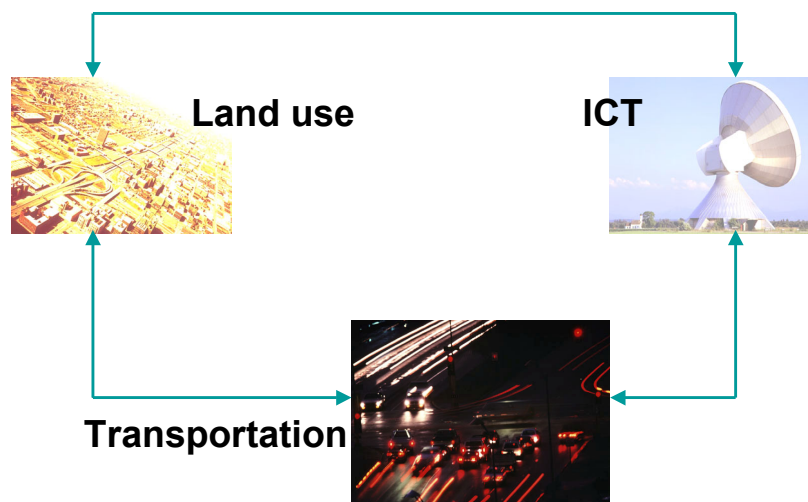


**Dr.-Ing Carsten Gertz**  
**European Center for Transportation and Logistics**  
**Technical University of Hamburg-Harburg, Germany**  
**gertz@tu-harburg.de**

**The Relationship between Transportation, Urban Form and ICT:**  
**What we know. What we don't know.**

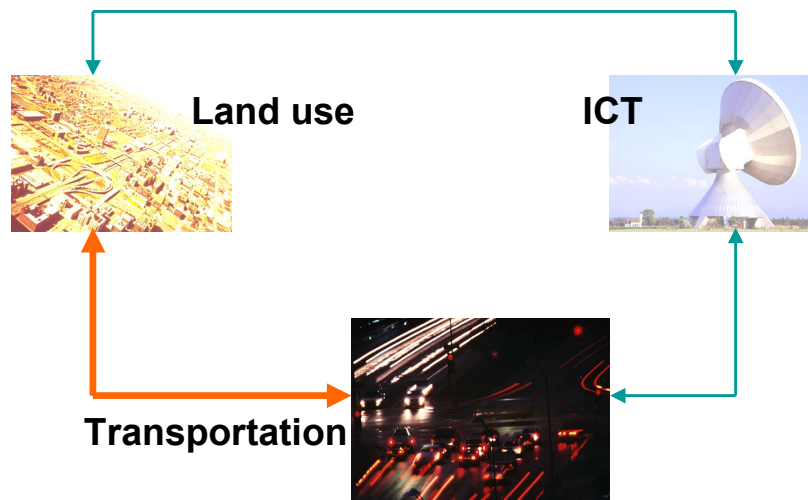
**STELLA**  
**Focus Group 2**  
**ICT, Innovation and the Transport System**



## ***Purpose of the Presentation***

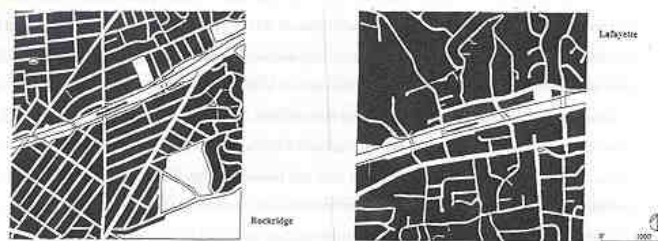
**The paper does not present the results of a single project. The goal of the presentation is:**

- **to reflect the current situation in research**
- **to identify topics where an international exchange of experience and knowledge as well as common projects between the US and Europe would be especially valuable.**



