

# THE TRIGGERS OF BEHAVIOUR CHANGE AND IMPLICATIONS FOR TDM TARGETING: FINDINGS OF A RETROSPECTIVE COMMUTER TRAVEL SURVEY IN CAPE TOWN

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## ABSTRACT

This paper will discuss the findings of a retrospective travel survey with respect to what triggers change in commuter travel behaviour. The survey was conducted in Cape Town during August 2006, as part of a project commissioned by the Department of Transport to develop a strategic framework to guide the implementation of Travel Demand Management (TDM) strategies in South African cities. Data were collected in four residential areas (Wynberg/Plumstead, Steenberg/Seawinds/Coniston Park, Gugulethu, Mandalay/Mont Claire) in which a large portion of households fall within the R3,000-R6,000 income band, observed in other data sources as strategic from a car ownership and mode switching perspective. The paper will identify the different elements of a commuting trip decision as origin, destination, mode and departure time and then discuss the findings of the survey with respect to what events or shocks triggered a deliberate (or 'preference-based') – as opposed to habitual (or 'scripted-based') – reconsideration of usual behaviour for each of these trip elements. Events or shocks triggering deliberate reconsideration that led to both change and no change will be analysed. The paper will conclude with a discussion on the implications of these findings for the strategic targeting of TDM measures at people more susceptible to changing particular aspects of behaviour than others, and how triggers might be deliberately introduced through TDM intervention.

## 1. INTRODUCTION

The contribution of transport to energy consumption, pollution and climate change has been known for many years, as has the call for Transport Demand Management (TDM). However, almost all applications of TDM have been small in scale and to a large extent ineffective in terms of the scale of the problem, with a few notable exceptions such as the congestion pricing schemes in Singapore and London.

It is probable that changing driver behaviour is not easy, and that the reason for the failure of many TDM strategies and techniques is to be found in their being rooted in the assumptions used in the conventional four step transportation planning (TP) models, rather than on an understanding of the process of achieving change in travel behaviour.

This paper briefly outlines some recent literature that begins to identify the factors that trigger changes in travel behaviour and the findings of a study done in Cape Town to

identify the triggers, the circumstances of these triggers and the frequency that changes are considered and made.

## 2. LITERATURE REVIEW

Recent literature suggests that TDM cannot be modelled using the conventional aggregate four step models because TDM is about changing an individual's behaviour that has developed over a long period of time, constrained by the prevailing circumstances (some of which do not pertain to the transport system). Possibly even more important is the fact that the travel pattern has become habitual and therefore there is inertia to change, whereas TP models suggest that any change in transport circumstances will result in a change in behaviour (albeit at the aggregate level).

The fundamental concept behind TP models is the concept of utility maximisation; i.e. a traveller will identify alternatives, assess these and select the one that best meets his / her goals. In modelling, the estimation of travel behaviour is based on estimating the utility ascribed to values of a limited set of attributes (attributes and structure of the model selected by the modeller) that is derived through the calibration process. While the modelling procedure can be technically very complex, its conceptual structure is quite simplistic.

A number of authors have attempted to identify other approaches to modelling travel behaviour (e.g. Aarts *et al* 1997, Fujii and Gärling 2003, Gärling and Axhausen 2003, Møller 2001, Verplanken *et al* 1997).

The main criticisms of adopting a utility maximisation approach to travel behaviour are:

- The information is limited or incomplete.
- Individuals have a limited ability to determine the real utility of alternatives.
- Decisions might not be based on maximising utility, but on other decision making strategy; e.g. satisficing (Ortuzar and Willumsen, 2002)
- A decision maker might not even try to examine all alternatives, preferring to choose an acceptable alternative that involves the least effort to identify (Zipf 1949) or to implement.

The last mentioned concept is extended further by Gärling *et al* (2005) to suggest that people respond to changing circumstances if a discrepancy exists between their own goals and what they are currently experiencing. In responding to this need to change, people follow a sequential cost minimising approach in which they first try the change that incurs the least cost (in terms of money, mental or planning energy). A more costly change is tested only if the behaviour does not satisfy the goals.

The focus of this research is on the triggers that prompt the traveller to consider the need to change and those that result in a change.

