negative effects			positive effects		
hh. type other vs. single	0.1	0.6	*trip mode moped vs. PT*	10.9	83.9
social category independent vs. higher	0.3	0.6	trip mode car driver vs. PT	3.5	10.0
hh. owns a car	0.4	0.7	*trip duration over 80 min.*	2.8	6.2
age over 75 vs. 35-49	0.2	0.7	*trip duration 40-79 min.*	2.2	3.8
social category lower vs. higher	0.5	0.8	*trip mode walk vs. PT*	2.1	5.9
likes mode used for that trip	0.5	0.8	heath problems	1.9	3.3
likes driving a car	0.5	0.9	age 21-24 vs. 35-49	1.9	3.6
trip purpose sport vs. other	0.4	0.9	*holds motorcycle license*	1.7	3.1
hh. owns several cars	0.6	0.9	*occasionally drives a car*	1.6	4.6
age 65-74 vs. 35-49	0.3	0.9	*trip mode car passenger vs. PT*	1.5	4.6
has travelled by plane for one year	0.6	0.9	*trip longer than expected*	1.4	2.6
trip on motorway	0.5	1.0	*hh. region west vs. south-west*	1.3	2.7
social category inactive vs. higher	0.4	1.0	*trip mode bicycle vs. PT*	1.2	5.8
has travelled by train for one year	0.7	1.0	*obese*	1.2	2.2
hh. owns bicycle	0.6	1.0	*has ridden public transport for one year*	1.1	1.7
			travels by bicycle	1.1	2.2
			regularly exercises	1.1	1.6
			age 25-34 vs. 35-49	1.1	1.8
			hindered in travel	1.1	2.4
			hh. region east vs. south-west	1.0	2.3
			trip walking time over 5 min.	1.0	2.0
			region Mediterranean vs. south-west	1.0	2.2

Italicized are variables not having a significant effect on the trip being unpleasant (with opposite sign).

Logically, variables having a positive effect on the trip being pleasant have a negative effect on the trip being unpleasant, and the reverse (such as younger age, and driver mode). But some other variables (italicized in Table 7) have an effect on the trip being unpleasant without having a reverse effect on the trip being pleasant. Bicycle or car passenger travel modes, have a positive effect both on the pleasantness and unpleasantness of the trip, which shows that those trips make people less often unaffected. The same is true for long trips.

3. SOCIOLOGICAL DIMENSIONS OF TRAVEL

> "Whereas the strict view of travel as a derived demand would hold that the destination is always 100% primary, we suggest that the set of all travel for which destination is primary is a fuzzy one. Stated another way, the relative proportions of "primariness" of the travel and the destination constitute a continuum" (Mokhtarian, Salomon, 2001)

The cognitive construct of a continuum is very useful to graphically represent a progressive opposition between two foci. It urges this paper to propose the simultaneous analysis of all trip types, without a priori assuming – as often done before – that an irreducible gap splits trips carried out for their own sake from trips required by some destination activity. If introducing this distinction looks helpful from a sociological point of view, it is yet insufficient. We believe that this axis opposing *directed travel* and *undirected travel* is multifaceted and actually covers eight different axes. Let us understand the multiple possible declensions.

3.1. Time/activity constrained behaviour

The first ambiguity of the continuum linking *directed* and *undirected travel* derives from the fact that it reports some relationship with time while reporting a relationship with the content of activities performed while travelling. To get rid of this ambiguity, we suggest two axes.

- A horizontal axis scales the range of emergency levels. Those trips mainly generated by a *derived demand* are understandably in a rather tense relationship with time. As they are only meant to go to destination activity, they should be as short as possible; conversely, trips with an intrinsic utility are more enjoyed or, anyway, time is not at stakes.

- A vertical axis scales the range of travelling individuals commitment levels in activities performed during the trip, as carrying out an activity is one of the dimensions implicitly retained by the authors to explicit their continuum:

  > "Vigorous physical effort is neither a necessary nor a sufficient condition for an activity to constitute undirected travel, although physical exercise may be one motivation for engaging in such an activity." (Mokhtarian, Salomon, 2001)

The axis bottom locates the focus of trips requiring little commitment in following the travel path and making it mechanically possible to perform a simultaneous activity (reading, chatting, working…). The axis top locates the set of trips demanding a strong individual's commitment in the direction making cognitive activity (managing mode chaining, driving, orientating in space, finding a platform…). It is then impossible to perform any other activity while travelling.