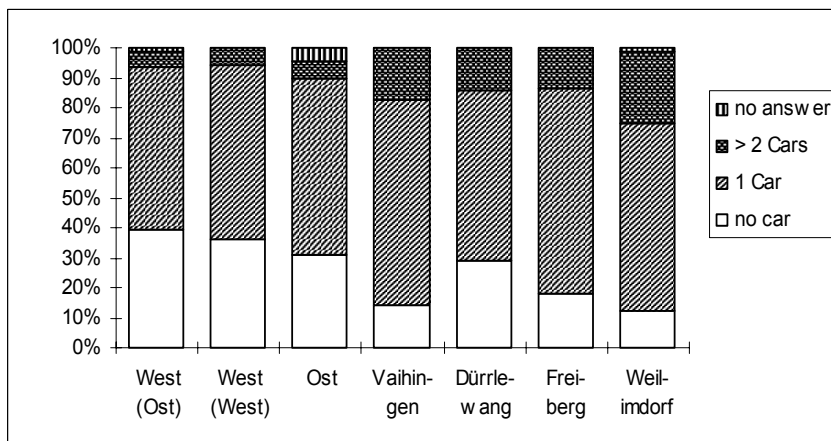
## Situation in land use - travel behavior research

- The relationship between urban form and travel behavior has been a very important research area in the past decade.
- There is a large number of studies (in the US and Europe) that describe travel behavior as a function of certain land use characteristics.



ECTL  
European Centre for  
Transportation and Logistics

## Example: car ownership in different types of neighborhoods



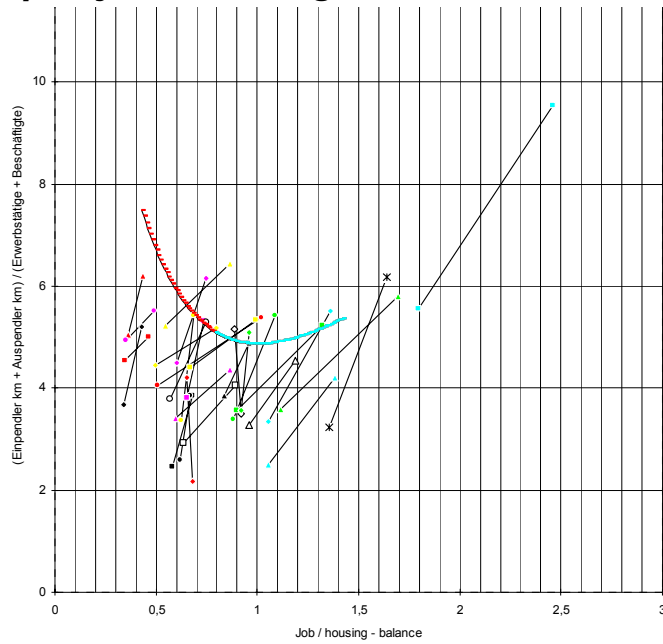
West, Ost: traditional neighborhoods, mixed use; Vaihingen: single family houses Dürrlwang, Freiburg, Weilimdorf: new development, multi storey houses

ECTL  
European Centre for  
Transportation and Logistics

6

### Example: job - housing balance

Average trip length to work in smaller cities within the metropolitan region of Stuttgart 1970 - 1987



ECTL  
European Centre for  
Transportation and Logistics

### Example: travel distances in different neighborhoods

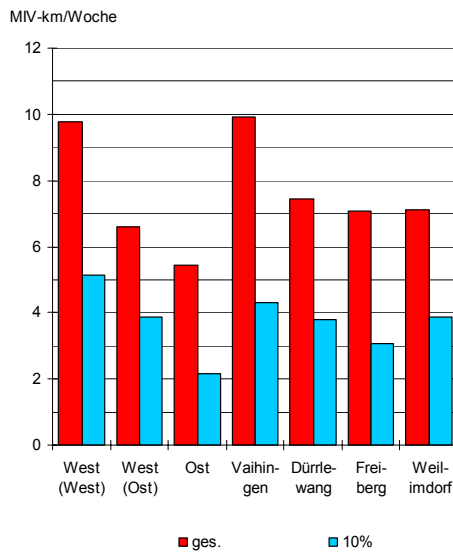
Kilometers traveled by car for leisure activities / week:

10 % of the population is driving approx. 50 % of the total kilometers for leisure activities

West, Ost: traditional neighborhoods, mixed use;