Van der Waarden and Timmermans (2005) found that the factors that prompted change in mode choice could be grouped into "key events" (e.g. major events in a person's life) and "critical incidents" (events that changed a person's attitude). They found the most important personal events impacting on change to be changes in mode availability (e.g. getting a driver's license or a bicycle), changes in work location, having children, and changes in daily activity patterns. Being involved in accidents or feeling unsafe were found to have a surprisingly small impact on mode switching. In fact attributes of the modes and the

transport system at large appear less important, leading the authors to conclude that, once forced by key events to re-evaluate mode choice, users are reluctant to change their behaviour.

Verhoeven et al. (2005) measured the occurrence of seven different key events in respondents' lives (namely change in residential location, change in household composition, change in work location, change in study location, change in car availability, change in availability of public transport pass, and change in household income) on mode choice. Arentze et al 2004 found that socio-economic variables affect the types of adaptations or behavioural changes people are willing to consider in response to TDM interventions. Typical variables include gender, age, education level, employment status, the presence of children in the household, marital status, and auto ownership. Harms (2003) had found that some of these variables are slow-changing.

Furthermore, increasing complexity of the activity pattern of a household prompts a rethink of the travel patterns and sometimes a change. Gärling (2005) suggests that the more complex the pattern becomes the greater is the demand for door-to-door speed; which can in turn produce an increase in demand to use the car.

This discussion of the literature leads to the conclusion that changes in travel patterns might be prompted more by changes in household characteristics than changes in the transport system, which are the usual domain of TDM interventions.

### **3. SURVEY METHOD**

The study on which this paper is based had six objectives; namely:

- To determine the factors that trigger change in any of the six aspects of travel behaviour (home location, work place, mode to work (including lift clubs), departure time, and route choice in the case of car drivers).
- To determine which types of passenger are most likely to experience which trigger.
- To determine the frequency of the triggers.
- To determine circumstances when travellers respond to the triggers.
- To determine the conditions that lead to changed travel pattern.
- To determine the conditions that lead to continued change in travel pattern, i.e. breaking the travel habit.

The data were collected using a retrospective survey in which respondents were asked to recall when last they had considered changing or had changed any of the abovementioned aspects of their usual travel pattern.

The sample of 250 households was selected on the basis that the monthly household income was between R3000 and R6000 (the income range below which households have a low car ownership and above which they have a high car ownership (NHTS, 2003)). The respondents were selected from three areas in Cape Town as follows:

- Wynberg/Plumstead (83 surveys) in an area bounded by York/Brentwood Roads, Prince George Drive, Southfield Rd and the railway line
- Steenberg (83 surveys) in the four quadrants around the intersection of Military Road and Prince George Drive (Steenberg; Area bounded by Allenby Drive, Symphony Way, Prince George Drive and Military Road; Seawinds: Area East as far as Spoonbill Crescent and Coniston Park to the south west

- Gugulethu (84 surveys) in the area bounded by NY78, Terminus Road, Ananwabisi Street and Koornhof (30 surveys) and in Mandalay / Mont Claire (54 surveys)

In each of the selected households, one worker aged 18 to 65 who regularly travelled to work, was interviewed. Interviewers used a Politz grid to ensure that the both genders and all age groups would be represented among the respondents.

#### 4. FINDINGS OF THE STUDY

This paper is limited to a discussion of the triggers that prompt the consideration of change and the change itself. (For a discussion of the frequency of the triggers see Behrens et al, 2007)

##### 4.1 Triggers that prompt reconsideration and/or change of usual commute behaviour

The survey asked respondents to report what prompted them to think about, change or not change any of the following commute components:

- Home location
- Work place
- Mode
- Departure time

The data collected for route choice to a large extent mirrored that for home and work location and is not discussed further in this paper. This implies that respondents did not reflect the more local changes in route such as rat running. The number of respondents reporting on lift clubs was limited and an in-depth discussion is not possible.

##### 4.1.1 Changing home address

Table 1 shows the types of triggers that prompt a household to change location. From this it can be seen that *events in the family life cycle* significantly affect changes in home location. These events include *leaving home, getting married and increasing household size*. The other aspect that affects a change in the home location is the *need to improve the house and the living environment*.

