



# Psychological Insights on Transportation Mode Choice

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# Abstract

*Abstract: Transportation mode choice is often expressed in terms of models which assume rational choice; psychological case studies of mode adoption are comparatively rare. We present findings from a study of the psychology of adoption for sustainable transportation modes such as bicycles, car sharing, and mass transit. Case studies were conducted with current and former participants in PSU's 'Passport Plus' transit pass program, as well as a longitudinal cohort study of first-time winter bicycle commuters. Composite sequence analysis was used to construct a theory of the adoption process for these modes. Our findings suggest that mode evaluation is cognitively distinct from mode selection and has different information requirements. We conclude that public and private organizations could improve the adoption rate for these modes by tailoring their communication strategies to match the commuter's stage of adoption.*

# Let's Be Rational



**Transportation mode choice** models are generally based on economic theories of rational choice.

- These theories assume **equilibrium conditions**
- And are considered robust over a range of applications.

***But...***

# Fear rides the MAX

■ *Gresham attack sparks widespread outrage and plans for a safety forum*

According to her, the members of this gang would actually board the MAX and assault people at 4 o'clock in the afternoon! She mentioned personally seeing several muggings on the platforms, and a corpse on another platform in the area. She said that MAX had become increasingly dangerous over the past 3 years, which she attributed to explosive population growth in the Portland metro area which was straining the police resources. Upon hearing this exchange, a second passenger remarked, "Maybe it's time for me to look into getting a car..." (TriMet Journal, March 6, 2006)

**"MAX is little more than a way for the criminal element to move from one crime scene to another,"**

— Bryce Jacobson, MAX rider

**This is the fifth MAX ride in a row in which I have not felt safe. ...**

**Disturbing trends noted**

He had been waiting for the train at the MAX platform (at 6 PM) when a mixed group of teenagers came up behind him and started talking about a gun they had in their possession -- "You got a clip in that? You got bullets?" He got up and walked to the far end of the platform to wait. He said security is his biggest concern on TriMet, especially the Lloyd Center MAX stop. (Journal, May 24, 2006)

# ...What If You're Far From Equilibrium?

- If utilities aren't stable over time
- If commuters influence each other
- If populations aren't perfectly mixed

Upon hearing this exchange, a second passenger remarked, "Maybe it's time for me to look into getting a car..." (March 6, 2006)

## Transportation Mode Adoption

# How do commuters adopt sustainable transportation modes?

Alternatives to single occupancy vehicles:



Bicycles



Buses



Light rail



Car sharing



Car pooling



# Study Objective

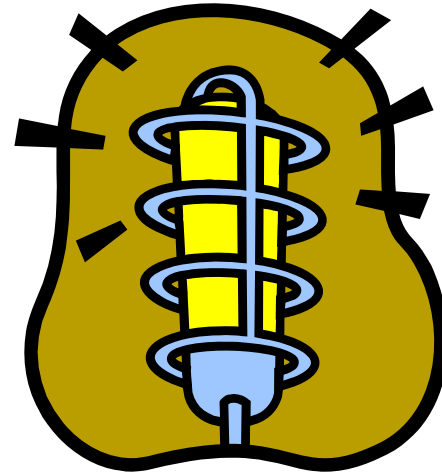
To map the **adoption process** from the commuter's perspective.

- **Theory building**
  - As opposed to hypothesis testing
- **Process research**
  - Analyzes events rather than variables
  - Addresses 'how' rather than 'why'
- **Adoption psychology**
  - The **structure** and **behavior** of adoption



# Study Limitation

Process research is designed to sample **theoretical content**, not populations.



- Qualitative interviews can suggest psychological themes and interesting insights into the adoption process.
- However, these findings should not be considered statistically representative until confirmed by multivariate survey research.

# Two-Case Design



## PSU's Passport Plus program

- TriMet MAX
- TriMet Bus
- Flexcar
- Reduced rate campus parking

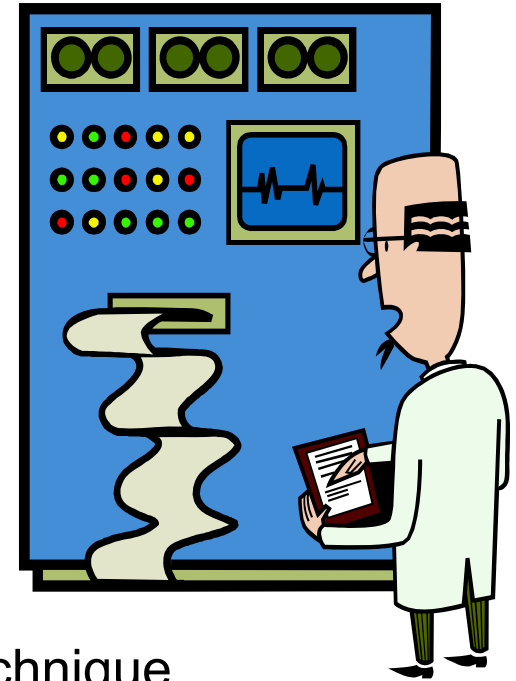


## Winter Bikes

- Novice winter bike commuters
- Six month cohort study
- Focus on attitude shifts