On this behaviour plane, the distinctions introduced by the opposition between *directed travel* and *undirected travel* become more explicit. Travel "as an activity" is clearly displayed bottom left (it is characterized by a flexible relationship with time). It opposes trips "to an activity" top right (they reveal a tense relationship with time needing a strong involvement in the direction making activity).

3.2. Affects of travel

Measuring an individual's affinity or liking for travel is a fundamental first

> step. (…) Obtaining a reliable measurement of travel liking, however, is a non-trivial matter. (Mokhtarian, Salomon, 2001).

If mobility appeal is included in the construction of the *directed* vs. *undirected travel* opposition, it should show, and for that the affect plane is proposed. In fact, the second level of ambiguity between *directed travel* and *undirected travel* derives from the fact that the individual's assessment and experience do take part in the opposition construction:

> "Undirected travel (…) contribute to its positive utility: the sensation of speed, the exposure to the environment and movement through that environment, the ability to control movement in a demanding and skillful way, the enjoyment of scenic beauty or other attractions of a route, not just a destination. It is likely that those same positive aspects of travel apply, to some extend, to ancillary or directed travel as well. (Mokhtarian, Salomon, 2001)"

The proposed examples here relate to two levels of analysis. They obviously underline the role of assessment (positive or negative) in the opposition, but also, implicitly, the role of experience (memorable or routine). For that, the use of a second plane is suggested: the affect plane, with two new axes.

On the vertical axis of *travel assessment,* the qualification of the travel experience is reported as either positive, easy, pleasant, or indifferent, or conversely negative, difficult, unpleasant. On the horizontal axis of *travel experience*, the consideration of the travel experience is reported as either a unique, memorable, unforgettable, even irreversible event, meaning that it induced some change, while other trips are only translations without any impact on the individual's identity: they may get melted in the mass of indistinct routine memory items that are not significant. On the affect plane, the distinctions introduced with the opposition between *directed travel* and *undirected travel* become clearer. Top left the *undirected travel* focus is displayed as a generally rather pleasant and unforgettable experience while routine and burdensome trips logically belong to the *directed travel* focus bottom right. While the former generate socializing (with other people, in particular places), the latter are uninspiring and would be willingly avoided should teleportation be available, which the authors by the way notice:

> "The individual who wants to tour the US by car, or Europe by rail, may selectively teleport himself between some desired destinations, but complete teleportation from spot to spot is unlikely to appeal to those who want a sense of connectivity between locations, linkage to the surrounding geographical and cultural context, and/or enjoyment of a route as well as a destination. This orientation contributes to a preference (...) of ground-based alternatives over air travel (which begins to approach teleportation)". (Mokhtarian, Salomon, 2001)

3.3. Sense of people and places

The third ambiguity level on the continuum linking *directed* and *undirected travel* regards the social and spatial connections that the trip triggers. The examples given by the authors prove the importance of resetting the trip within its social and spatial context:

> "Consider the situation in which, in a dense urban environment, there are a number of franchises of the same 'favorite' restaurant or coffee house. Only one is 'nearest'. Yet an individual may habitually visit more distant ones as well as the closest, not because of an intrinsic greater attractiveness of the more distant franchises, nor even particularly because of a greater attractiveness of the neighborhoods in which the more distant facilities are located, nor because of trip chaining economies, but purely out of a variety-seeking impulse. In this example, a variety-seeking orientation leads to excess travel". (Mokhtarian, Salomon, 2001)

Doing that, the authors implicitly introduce new dimensions that participate in the building of the continuum, with the risk of making this notion fuzzier. What they call "variety-seeking" means the potential interest in given places, or in specific persons (passed by, joined) in an *undirected travel* situation. Conversely, the travelling individual may remain insensitive to these places (felt as impersonal) or to these persons (felt as interchangeable) in a *directed travel* situation. For that, a new plane is built to oppose horizontally the content of the relationship with other people during the trip. The other people can be mainly considered in their impersonal role as given by a corporation (train conductor, toll booth collector, supermarket cashier…) or, on the contrary, be considered in their whole personality and their individual character, which render them not replaceable. The same goes for places. The vertical axis estimates the content of the relationship to space. Is it considered in its singularity, in its uniqueness, and is it passed through for its particular features (which render it irreducible)? Or is the travelled space only a frame without its own value, a *non-place* (Augé, 1992) that may be perfectly substituted by other places, and to which the individual do not attach any particular importance?