**Table 1: Triggers prompting change in home location**

	Changed	
	TOTAL	Percent
Family life cycle events	57	40.4
Improve conditions related to home	57	40.4
Transport related	19	13.5
Other	8	5.7
TOTAL	141	100.0

The triggers that were reported to trigger changing home address can be grouped into family life cycle related and non-family life cycle related. Three triggers that relate to the family's life cycle that together account for over 50 percent of the responses are *got married* (19,4%); *changed household size* (17,3%) and *bought first house* (15,1%). Two other relevant life cycle triggers are *moved out of home* and *increased income*.

The non-family life cycle triggers include to live in a better area (16,5%), to be near to public transport (5,8%) and to be closer to work (5,8%)

The following triggers were reported most frequently among specific groups of respondents:

- *Getting married*; by almost all respondent groups.
- *Changed household size*; by those in the younger and older age groups and those in the higher and lower incomes
- *Bought first house* by 'Coloured' respondents.

#### 4.1.2 Changing work place

Table 2 shows the types of triggers that prompt the respondent to consider changing work place as well as those that actually resulted in a change. From this, it can be seen that thinking about changing work place is generally prompted by a desire *to improve one's career*, while *decisions taken by the employer* also play a major role in actual changes in work place.

**Table 2: Triggers prompting a change in work place**

	Considered changing		Changed	
	TOTAL	Percent	TOTAL	Percent
Career improvement	175	70.3	118	68.2
Company related	44	17.7	42	24.3
Transport related	19	7.6	6	3.5
Other	11	4.4	7	4.0
TOTAL	249	100.0	173	100.0

As expected the most common triggers reported for changing the workplace were *started a new job* (59,5%) and *offices relocated* (16,8%). One could argue that *started a new job* could also include some of the other reasons given such as *career change*, *better salary*, etc.

#### 4.1.3 Changing modes

Table 3 summarises the responses from the respondents who changed modes and considered changing modes.

**Table 3: Triggers prompting a change in mode**

	Considered changing		Changed	
	TOTAL	Percent	TOTAL	Percent
Change in transport context.	32	14.3	32	26.9
Transport mode advantage: Cost	34	15.2	12	10.1
Transport mode advantage: Travel time	15	6.7	4	3.4
Transport mode advantage: Convenience/"better"	81	36.2	41	34.5
Transport mode advantage: Safety	30	13.4	10	8.4
Transport mode advantage: "Captive"	15	6.7	12	10.1
Family life cycle	2	0.9	2	1.7
Other	15	6.7	6	5.0
TOTAL	224	100.0	119	100.0

From this table it can be seen that the thought that another *mode was better* (e.g. *train more convenient*, *more convenient by bus*; *transport context*, *transport cost and transport safety*) was the trigger type that prompted reconsidering a change in mode most often. However changes were prompted by this and by the changes in the transport context (e.g. *changed jobs*, *working far from home*, *work transport stopped*) and *transport cost and transport safety*.

The triggers reported most frequently by the respondents for changing mode to work can be grouped together as follows (frequency and percentage frequency given in brackets):

- Family cycle related: *got married, changed job or home* (25; 21%)
- Car related: - *gained or lost the use of a car* (15; 13%)
- *Distance between home and work* (7; 6%)
- *Convenience and availability of transport* (38; 32%)
- Transport aspects: *cost, safety and travel time* (26; 22%)
- Other (8; 7%)

These trigger groups were reported most frequently by the following users:

- Of the family related triggers, *changed jobs* had the greatest impact on mode change.
- Of the car related triggers; *gained the use of a car* affected those in the higher income group.
- Of the convenience triggers; *convenience* (unspecified) was by far the most reported trigger and could be taken to refer primarily to those that had access to a vehicle.
- Of the transport aspects; *cost* was a major issue among those with the lowest income.

The main triggers prompting respondents to think about changing mode to work were transport related; i.e. *to be less expensive* and *more convenient*. The *safety of trains* was reported as a trigger by respondents earning between R5001 and R6000/month, by females, and by those between 35 and 44 years of age.

The major mode changes in terms of the different respondent categories were found to be:

- Between 10 and 20% of the respondents from each category changed from train; except for respondents from Seawinds, Mandalay/Montclair; those younger than 25 and those earning between R3001 and R4000 /month.
- The change from train to car was highest among respondents in the predominantly non-Black residential areas, those who had access to a vehicle and those that earned more than R5000/month.
- The percentage changing from train to car passenger was always less than 10% of the respondents in each category; with the largest percentage coming from respondents in the R4001 to R5000/month income category.
- The percentage of respondents reporting changes from train to bus was equally small.
- The percentage of respondents reporting a change from minibus was largest among respondents from Steenberg and among those with more than one car.
- The percentage of respondents changing from car and bus was also relatively small.