Vaihingen: single family houses

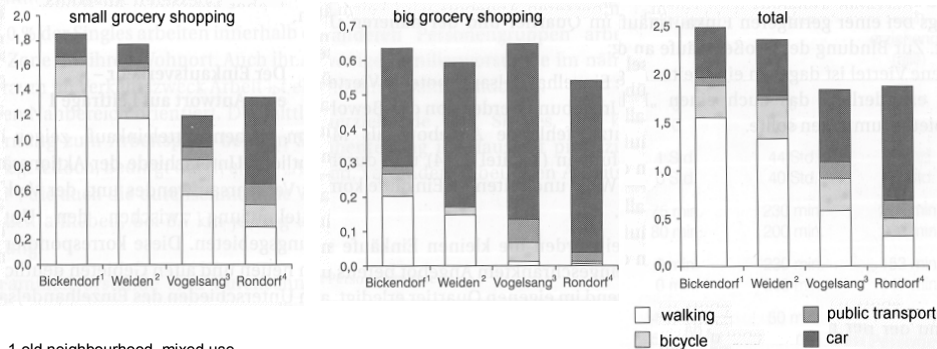
Dürriewang, Freiburg, Weilimdorf: new development, multi storey houses



ECTL  
European Centre for  
Transportation and Logistics

## Example: Numbers of Shopping Trips (I)

Number of trips / person per week



- 1 old neighbourhood, mixed use
- 2 new neighbourhood, mixed use
- 3 old neighbourhood, single use
- 4 new neighbourhood, single use

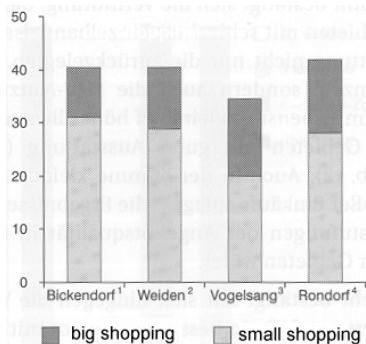
- In mixed used areas where shops are nearby people shop more frequently (mainly walking).
- In single use areas more people have to use the car.

ECTL  
European Centre for  
Transportation and Logistics

Neighbourhood perspective: 4 areas in Cologne, N=579 persons  
Source: Holz-Rau et al. 1999, p. 41

## Example: Total Travel Time for Shopping Trips (II)

Total travel time for shopping trips (minutes / person per week)



- 1 old neighbourhood, mixed use
- 2 new neighbourhood, mixed use
- 3 old neighbourhood, single use
- 4 new neighbourhood, single use

- Despite the difference in the number of shopping trips, the time use for shopping trips is nearly the same in all 4 neighbourhoods.
- In mixed used areas where it would be possible, the chance to save time for shopping trips is not used. It results in more frequent (mostly non motorised) trips.

ECTL  
European Centre for  
Transportation and Logistics

Neighbourhood perspective: 4 areas in Cologne  
N = 579 persons  
Source: Holz-Rau et al. 1999, p. 41

### ***The political implication***

**This kind of research found it's way into a broader political debate at the community level.**

**The message of the research was, that we should have:**

- **more mixed used development**
- **a job housing balance**
- **a higher density**

**to reduce automobil dependence and to enhance transit and non-motorized modes as alternatives.**

### ***Great interest in land use - transportation research***

**The transportation - land use “research wave” of the nineties came along with a general concern about the ongoing sprawl development (both in Europe and the US).**



### ***Policy and planning options***

**Under the umbrella of catchwords as “livable communities” or “integrated planning” we see a lot of projects that understand land use planning as a basis for a more sustainable development of the transportation system (reduction of VMT, mode share).**



*ECTL  
European Centre for  
Transportation and Logistics*

### ***Shifting research focus***

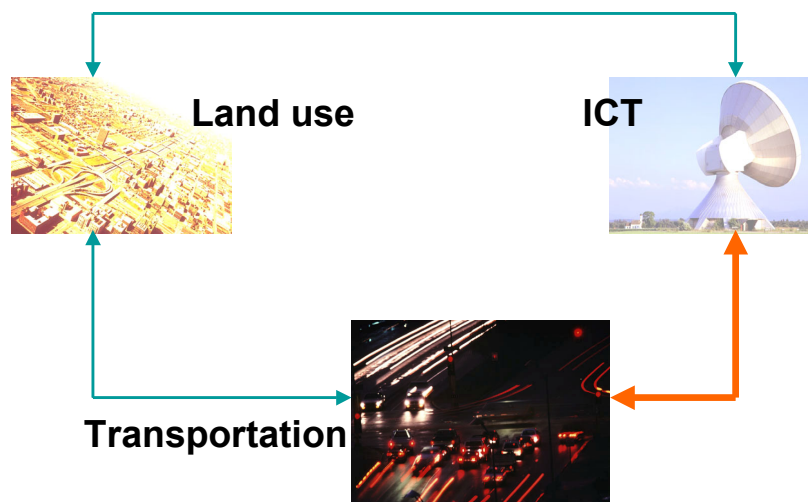
- **It is no surprise that the focus of the transportation - land use research seems to shift away from analytical projects about travel behavior to research questions that deal more with an improved implementation of integrated land use and transportation policies.**
- **Necessary is the development of tools that can help planners to better estimate the effects of future development (more than transportation modelling).**
- **Fiscal impact analysis / LEM are interesting developments in the US that should also be applied in Europe.**