There is the third way to grasp the continuum between *directed travel* and *undirected travel.* The examples given by the authors now become much more explicit when this continuum is understood as contrasting the tension between the irreducibility of places and people that is specific to *undirected travel* (top left) and the anonymity of places and people that is specific to *directed travel* (bottom right). Both gaits towards met persons and travelled places relate to two opposed confidence schemes that are widely debated in sociology (Simmel, 1991; Giddens, 1994; Luhman, 2001). Some trips mean the will to ground (spatially) anchored and (personally) embodied confidence relationship. Other trips derive from the modern life need to ground confidence into "expert systems" that cannot be controlled or checked at all on one's own (franchised stores, the plane maintenance procedure of an air carrier, the banking system…).

3.4. Decision timing and environment exploitation process

Finally, the examples given by the authors introduce a fourth level of ambiguity. By means of the continuum between *directed* and *undirected travel,* they make an attempt to report the genesis of travel behaviour. They for instance say that mobility is sometimes the output of some utility at destination, but also sometimes of some disutility of immobility.

> "Consider for example, the choice to eat out instead of eating at home, even though ample food is available at home. In some cases, eating out may be preferred because a certain type of food or a certain neighborhood or a certain ambiance is actively desired. In these situations, the decision to eat out and the destination may be chosen simultaneously, and the utility of a particular destination combination (the net of the positive attractiveness of the destination and the putatively negative utility of travel) exceeds the utility of the home alternative (the net of a lower attractiveness plus zero travel). In other cases, the disutility of cooking and cleaning up is the primary motivation for going out to eat, and the destination may be a secondary choice. (…) Many other such examples are possible, in which the decision to travel is made first, and the destination/activity is invented to support that decision and yes, increase its utility. (Mokhtarian, Salomon, 2001)"

By doing that, the authors implicitly introduce the role played by the chronology of the individual's trade-offs, and by his/her environment that he/she masters only to some extent. These data are new variables potentially participating in the construction of the founding continuum between *directed* and *undirected travel,* which is the opportunity to produce a fourth plane mitigating the ambiguity by bringing in a last point regarding this tension.

When most models assume the simultaneous occurrence of the intent to act and of the choice to travel (general case in *directed travel*), it may happen that the choice to travel be made prior to the intent to act (when the eye is sensitive to an unexpected *affordance* (Gibson, 1979) located on the individual's path) or that, conversely, the intent to act be made prior to the destination choice (when a need is felt while opportunities are expected in the course of travel to meet it). Here are introduced the notions of unexpectedness (to the right of this horizontal axis), and uncertainty (to the left of this axis), that are both fostered, searched for, and welcomed when the trip belongs to *undirected travel,* and that are both avoided and feared when stuck to *directed travel.* Besides, the environment may provide a resource, or dictate a constraint; according to that, the travel situation can be located on the vertical axis. As *directed travel* should not be impeded by space, the environment soon becomes a constraint. Conversely, environment is more often associated with a resource when *undirected travel* occurs, as it implies some opening to opportunities.

The four proposed planes (built from eight dimensions contrasting sixteen foci) are as many facets of the same reality. They are as many ways to consider the continuum linking *directed* and *undirected travel* in order to understand its profusion notwithstanding its relative multiple meanings. The present additional model (Table 8) appears necessary not to reduce it to one

simple ambiguous axis.

Table 8. Trip modelling on four planes

Planes	**Axes**	**Focus of high primary utility trips *(undirected travel)***	**Focus of destination derived demand trips (*directed travel)***
BEHAVIOUR PLANE	**Emergency level**	Take time	Tense relationship with time
	Level of commitment in path	Weak involvement giving way to accessory activities	Strong involvement leaving little room for another activity
AFFECT PLANE	**Trip assessment**	Pleasant, easy or positive	Unpleasant, difficult or negative
	Trip experience	Memorable, unforgettable and with sometimes irreversible consequences	Routine, without implications, melted in the memory mass
SOCIO-SPATIAL CONNECTION PLANE	**Sense of people**	The other person is unique and not replaceable	The other person is playing an impersonal role
	Sense of place	Space is singular (irreducible)	Space is plural (interchangeable)
EVENT PLANE	**Decision timing**	Travel choice before (or after) activity intent	Simultaneous activity intent and travel choice
	Environment status	Environment as resource	Environment as constraint

4. THREE FACTORS SHAPING TRAVEL

4.1. Principal component analysis of sociological dimensions

Twenty travel situations were selected to be suggestive and ordinary examples of the daily life. They were chosen to be as varied as possible in terms of the aforementioned sociological dimensions, but they are not of course representative of all trips performed in France. They were plotted on each of the four planes described in Table 8. These situations are ranked in Table 9 according to their level of *directedness*.