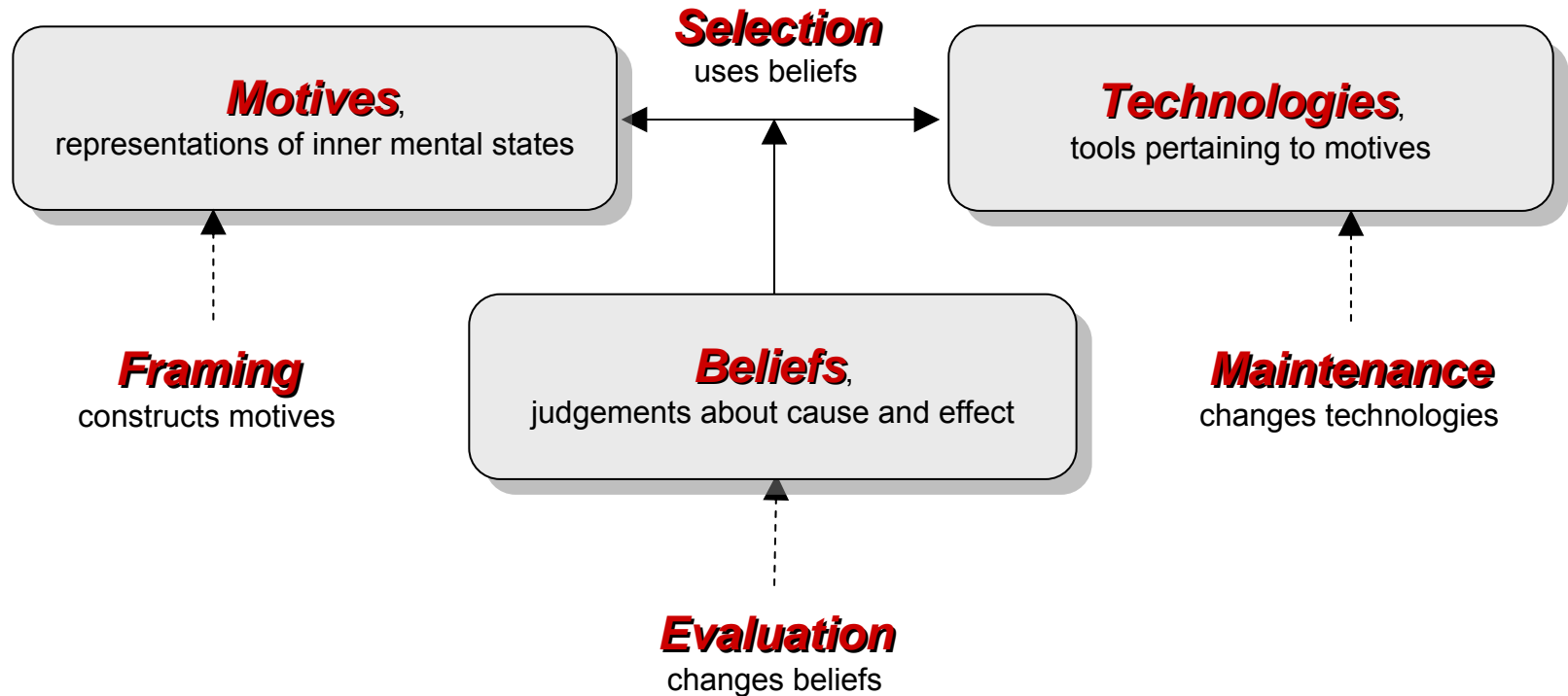
# Data Collection and Analysis

- Case studies
  - Passport Plus: **retrospective** case
  - Winter Bikes: **longitudinal** case
- 42 in-depth interviews
  - 32 interviews of 21 primary informants
  - 10 interviews of secondary informants
  - Semi-structured, using the Critical Event Technique
- Analysis
  - Grounded Theory
  - Composite Sequence Analysis

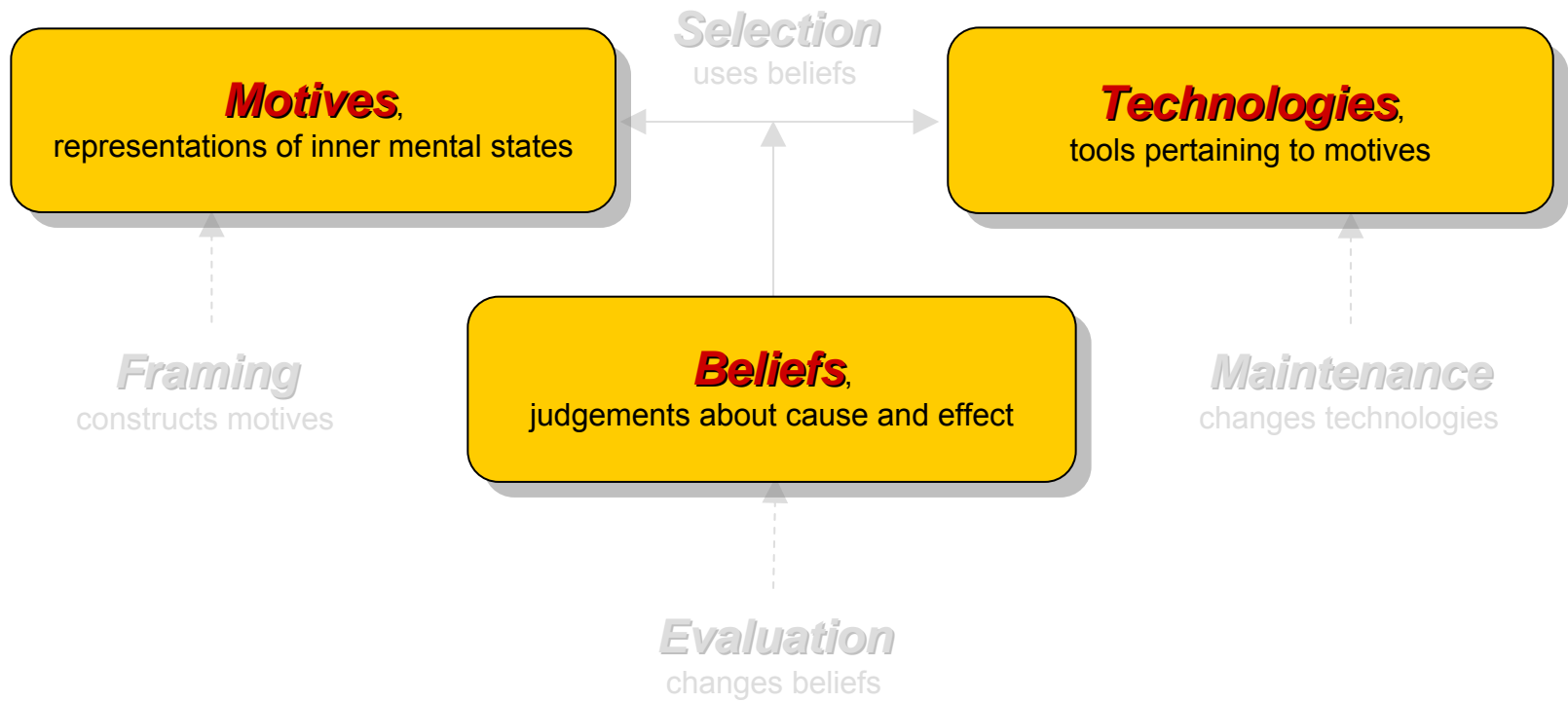


Sources: Eisenhardt (1989); Yin (2003); Chell (1998);  
Strauss and Corbin (1998); Miles and Huberman (1994)