*ECTL  
European Centre for  
Transportation and Logistics*

14

### ***Empirical research needs***

- **A deficit of a lot of empirical studies in the past was that they didn't pay enough attention to the individual or social background of travel behavior.**
- **Problem of “self-selection” when comparing travel patterns of residents in different neighborhoods (e.g. people who prefer walking or transit may choose neighborhoods that support their predilection).**
- **Necessary is more research about:**
  - **life styles / mobility styles,**
  - **non work travel,**
  - **background of location decisions**



## ***Substitution versus complementarity***

- **The main question for a long time has been: substitution versus complementarity.**
- **The hope for substitution was an easy image (especially for non-experts).**
- **Now more and more accept that it is much more complicated.**
- **New ICT has not been accompanied by a noticeable decrease in the total travel volume.**

## ***Phases in ICT - Travel behavior research***

### **telecommuting**

**(teleconference / telelearning)**

**teleshopping / E-commerce**

**\_\_\_\_\_ relation between different kinds of ICT**

**in parallel: adaption of ITS applications**

**research steps:**

- **adaption of the new technology (e.g. number of users)**
- **effects on travel behavior (e.g. change in VMT)**

## ***Impacts of Teleworking on individual mobility***

***Most studies seem to agree:***

- **Teleworkers have a reduction of their kilometres / VMT travelled.**
- **For other trips there is an orientation towards the location of the residence.**
- **Teleworkers don't compensate the reduction of work trips through an increase of leisure activities.**

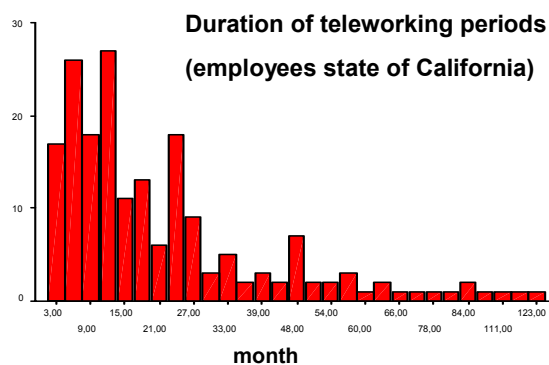
## ***Teleworking as transportation reduction strategy?***

- **There are not as many telecommuters as expected at the end of the eighties.**
- **The dispersion is slow.**
- **The reasons are mainly non-technical: e.g. management policy, job visibility, social and professional contacts to the co-workers etc..**
- **But the cost reduction for office space is a more recent driving force.**

## ***Teleworking: remaining questions***

**Points where a verification of existing results would make sense:**

- **long term patterns of teleworking**
- **effects on residential location**
- **net effects mobile workers**



ECTL  
European Centre for  
Transportation and Logistics

## ***Teleworking - Teleshopping: different situation in research***

**Telecommuting:**

- **15 year history of research at both sides of the Atlantic, a lot of data sets available.**

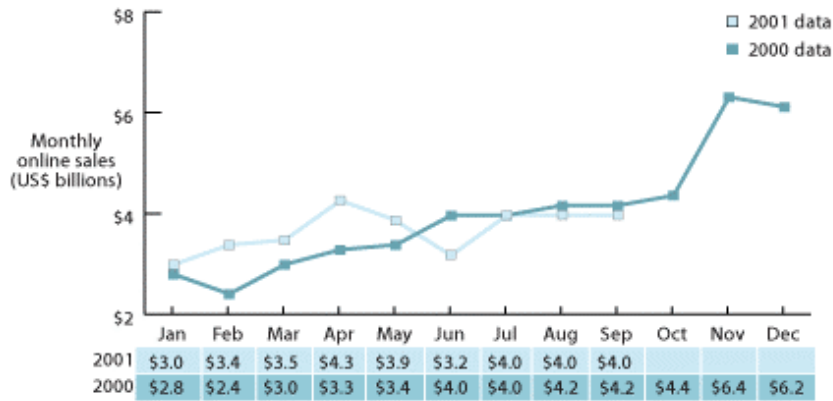
**Teleshopping / E-commerce:**

- **A lot of studies but very little empirical research or data that allows a direct analysis of the effects of teleshopping on travel behavior.**
- **Most studies are reporting the penetration and the shopping behavior (mainly based on the data from market research companies).**

