

# 49<sup>th</sup> ASECAP DAYS

## *Decarbonizing Road Infrastructure: Challenges, Perspectives and Actions in a Tough Economy*



Motorway customers' acceptance towards highly automated vehicles

Conceição Magalhães

Brussels, 24 - 25 November 2022

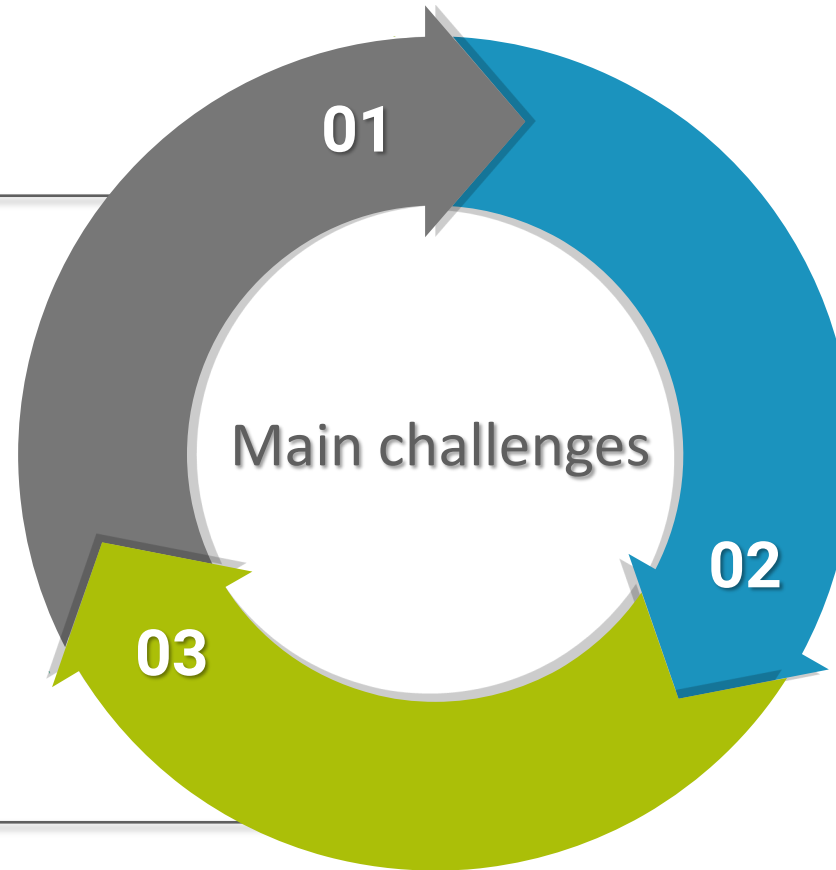


# 1 Introduction

## Problem definition

### Technological Revolution

*AVs entry onto public roads and overall removal of CVs*



### AVs deployment

*AVs generalization in real contexts is expected to start on motorways*

### AVs acceptance

*There is still considerable public hesitance towards AVs acceptance*

Legend: AVs - Autonomous vehicles; CVs - conventional vehicles

# 1 Introduction

## Motivation

### Safety



*Fatalities due to road accidents*



### Legal



*Institutional framework*

### Market



*Customers' acceptance of AVs*



# 1 Introduction

## Death toll in road accidents 2019-2021



### European Union (EU)

Road fatalities in 2021 fell by 13% compared to pre-pandemic period in 2019



### Portugal

Portugal is one of the five EU countries with better performance in reducing road fatalities



### EU motorways

No changes in road traffic fatalities occurred on motorways



↓ 13%



↓ 22%



= 8%

Source: European Commission.  
Mobility and Transport. Road Safety (March 22)