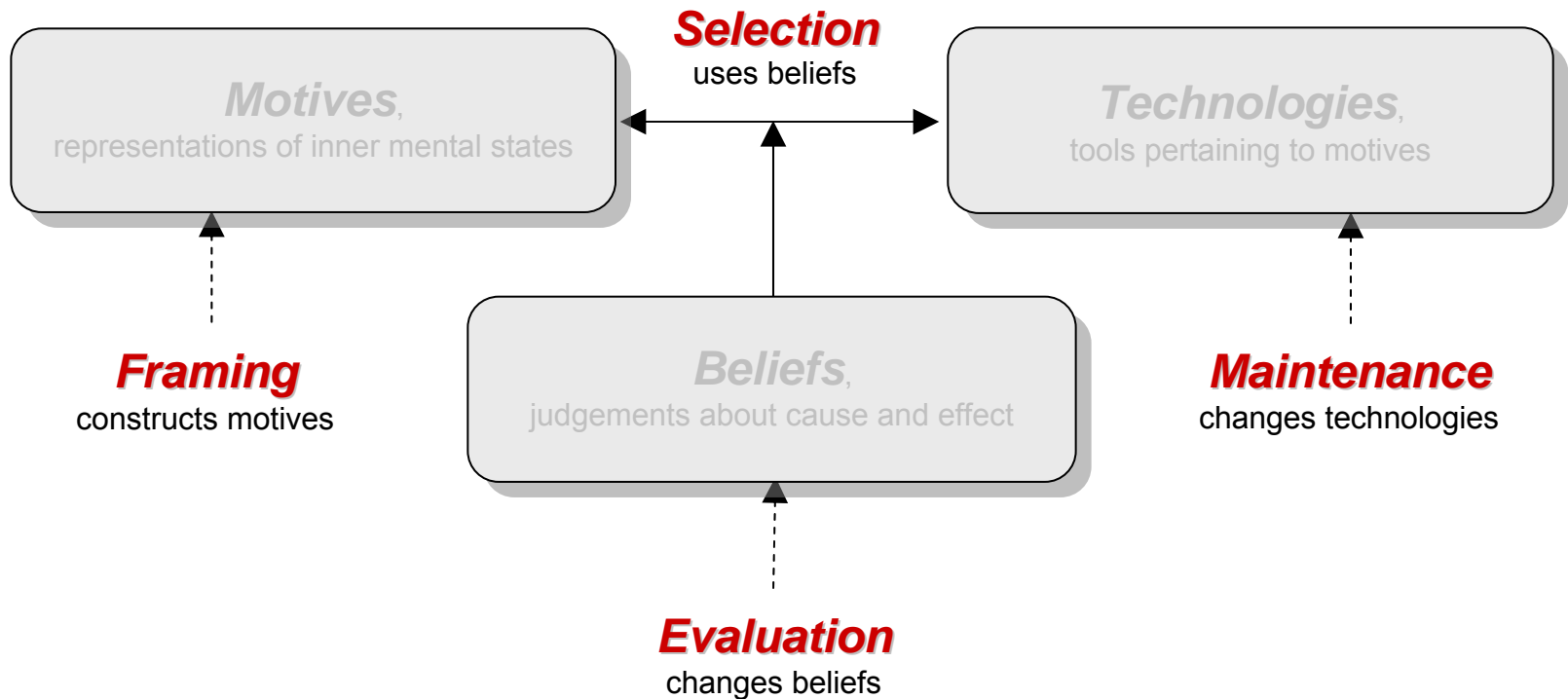
# Adoption at a Glance



# The Structural Elements



# The Behavioral Processes



# The Behavioral Processes

Discrete mode choice models focus exclusively on selection.

***Selection*** chooses a mode in response to an immediate need.

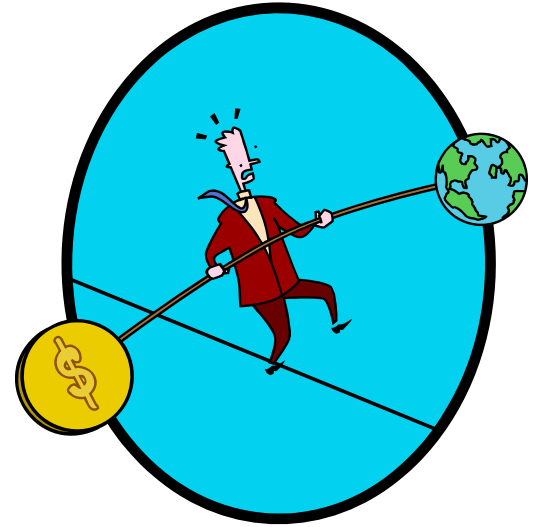
***Framing*** determines which needs are relevant to a situation.

***Maintenance*** determines the functional status of a mode.

***Evaluation*** assesses how well a mode satisfies a need.

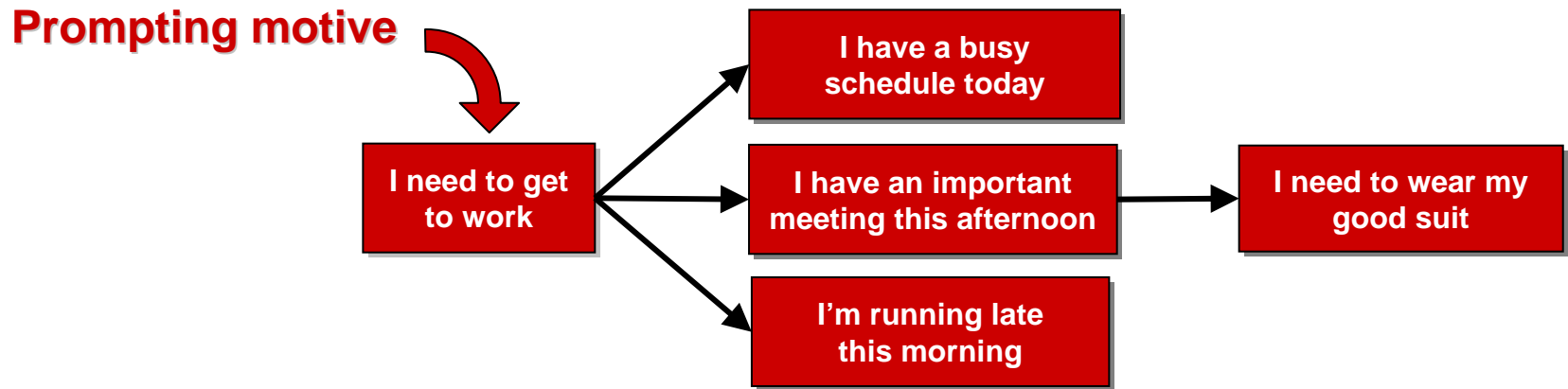
# 1. Framing

- Determines which needs are relevant in a given situation.