ECTL  
European Centre for  
Transportation and Logistics

22

## The development of b2c E-commerce in the USA



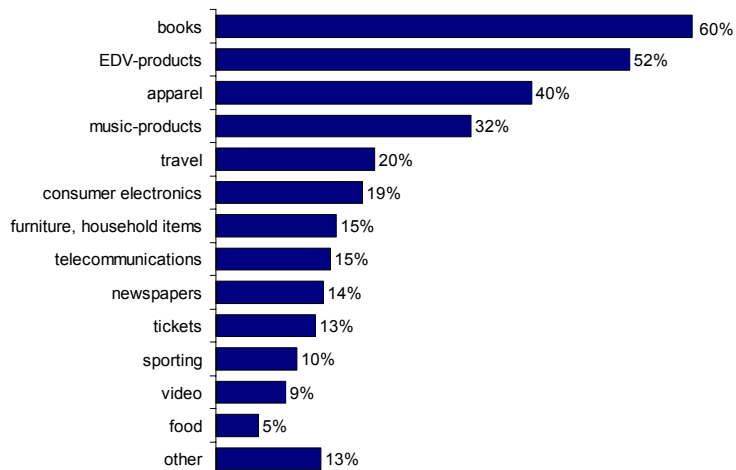
**Note:** Owing to changes in the methodology of the Index, beginning in April 2000, we discourage making year-to-year comparisons for any particular category until April 2001, although general top-line trends appear stable over that period

Source: www.forrester.com

ECTL  
European Centre for  
Transportation and Logistics

23

## What Did You Buy Online?



Data from Germany:  
N=6.909

- Books and PC-related goods are the favourite products of internet shoppers.
- Currently food does not play an important role.

ECTL  
European Centre for  
Transportation and Logistics

Source: Symposion, 1999, p. 60

## Book Sales: a Closer Look

|                     | Online         | Traditional    | Online – Share |
|---------------------|----------------|----------------|----------------|
| Book Stores 1998    | 1300           | 7000           | 18 %           |
| Customers 1998      | 400,000        | 35 million     | 1.2 %          |
| Total Turnover 1997 | 30 million DEM | 17 billion DEM | 0.2 %          |

- Even for this favourite product of online shopping the current share of the total book-market is very small.

## Reasons for Stopping the Online Transaction



- The logistic-related barriers for doing online-shopping are still high.

### ***Impacts of Teleshopping on individual mobility (I)***

- **There is no data available that could give a clear answer to the question on how tele-shopping might influence the individual mobility.**
- **All what can be done at this stage is to put some pieces together and show possible directions of the most likely effects.**

### ***Impacts of Teleshopping on individual mobility (II)***

#### ***Kilometres travelled:***

- **In Germany the share of all kilometres travelled by car for shopping is relatively small (11 %) and remained relatively unchanged over the past years.**
- **Even if one would assume a high substitution because of teleshopping the net effect would be relatively small.**
- **It looks a little bit different for the number of trips, because 20 % of all car trips are for shopping.**

### ***Impacts of Teleshopping on individual mobility (III)***

#### ***Trip chaining:***

- **Shopping has a high share of unchained trips: so here would be a potential for substitution.**
- **But a lot of shopping trips combine shopping at different stores / shopping of different products. If we take into account that the acceptance of product groups in the internet is very different, certain purchases over the internet doesn't reduce the need for other shopping trips.**
- **If different activities are combined, a substitution of trips in total is less likely especially for the tripchain work - shopping.**