Table 9. 20 travel example situations

Rank	Example
1	Go and drop a check in a bank agency
2	Be late for an appointment and stamp out of impatience on a subway train
3	Travel and stay overnight in a franchised hotel on the roadside not to enter the city
4	Sit at the wheel for the first time with the fascination of a child allowed to play with a new toy
5	Out of fear, follow a longer route not to go through a neighbourhood where a threatening encounter was experienced in the past
6	Be late in work tasks and take benefit of a train journey to catch up
7	After a near run over, prefer ped crossings even though it implies extra walking
8	Think to stop at a chemist's when travelling by
9	Decide to stop on motorway rest area to take benefit of the "Alps view" as displayed on a road sign one mile before
10	At noon, be hungry and go for lunch in town without knowing beforehand where and what
11	Choose to stay overnight in a guest house
12	Choose another route because it is a recommended tourist route
13	As vacations get close, feel the need for holidays, rest, and disconnection; want to leave, anywhere, but leave… and spend most of the travel time sleeping
14	Train for exercise (such as jogging)
15	Sign for an athletics competition
16	Search for one's child, after he got lost among supermarket shelves
17	Walk one's dog and meet one's neighbour
18	Wander around workplace and smoke a cigarette
19	Go for a walk with one's beloved person
20	Among fellow football supporters, let one's joy burst after a victorious match

These twenty travel situations are meant to illustrate the eight sociological dimensions. To get a simpler description of this eight-dimension universe, a principal component analysis is performed with those twenty situations, using their coordinates on the eight axes, and adding the rank as a ninth dimension. As this principal component analysis is not performed on empirical data, the results should not be considered as statistical results, but as a way of reducing the conceptual framework of sociological dimensions to get a more workable universe. The results are given in Table 10. The first three factors explain 70% of the total variance, with the fourth factor below 10%. Even if all sociological dimensions deserve to be considered, most of the interpretation can be put on only those three factors, summing up more than half of the variety of all axes but two.

Table 10. Contribution of sociological dimensions to first three principal component factors, and variance explained by each factor

	Factor1	Factor2	Factor3	*Final communality estimates*
Rank	0.75	-0.36	0.15	*0.72*
Time constraint	-0.71	-0.29	0.40	*0.75*
Activity constraint	-0.31	-0.53	-0.31	*0.47*
Routine	-0.29	0.32	0.79	*0.81*
Pleasantness	0.86	0.37	0.19	*0.91*
Sense of people	0.42	-0.71	-0.10	*0.69*
Sense of place	0.37	-0.48	0.05	*0.37*
Unexpectedness	-0.39	0.53	-0.61	*0.80*
Environment resource	0.71	0.51	-0.10	*0.77*
Variance Explained	*2.95*	*2.02*	*1.33*	*Total = 6.30*

4.2. First factor: why are you going?

The first factor is positively correlated with situation rank (undirected travel), trip pleasantness, and environment resource utilization, and negatively correlated with time constraint. It contrasts trips purely aimed at going to the destination to pure promenades. It mainly expresses the original notion of travel undirectedness, as developed by Mokhtarian and Salomon (2001). It is consistent with the analysis of the FNTS showing the correlation between undirected travel and the pleasantness of the trip. It shows in fact the main motivation of the trip: the first factor is low for trips aimed at going to the destination, and high for trips performed for their own sake. It answers to the question: why are you going?

4.3. Second factor: what are you doing?

The second factor is negatively correlated with the sense of people, and activity constraint, and positively correlated with destination unexpectedness, and environment resource utilization. It opposes trips where the traveller is fully busy with performing the trip, not paying attention to other people, to trips where his/her mind is free to engage into other activities and socialize. It is low for trips where conducting the travel to destination is the main task, and high for trips where other activities and concerns can take place during the journey. It indeed concerns travel time use. It relates to the question: what are you doing?