The triggers that were reported by respondents for making changes between modes were grouped as follows:

- Of the family cycle trigger type; *changed job* prompted the change from train and *changed home* prompted the change from bus and minibus.
- Of the car related trigger type; “*have car*” prompted the change to car use and “*lost car*” prompted the change from car use.
- More convenience was a major factor in all mode change.
- Of the transport related triggers, “*safety*” was the main reason to change from train and “*less expensive*” was the reason given for the change from all modes.

#### 4.1.4 Churn in mode change

Table 4 shows the changes between modes reported by respondents during their working lives. From this it can be seen that the following mode changes were reported by the respondents:

- 63% of respondents did not change their mode to work during their working life.
- The percentage of car drivers increased from 20,8 % to 29,6 %.
- The percentage of train passengers decreased from 41,2% to 35,2% percent.
- The percentage of bus and minibus passengers increased from 5,6% to 6,4% and from 16,0% to 19,2% respectively.

What is interesting to note is that while private transport attracted 43 respondents from public transport, it also lost 15 respondents to public transport. This provides evidence that the change in mode is not occurring only in one direction, even if it did result in a net change in favour of the private vehicle.

**Table 4: Changes in transport mode**

		AFTER						TOTAL BEFORE	% modal split
		Car driver	Car Pass	Train	Bus	Minibus	Other		
BEFORE	Car driver	42	1	4		5		52	20.8
	Car Pass		10	3	1		1	15	6.0
	Train	26	6	63	4	2	2	103	41.2
	Bus	2	1	5	7	1		16	6.4
	Minibus	4	2	9	2	29	2	48	19.2
	Other		2	4		3	7	16	6.4
TOTAL AFTER		74	22	88	14	40	12	250	100
%modal split		29.6	8.8	35.2	5.6	16.0	4.8	100	

#### 4.1.5 Changing departure time

Table 5 summarises the triggers given why respondents considered changing their departure time and why these prompted them to actually change. From this it is apparent that the most common trigger types for reconsidering the departure time are *to improve punctuality* (e.g. *traffic congestion, to be on time*), *change in home to work conditions* (e.g. *change home address, change jobs*) and other (mostly to related to *a preference to sleep later*). However, the trigger that prompted the most actual changes in departure time was that *the home to work conditions had changed*.

**Table 5: Triggers prompting changes in departure time**

	Considered changing		Changed	
	TOTAL	Percent	TOTAL	Percent
To be punctual/save travel time	37	28.5	12	16.2
Home to work conditions changed	35	26.9	35	47.3
Work conditions changed	12	9.2	12	16.2
Mode changed	5	3.8	5	6.8
Life cycle change	3	2.3	3	4.1
Other	38	29.2	7	9.5
TOTAL	130	100.0	74	100.0

The most frequently reported triggers that prompted respondents to change their departure time to work were:

- The respondent had changed his/her job.
- Changing family life cycle triggers were reported by respondents earning between R4001 and R500/month and in the age groups between 35 to 44 and 45 to 54 years of age, as having prompted changes in departure time.
- Changes in home and work places were also reported as triggers for changing departure time, as were changes in work conditions (either shift work or more flexible conditions).

The triggers reported by respondents for thinking about changing their departure time were:

- To be on time for work; be this either to be early, to allow for congestion, or to allow for the unreliability of public transport.
- To sleep a little later.
- Safety was given as a reason; mainly by 'Black' male respondents.

#### 4.1.6 Changing membership of a lift club

Only 17 respondents reported having stopped being part of a lift club. The most frequently reported reason for stopping participation in a lift club was that they had *changed their jobs* (7). Other reasons included that *other drivers were unreliable* (3), *other drivers stopped participating in the lift club* (2) and other (5):

Twenty-one respondents reported that they had considered joining a lift club. The most frequently given reason was that *it could be more economical* (11). Other reasons included *convenience* (3), *safety* (1) and other (6).