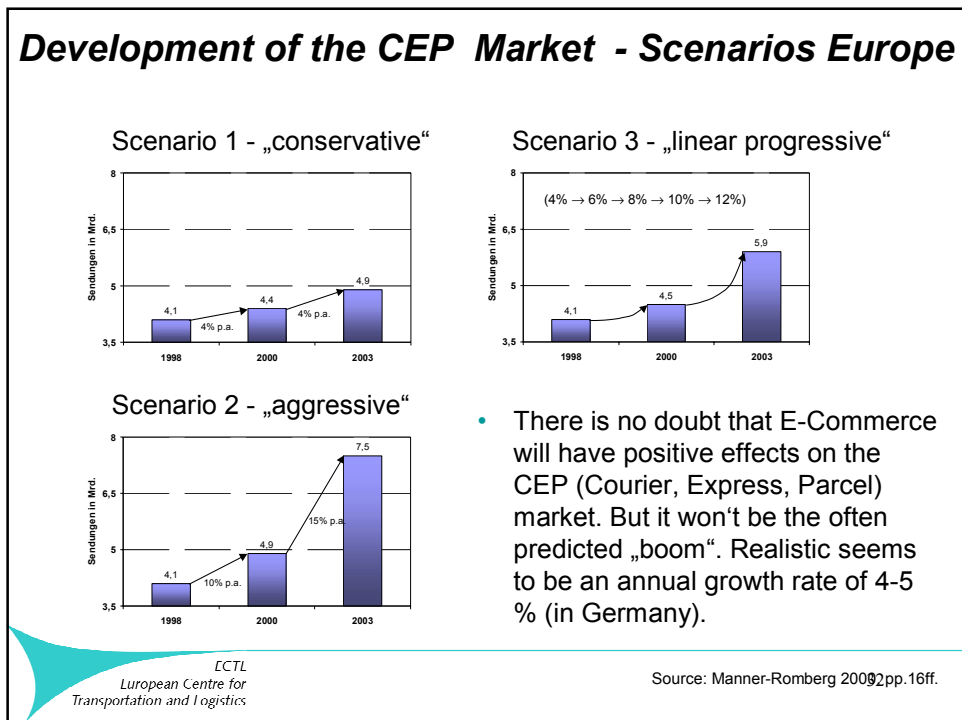
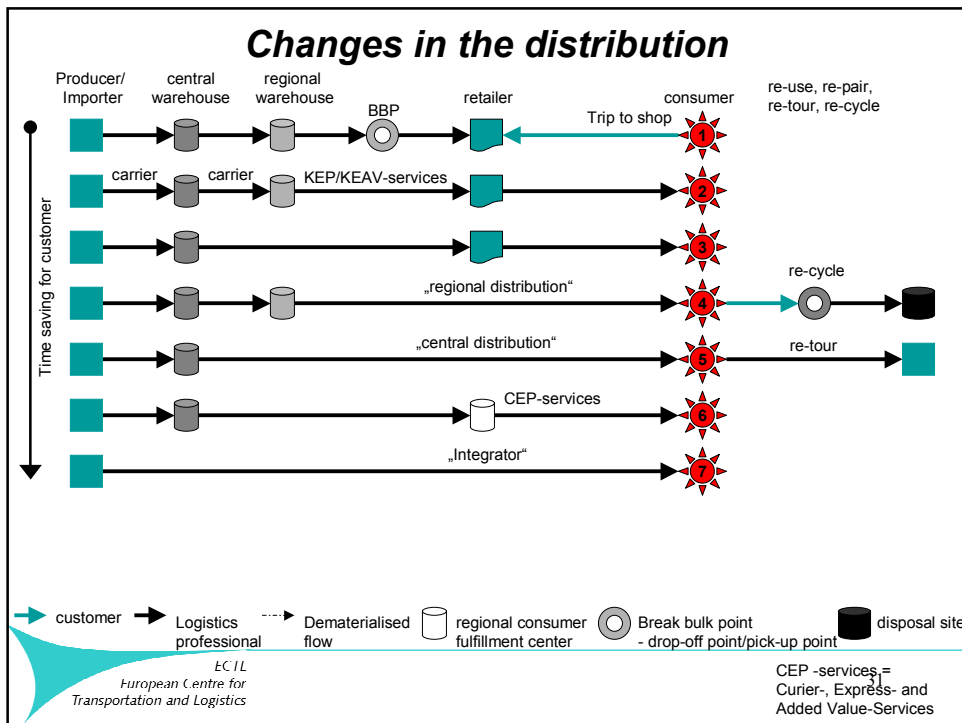
### ***Impacts of Teleshopping on individual mobility (IV)***