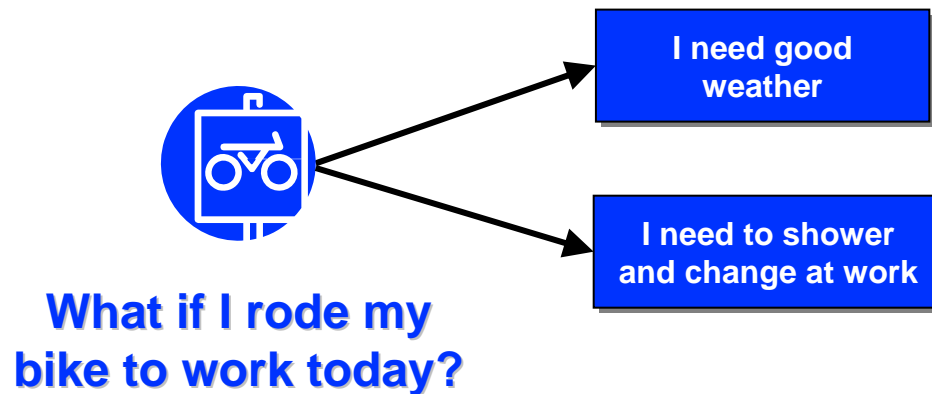


- Framing is sensitive to which needs are included and the order in which they are considered (“**plasticity**”)

**Situational needs** are evoked by the end goal.

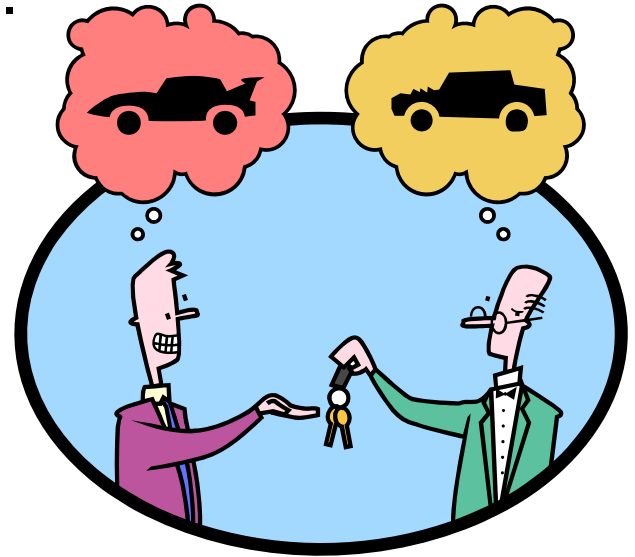


**Optional needs** are evoked by the mode itself.



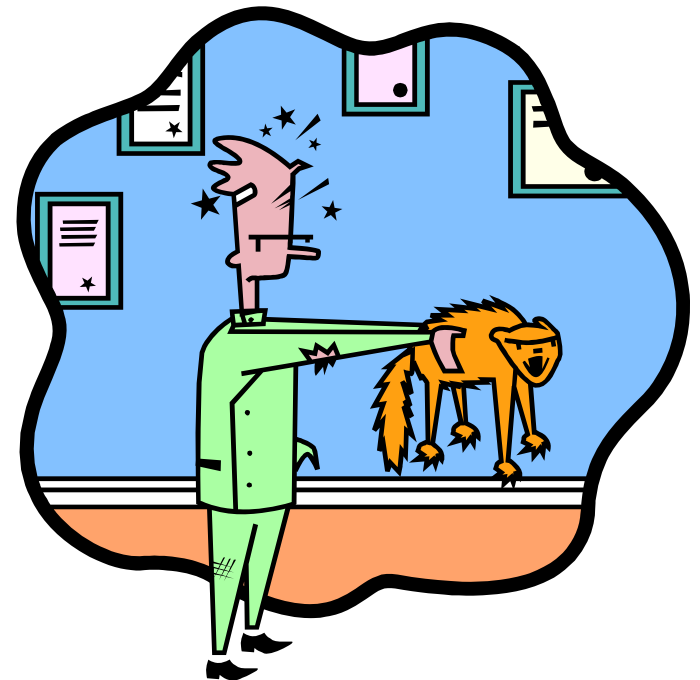
# “Not on the Radar”

- We tend to pigeonhole or **consolidate** modes into conceptual categories.
- A bicycle can be seen as:
  - A ‘thing-for’ saving money
  - A ‘thing-for’ losing weight
  - A ‘thing-for’ wellness
  - A ‘thing-for’ having fun
  - A ‘thing-for’ saving time
  - A ‘thing-for’ competition
- We tend to take these categories for granted.
  - A bike commuter and a weekend ‘roadie’ may have less in common than we might suppose.
- The tendency to presume that our thoughts and beliefs are generally shared is called “**category error.**”



# The Squeaky Wheel Gets the Grease

- **Sensitivity** is the tendency to devote attention to the most salient stimuli in a situation
  - Everything else is relegated to the background (**habit**)
  - Sensitivity is a **key precursor to discontinuance**
- Pet peeves can develop into major annoyances over time
  - Cold hands while biking to work
  - Rowdy teenagers on the bus
  - Security incidents on MAX



# Sensitivity and Importance

- A **sensitive** need lacks a satisfactory solution.
  - Once our other needs have been satisfied, petty annoyances come to occupy our attention
- An **important** need is deeply connected to other needs.
  - Importance is observed mainly in the breach; for example, breathing becomes important when you can't do it anymore
- Sensitivity is a presence; importance, an absence.
  - Eastern Flight 401: Aircraft crashed into the Everglades after the crew became fixated on a faulty landing gear light and failed to realize that the autopilot had disconnected.
  - United Flight 173: Aircraft ran out of fuel and crashed in Portland while the crew was distracted with a landing gear problem.

# Regret

- A powerful psychological force at the root of certain unsafe traffic behavior:
  - Running yellow lights
  - Stretching the walk signal too long
  - Dashing across the street to catch a bus
  - Playing “beat the train” at railroad crossings



- *Regret is not motivated by the desire to save time.*
- It is caused by the desire to avoid reframing from the **domain of gains** into the **domain of losses**.