#### 4.2 Reasons reported for not changing travel behaviour

The reasons given by respondents most frequently for not changing their travel behaviour were as follows.

- They chose not to change mode because they *did not have the financial resources* to do so.
- They chose not to change departure time because they felt that *it could affect them getting to work on time; they had things to do at work that did not permit them to change; they decided that there was no need to change; they preferred the convenience which they presently enjoyed or they (a few) needed to have time with their children.*
- The reason given for not joining a lift club was that there was *no other person in the area with whom to form a lift club.* (Very small sample.)

### 5. DISCUSSION

In developing a TDM strategy it is necessary to examine the types of triggers that have prompted change in the past, as these provide the best possibility for success.

Table 6 groups the triggers described in the preceding sections into "family life-cycle", "work", "transport" and "other" categories.

From this it can be seen that transport related triggers account for a significant number of triggers only in the case of modal choice. Otherwise, family life-cycle and work related triggers are the most relevant. This implies that targeting TDM measures to take advantage of or mitigate family life cycle and work related changes is essential to improve the impact of TDM interventions.



**Table 6: Changes in travel behaviour, reported frequency and trigger type**

RESPONSES	Total	Family	Work	Transport	Other
Home address	141	57		19	57 (1)
Work place	173	118*	42	6	7
Mode	119	2		79	38 (2)
Departure time	74	3	59	5	

(1) Improve housing conditions

(2) Change in transport context

\* Career improvement included

Table 7 lists the most significant triggers that were reported to either change travel behaviour or prompt the consideration to change travel behaviour. The relevance of non-transport related triggers to change and possible change in travel behaviour is obvious from this table.

**Table 7: Significant triggers to change or consider change in travel behaviour**

Transport element	Change	Consider change
Home location	Got married Changed household size Bought first home Sought a better area	(Not asked)
Work place	Started new job Work place relocated	Career improvement Company related
Travel mode	Got married Changed home location Gained or lost a car More convenient Cost (among low income)	More convenient Less costly Change in transport context Safety issues
Departure time	Change in home - work circumstances Punctuality Work circumstances changed	Change in home - work circumstances Punctuality

The reported frequency of the triggers shown above cannot be taken as the only measure of potential effectiveness. The time frequency of the reported changes must also be considered and these are shown in Table 8.

**Table 8: Frequency of changes in travel behaviour by and trigger type (years)**

YEARS	Average	Family	Work	Transport	Other
Home address	17.1	15.2		9.5	22.1 (1)
Work place	11.6	11.9*	11.6	7.9	
Mode	10.0	1.7		10.6	9.1 (2)
Departure time	7.8	6.5	7.8	9.3	

(1) Improve housing conditions

(2) Change in transport context

(2) Change in transport context

This table shows that the frequency of change of aspects of the travel pattern is of the order of between 8 and 17 years; with a change in home address occurring on average every 17 years, of work place every 12 years and mode every 10 years and departure time every 8 years.

## 6. CONCLUSIONS

The literature suggests that travel behaviour is habitual and therefore the success of a TDM intervention is dependent on it being able to break that habit. Estimating the effect of TDM measures is not simple since it would need to take into account the inertia inherent in breaking habitual behaviour and also be able to estimate the time taken for change to occur. Traditional transport models are unable to do this. Since, currently, decisions to implement TDM measures would (at best) be based on the benefits forecast using traditional transportation models, it is unlikely that the estimated benefits actually materialise. Hence, the literature is poor on successful major TDM projects, except for schemes such as the Singapore and London road pricing schemes. The literature also suggests that changes in travel patterns and consideration to change travel patterns are more frequently due to changes in non-transport related factors (e.g. change in family and work circumstances) rather than to changes in transport related factors (e.g. cost, travel time).

In 2006, workers aged between 18 and 65 who regularly travelled to work were interviewed from each of 250 households in three areas of Cape Town. The areas were selected because they had predominantly households with monthly incomes of between R3001 and R6000 and because they had access to public transport systems.

In the retrospective survey, respondents were asked when last they had changed or considered changing each of six aspects of their commute trip and what had prompted them to change or consider making a change.