#### ***Shopping is more than purchasing a good:***

- **The recreational effect plays an important role. Shopping is often combined with window shopping, visit of restaurants and other recreational activities.**
- **This social effect of shopping reduces the potential of a trip substitution through teleshopping.**

#### ***Time use:***

- **Teleshopping might be welcome by people with time restrictions.**
- **But in areas where the saving of shopping time would be possible it isn't used and results in more smaller shopping trips.**



### ***More VMT through delivery vehicles?***

- **E-commerce (BtoC) / Teleshopping:** requires a large number of small shipments to geographically dispersed customers.
- **Reverse logistics** important.
- **Dot.com failure:** a lot of the new enterprises underestimated the importance of a reliable logistics network.
- **Winner of E-commerce** are the “traditional” mail order companies and the CEP - providers.

### ***Teleshopping: research needs (I)***

**Why is the research about the transportation effects of teleshopping unsatisfying so far?**

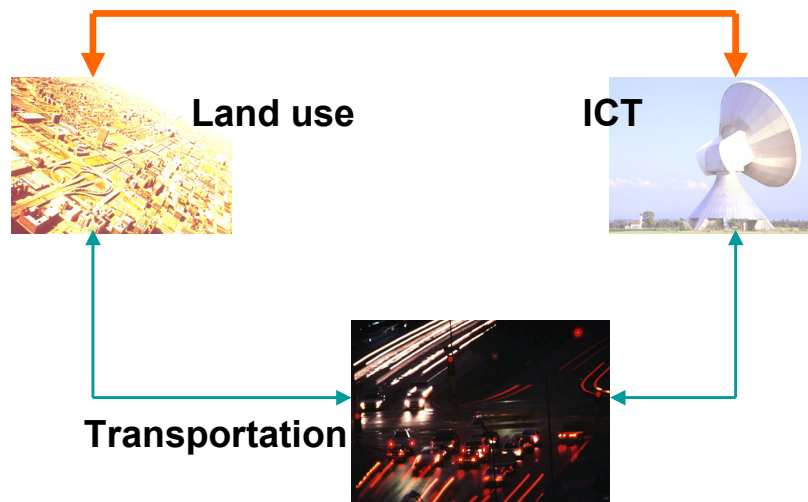
**The problem with surveys:**

- **Recruitment of samples** difficult.
- **Reporting changes in the travel behavior** is more difficult: non work trips are more disperse and often linked with very different activities - teleshopping activities might be not very regular.

## Teleshopping: Research needs (II)

Problems with Data Sources in the Field of E-commerce:  
„pick a number, any number...“ (Morgan Stanley 1997)

- Very dynamic development, data does not keep track with the development.
- Little data about the number and turnover of online shops and about spatial differences in the usage of the internet.
- A lot of data that is available is from online surveys, respondents are active users and might not reflect the behavior of the whole population.
- No data comparability in the logistic sector in Europe.



### ***ICT as driving force for land use changes?***

- **A lot of assumptions but little empirical evidence.**
- **It is hard to measure / observe.**
- **Overlay with other general trends.**

#### **teleworking:**

- **influence on location decisions**
- **teleworking in scenic areas**

#### **teleshopping**

- **problems for shops in inner city districts**
- **location choice logistics center**

### ***The speed of change***

- **Changes in the transportation infrastructure and the build environment are much slower than changes in the ICT-development.**
- **This raises questions for the decision making process.**

## ***What are the consequences of the results so far? (I)***

**Whereas the link between land use and transportation is also a highly political debate where science has an important role to give policy recommendations it is completely different when looking at the connection between ICT and land use or travel behavior.**

## ***What are the consequences of the results so far? (II)***

**IATBR 97:**

**“we can not give any policy recommendation so far.”**

**Where are we know? To stimulate a discussion:**

- **What is the role of the scientific community in this policy area?**
- **Is there a real policy area for this topic?**
- **Is there a need for changes in the regulatory framework (to enhance or prevent a certain kind of development)?**

***Is the innovation process different in the US and Europe?***

- In most cases new developments start in the US and then come to Europe sooner or later.
- The penetration / implementation is often different in the US and Europe.

**e.g. telecommuting:**

- **US:** promotion as transportation strategy right from the beginning - “telecommuting”
- **Germany:** promotion as strategy to increase the productivity, never really promoted as transportation reduction strategy - “teleworking”