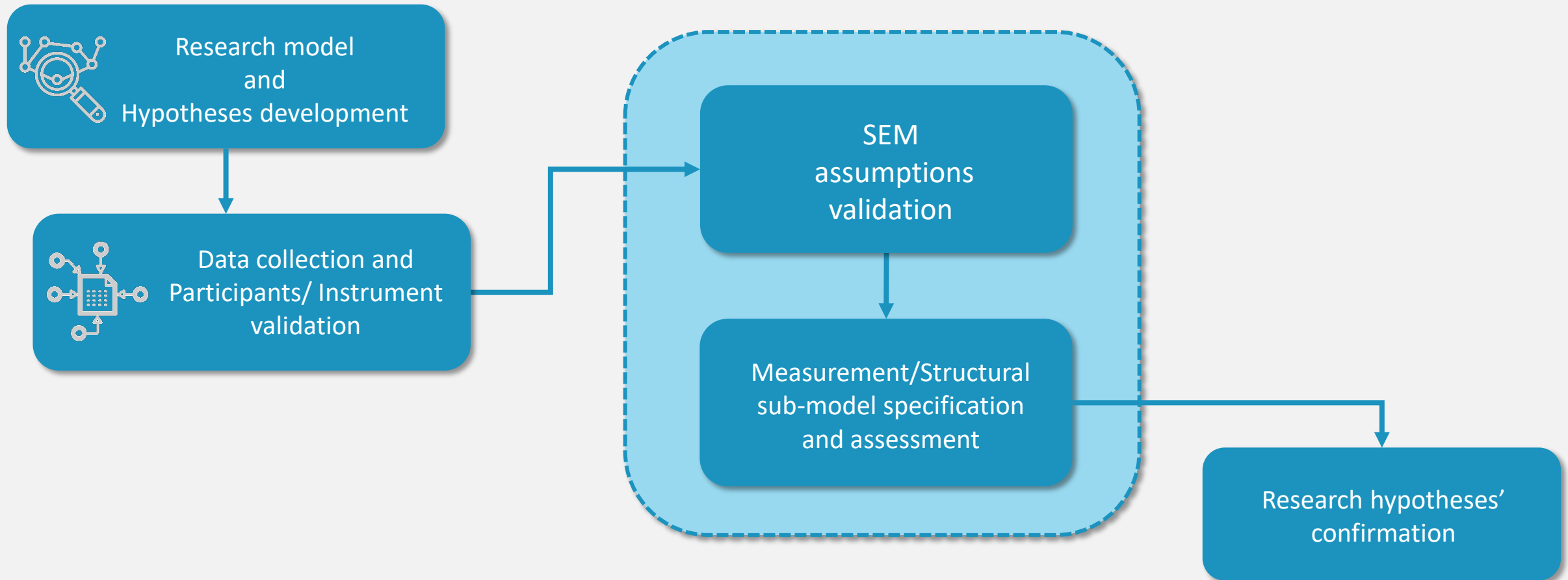
## *Research Question:*

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*Which factors act as  
drivers and inhibitors to  
highly automated vehicles  
motorway  
Customers' acceptance*

### 3 To address the challenge | Methodology

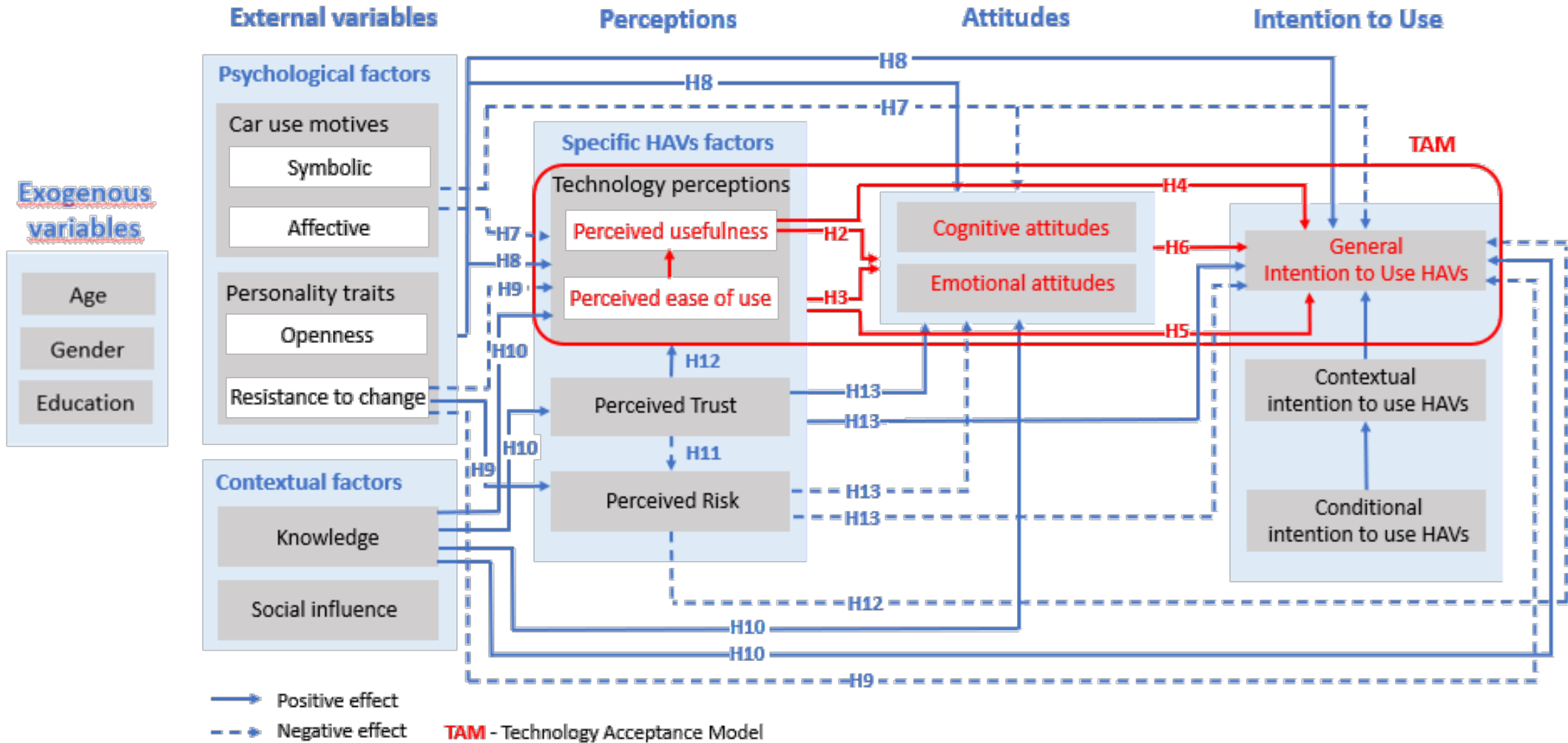
## Covariance-based SEM - Structural Equation Modelling evaluation