The study found that the majority of triggers prompting change or considering change were not transport related. It also found that the frequency of these changes was in the range of 7 to 18 years (Behrens et al 2007). The most significant non-transport related triggers were getting married, changing household size, buying a first house, moving to a better area and choosing a better job. These resulted in changes in the home to work context which in turn affect mode choice and departure time. Changes in these triggers were also reported to change mode choice and departure time.

It therefore appears to be appropriate to argue that if changes in non-transport factors are frequently found to produce changes in travel choice and consideration of changing travel habits, then the choice and implementation of TDM interventions should be aimed at these events and triggers to be more effective. Accepting that commuters reassess their travel habit when they say change their job, means that this is an opportunity when the commuter could be advised about alternative transport solutions that meet the transport objectives of the region (e.g. discounted or free public transport vouchers for a period of say one to three months or a household that has had a recent addition to the family is made more aware of the advantages (to the household) of locations that meet TDM objectives best so that when or if he/she looks for another house he/she will also consider locations desirable from a transport point of view).

These simple examples begin to show how TDM measures can and need to be better selected, targeted and implemented.

More importantly, the research shows the need for alternative modelling techniques to be developed to be able to estimate the benefits of TDM interventions and the rate at which they change travel habits. These techniques need to include the non-transport related triggers that prompt change, the frequency of the occurrence of these triggers, and the probability of the travel habit being changed.

## 7. REFERENCES

- [1] Aarts H, Verplanken B and van Knippenberg A, 1997: Habit and information use in travel mode choices, *Acta Psychologica*, Vol 96, ppl-14.
- [2] Arentze, T., Hofman, F., Timmermans, H., 2004. Predicting multi-faceted activity-travel adjustment strategies in response to possible congestion pricing scenarios using an Internet-based stated adaptation experiment. *Transport Policy* 11 (1), 31–41.
- [3] Behrens R, Del Mistro R, Lombard M , Venter C. 2007. *The pace of behaviour change and implications for TDM response lags and monitoring: Findings of a retrospective commuter travel survey in Cape Town*. 26<sup>th</sup> Southern African Transport Conference: 2010: The Challenges of Implementing Policy, Pretoria
- [4] Department of Transport (NDOT 2003) National Household Travel Survey. NDOT, Pretoria
- [5] Fujii S and Gärling T, 2003: Development of script-based travel mode choice after forced change, *Transportation Research Part F*, Vol6, pp117–124.
- [6] Gärling T and Axhausen K, 2003: Introduction: Habitual travel choice, Special Issue: Habitual travel choice, *Transportation*, Vol 30, No 1, February.
- [7] Gärling T, Eek D, Loukopoulous P, Fujii S, Johansson-Stenman, Kitamura R, Pendyala R and Vilhelmson B, 2002. A conceptual analysis of the impact of travel demand management in private car use, *Transport Policy*, Vol 9, pp59-70.
- [8] Gärling, T., 2005. Changes of Private Car Use in Response to Travel Demand Management. In: *Traffic and Transport Psychology*, G. Underwood (editor). Elsevier, 551-571.
- [9] Gärling, T., Gärling, A., and Johansson, A. 2000. Household choices of car-use reduction measures. *Transportation Research A*, 34, 309-320.
- [10] Harms, S. 2003. From routine choice to rational decision making between mobility alternatives. Paper delivered at 3rd Swiss Transport Research Conference, Monte Verità/Ascona, Switzerland.
- [11] Møller B, 2001, “*Travel mode choice as habitual behaviour: A review of the literature*”, Working paper 02-1, Aarhus School of Business, Aarhus.
- [12] Orthuzar J deD and Willumsen L (2002) *Modelling Transport* (Second Edition) John Wiley
- [13] Verplanken B, Aarts H, van Knippenberg A and Moonen A, 1998: Habit vs. planned behaviour: A field experiment, *British Journal of Social Psychology*, Vol 37, pp111-128
- [14] Verhoeven, M., Arentze, T., Timmermans, H. and Van der Waerden, P. 2005. *Modeling the Impact of Key Events on Long-Term Transport Mode Choice Decisions: A Decision Network Approach Using Event History Data*. Paper submitted for presentation at the 84<sup>th</sup> Annual Meeting of the Transportation Research Board, Washington, DC.
- [15] Zipf G, 1949: “*Human behaviour and the principle of least effort: An introduction to human ecology*”, Addison-Wesley Press, Cambridge.

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