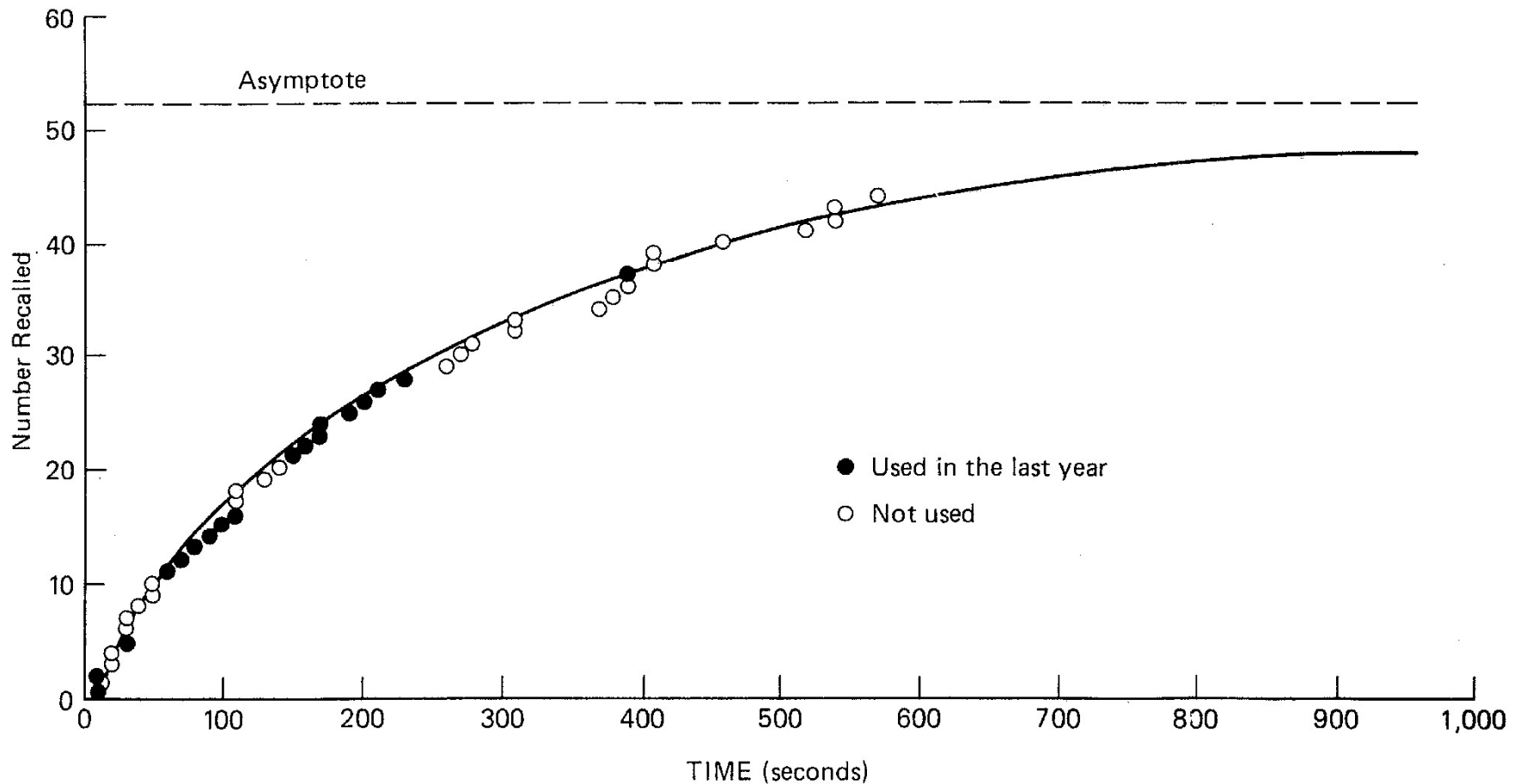
# Flexcar Booking Stress

1. Users must estimate in advance how long they will need the car. This exposes them to **uncertainty**.
  - Underbooking risks significant fines and social embarrassment.
  - Overbooking wastes money, but in many cases the employer pays.
2. Users tend to **overbook** and shift the risk to employers.
  - Employers push back by accusing employees of wasting money.
3. Users begin to think of Flexcar as **stressful** to use. They limit its use to situations which are absolutely necessary.
4. Over time, they may **fall out of the habit** of thinking about Flexcar.



*(Additional research is needed to determine the prevalence and strength of this effect)*