4.4. Third factor: when are you choosing?

The third factor is positively correlated with the trip routine affect, and negatively correlated with destination unexpectedness. It concerns the planning of the trip and the timing of the intent of travelling and acting at destination, and is stated in the question: when are you choosing?

The outcome of this analysis is that very different concepts were identified, either the eight sociological dimensions, or their reduction into three principal factors. But no single axis can contain all this information firstly developed as a directed/undirected continuum.

5. IMPLICATIONS FOR TRAVEL SURVEY DESIGN

While the first two factors have been already included in some surveys, the intent is still lacking proper investigation. But the understanding of all three factors implies the rethinking of travel survey objectives and their redesigning to include the actual drivers of travel demand. Travel surveys should not only be aimed at providing quantitative data to feed traffic models, but should widen at the development of comprehensive conceptual travel behaviour frameworks.

How is it possible to face the limits of conventional quantitative survey protocols such as household travel surveys when it should be necessary, to understand the drivers of travel, to collect less concrete data than the sole trip destination *purpose*? This paper is based on the cognitive construct of the continuum that makes it possible to dispute the frank break between contrary foci, as proposed by Mokhtarian & Salomon in order to set a better concept of travel behaviour patterns between *directed* and *undirected travel.* Meanwhile, the relative multiple meaning of these notions was underlined as well as the confusion risk they trigger. From there, it seemed useful to break down the *continuum* idea so as to build a four-plane eight-axis model. This makes it possible to better grasp the multiple meanings included in the *directed - undirected travel* opposition. Each plane is another facet of the same reality. Each plane displays one of the four « determinants » that build this opposition: the trip *goal*, the trip *shape*, the trip *confidence* content, and the trip *course*.

We suggest to better take into account travel *experience*, multiple *purposes*, the popping of *intent* in the course of travel, or of a random event along the path. This could consist in relating the understanding of travel behaviour to the trip genesis context when the *situation* demands it.

Surveyors should be trained and briefed about the existence of *trips* with *intrinsic* utility.

When a surveyor detects that a *travel situation* tends to become *undirected,* some distance is necessary to grasp its specificity, even if it means getting away from the questionnaire. The surveyor would then open more or less directive brackets within the structured survey instrument.

To record such a *situation* that may explain entirely or partly the trip decision, it is necessary to hire surveyors with high semi-structured interview skills. Their professional standards must be improved to guarantee that the necessary interview techniques (empathy) are mastered when a shift of the interview into the comprehensive mode is required.

Obviously, such an evolution would contradict some economic realities (surveyor wages should be dependent on the time spent and no longer on the number of filled questionnaires), as well as some methodological caveats from the Certu standard (2008) (no longer restrict one surveyor's output to fifteen households per week). However, if improving professional standards becomes possible, consultants will reduce the high surveyor turnover and the exhausting energy they presently dedicate to their training.

Now, the goal of survey protocols – such as household travel surveys – is to report observable travel patterns, but not really to provide the means to understand or explain them, which weakens the analysis. If such a goal is given in the future to some protocol, it will be necessary to record less objective parameters that are more complicated to collect. The proposed planes provide a first glance at possible investigation directions. When the trip utility obviously lies less in the destination activity than in the travel fact itself, the surveyor should estimate eight parameters:

- To what extent is the travelling individual tied in a particular relationship with time (take one's time, hurry up, getting impatient…)?
- To what extent does he/she get involved in some other activity than "following a path"?
- To what extent does the trip trigger a positive or negative assessment?
- To what extent is the trip considered as routine or memorable?
- To what extent is the other person considered in his/her impersonal role or in his/her uniqueness?
- To what extent are places considered in their plurality or in their irreducible particularity?
- To what extent does environment interfere in the trip?
- To what extent is the trip generated by the simultaneous occurrence of the intent to act and the destination choice, or are both decisions dissociated in time?

Among the tools that would be needed, we urge for a non-complete (but revealing) list of example *situations* for which the opening of a comprehensive semi-structured bracket is required. Among the studies that would be needed, we suggest that a qualitative survey using semi-structured interviews immediately re-questioning the present quantitative survey respondents would make it possible to estimate, by comparing results, the present risk of over-interpreting the observed travel patterns.

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