# Out of Sight = Out of Mind

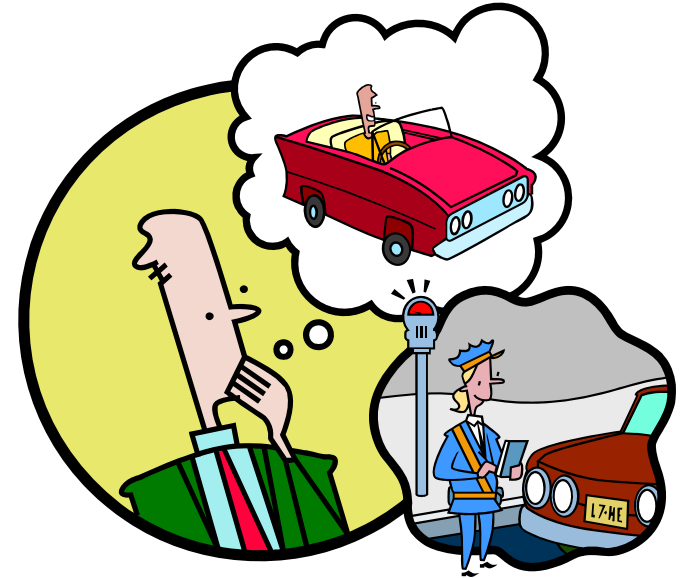


**The ability to recall options fades with disuse**

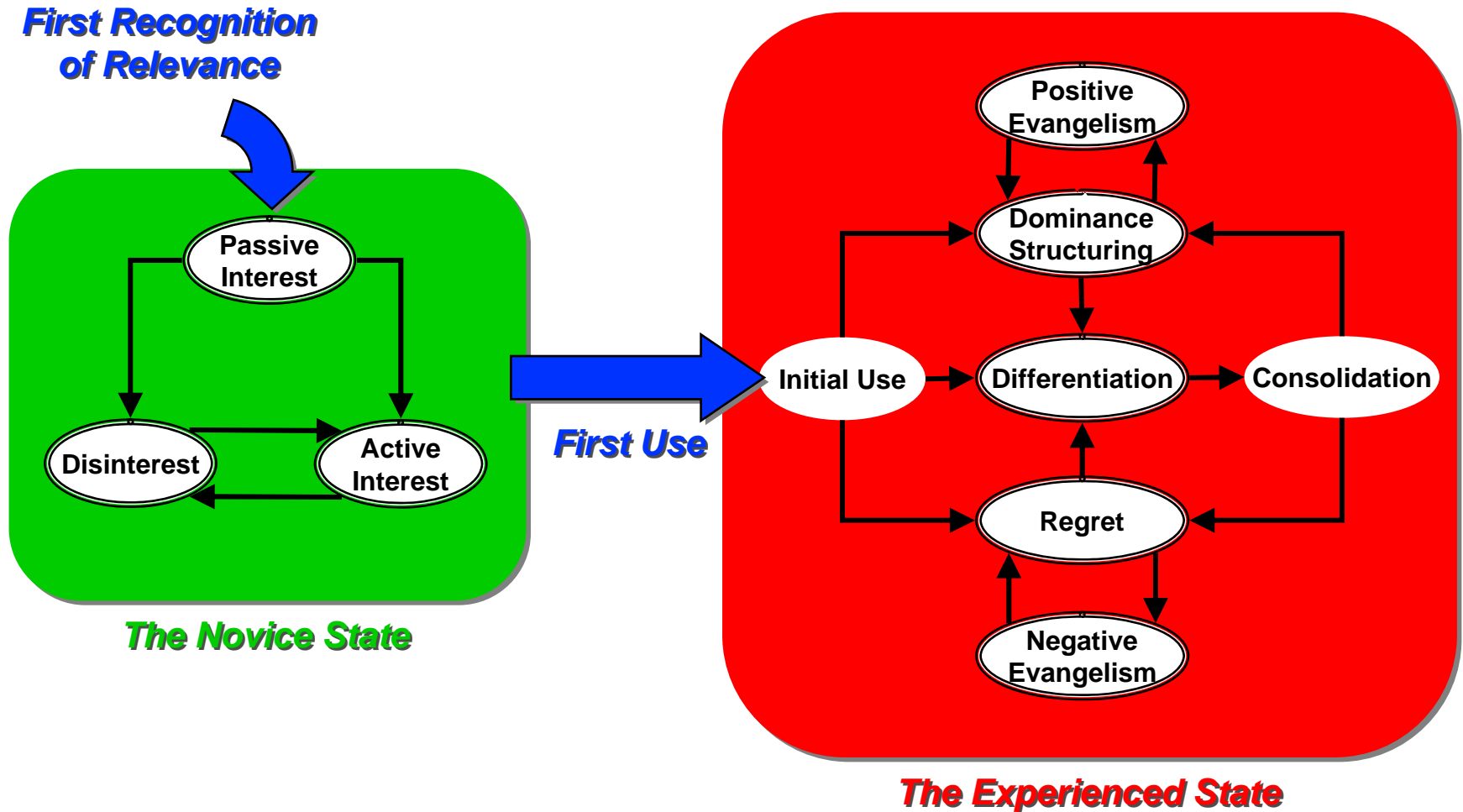
Source: Alba, Hutchinson and Lynch (1991)

## 2. Evaluation

- Assesses how well a mode satisfies a need.
- Evaluation unfolds over time in reaction to events (stimulus/response behavior.)
- “Jumpy”



# The Evaluation Process ( $n = 151$ )



# Novice vs. Experienced Users

Novice and experienced users differ considerably in terms of what they consider important.

- A recent study found significant shifts in the perception of **capability** (*what does it do?*) and **usability** (*how can I use it?*) between novice and experienced users.
- No such differences were observed between nonexpert and expert users.

# Novice vs. Experienced Users

Novice and experienced users differ considerably in terms of what they consider important.

## **Bike Lanes** (*Capability*)

- **Novice** cyclists seem reassured by bike lanes and find downtown traffic intimidating and scary.
- **Experienced** cyclists express confidence about riding in downtown traffic, but are wary of the illusory safety of bike lanes.



# Novice vs. Experienced Users

Novice and experienced users differ considerably in terms of what they consider important.

## Time Utilization (*Usability*)

- **Novice** bus riders tend to focus on how long the ride will take compared to the alternatives. They are less focused on ways to pass the time.
- **Experienced** bus riders learn to make constructive use of bus time (to read, work, rest, etc.) and may even come see these as virtues.



# Adoption and Retention are Driven by Different Factors.

- **Adoption**

- Factors which are important to **novice** users

- **Retention**

- Factors which are important to **experienced** users

- **Discontinuance**

- Retention factors which have become **sensitized** due to regular violations

# Bike Commuting: Adoption Factors

Bike adoption factors mentioned by informants during the study:

- The ability to **visualize biking to work** and what it might feel like
  - e.g., getting exercise; saving money; becoming part of something cool; reducing pollution; having fun; feeling positive about one's self-image.
- Having a **practical plan for getting there** by bike
  - Or alternatively, the ability to try it on a limited basis
- Availability of dedicated en-route or end-trip **bicycle facilities**.
- Availability of biking **role models**.
- Prior **history** of favorable bicycle use.
- Feelings of dissatisfaction, regret, or conflict about alternative modes of getting to work (**sensitivity**)
- A **triggering event** (e.g., Bike to Work Week; Bridge Pedal)



# Bike Commuting: Retention Factors

Retention factors mentioned by Winter Bikes informants:

- **Rain**: is rain gear worth it?  
Would dark clothes work?
- **Dark**: seeing; being seen;  
seasonal affective disorder
- **Rain + Dark**: when  $1 + 1 = 3$
- **Cold**: regulating body temperature;  
black ice; frost
- **Hygiene**: comfort and appearance
- **Wind**: headwinds and dense fog
- **Time Utilization**: rain gear hassles
- **Road Hazards**: leaves; potholes; glass
- **Maintenance**: more glass → more flats



**Any of these factors may become sensitized if they recur often enough.**

# “The Loser Cruiser”



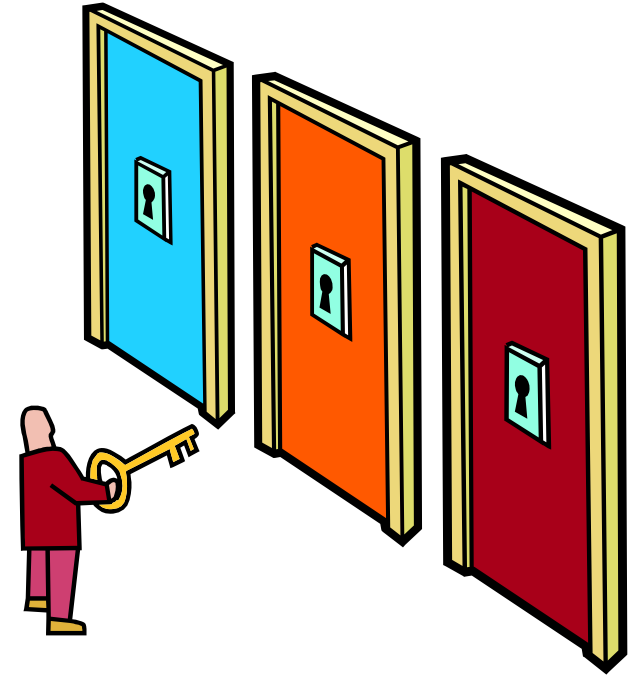
- When transit service becomes too restrictive, it can jeopardize a rider’s sense of being an independent, self-confident adult.

*“In Memphis [a bus rider] would be like, an extremely second class citizen. I knew some people who didn’t have a car, and they would be like ‘Oh, I can’t get there until so-and-so the bus’ or ‘I have to leave by so-and-so because the bus stops running at 11’, or 12, or whatever it was...it was almost like they had a curfew or something, like they weren’t an adult, a mature human being who could do whatever they wanted.”*

- Any product or service can acquire a stigma if its quality of service degrades to the point where it is no longer possible to construct a socially defensible narrative for using it.
- This phenomena is called **technological stigma**.

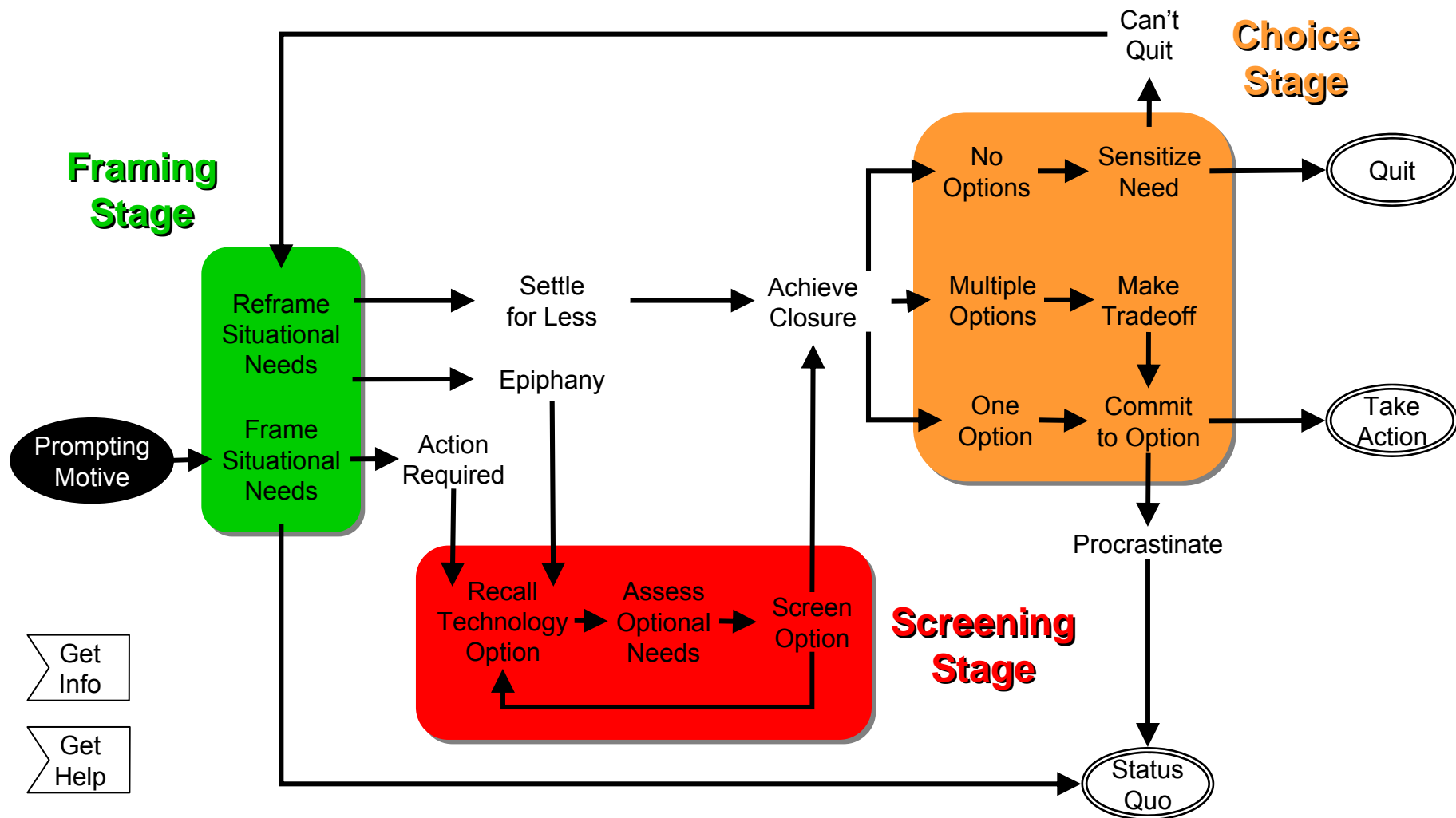
# 3. Selection

- Choosing a mode in response to an immediate need

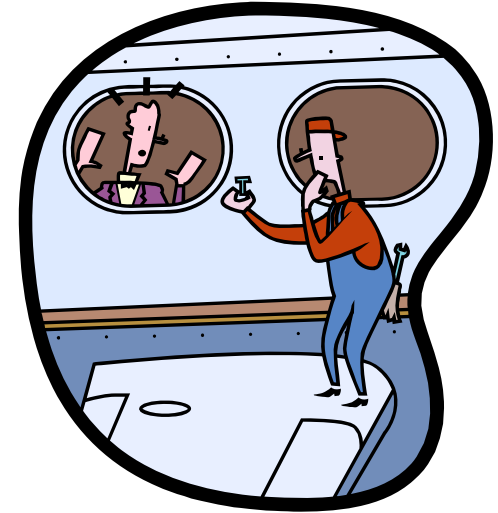


- Extensively studied (discrete choice models)
- “Flows” (involves a train of thought)
- Habits loom large (the morning debate)

# The Selection Process ( $n = 75$ )



# 4. Maintenance

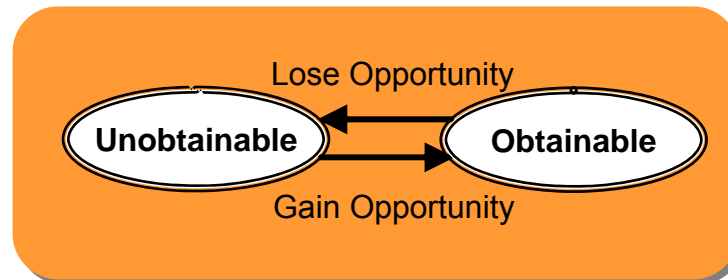
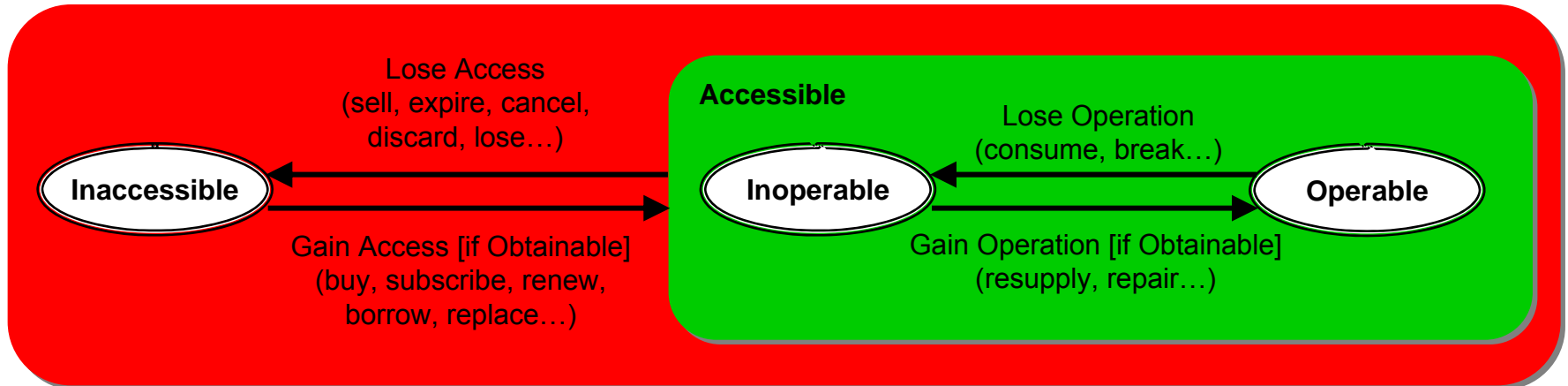


- Determines the functional status of a mode.
- Stimulus/response behavior
- “Jumpy”

# The Maintenance Process ( $n = 57$ )

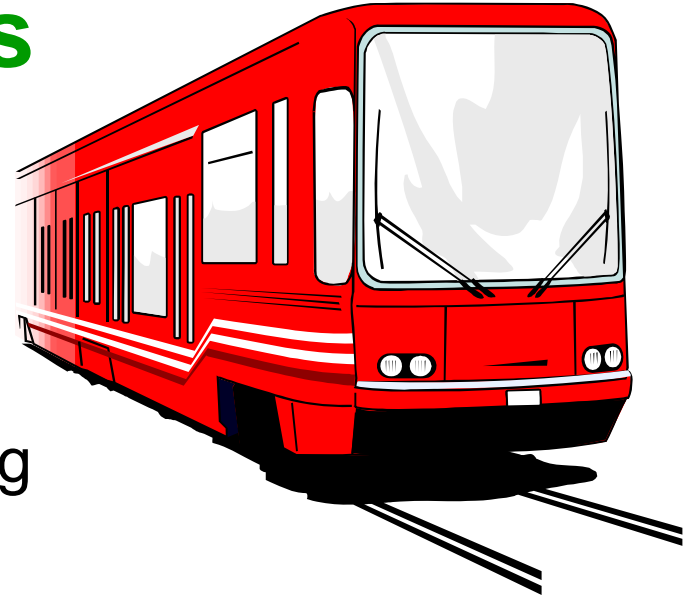
## Accessibility Axis

## Operability Axis



## Obtainability Axis

# MAX Parking Garages



- Several suburban informants reported that they would ride MAX to the PSU campus, but the Sunset and Gateway parking garages are chronically full.
  - After 7 AM it becomes as difficult to find parking at these garages as it is to find parking on the PSU campus.
  - Alternative parking facilities such as Millikan Way and Beaverton Creek would significantly increase the trip time *as a percentage of the trip time from the Sunset TC* (regret.)
- Thus, while parking is **obtainable** in principle, in practice it is seldom reliably **accessible** at the moment when it is actually needed.

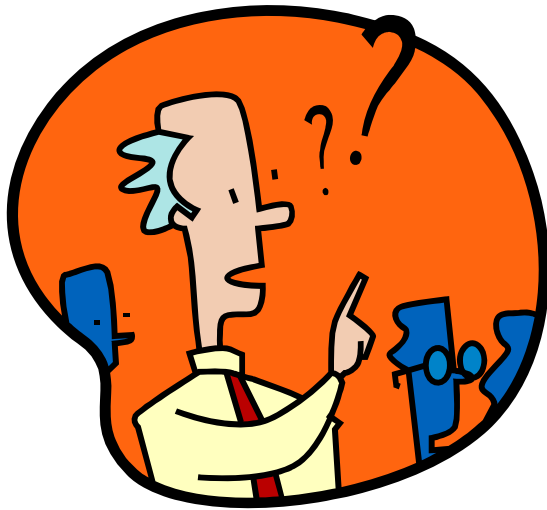
# Summary



1. Novice and experienced commuters differ in terms of what they consider important.
2. Adoption and retention are driven by different sets of factors.
3. Retention factors can become sensitive if violations recur often enough.
4. Communication campaigns should be tailored to match the commuter's stage of adoption.

# Launching a Communication Campaign

- **Focus on user segments with sensitized needs.**
  - Pay attention to pet peeves, which can become sensitized and lead to discontinuance of rival solutions, *regardless of their objective importance.*
  - How often do they occur? How many users do they effect?
  - *e.g., People who need exercise, but hate the gym.*
- **Beware of category error.**
  - Take care to ensure that you're speaking the same language.
  - *e.g., Trying to talk road warriors into bike commuting.*
- **Keep your message concrete, visual, and specific.**
  - Don't make users hunt for a reason why they need the service.
  - *e.g., "Sometimes you need a car." Like when, exactly?*



**Questions?**

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