***An acceptance model approach was used to validate research hypotheses***

# 3 Methodology

## Research model and hypotheses development





# 3 Methodology

## Data collection procedure and sample



A quantitative questionnaire, consisting of 7 sections, was used as measuring instrument



An online survey was launched with 3370 valid answers



Respondents were recruited from Via Verde private user's database



Respondents' distribution by regions was generally like their elected deputies



Segmentation was based on elected deputies' volume for each Portuguese district



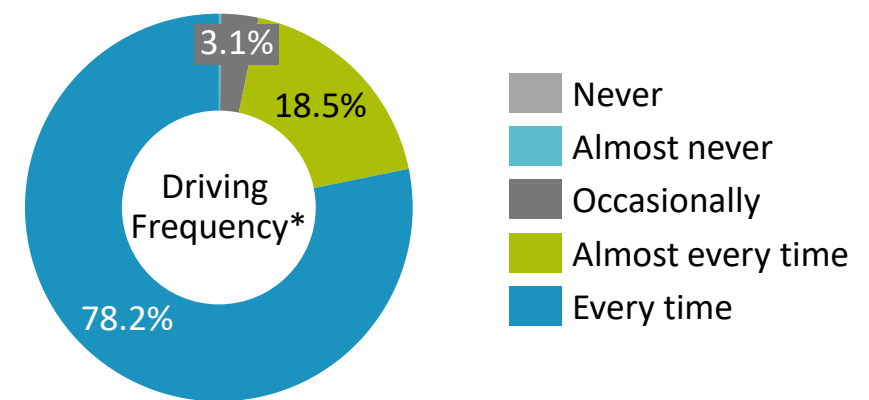
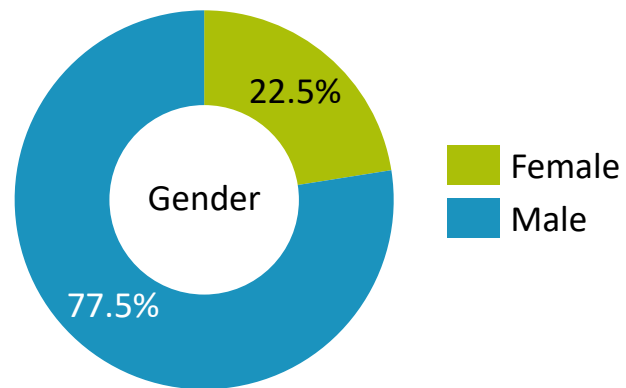
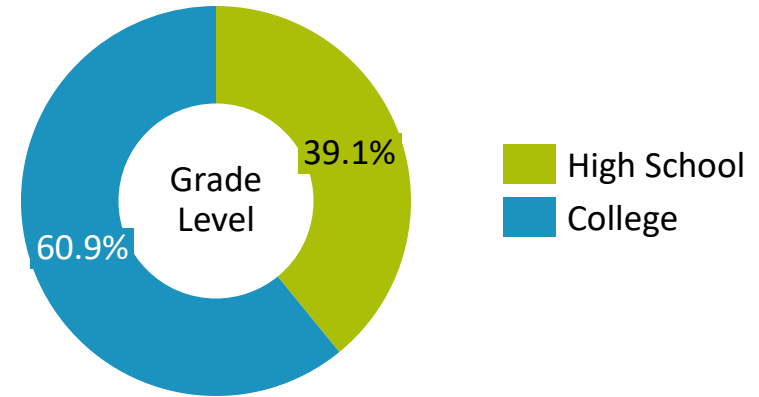
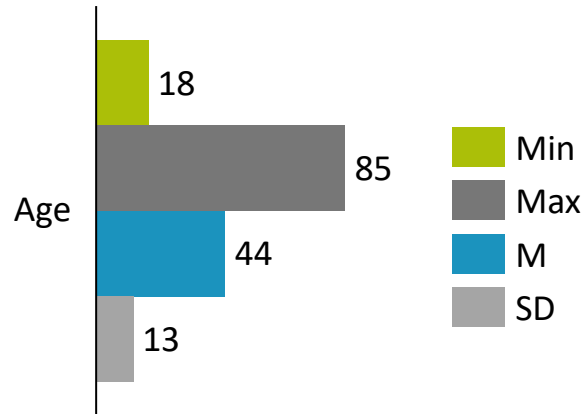
Database was cleaned for partial responses, outliers and respondents who never drive

***The total number of  
valid respondents used for  
analysis was 2991***

# 3 Methodology



## Participants' significant demographic characteristics\*



\*Driving frequency was not significant for the model but was very relevant for the study development

***Frequent drivers drive 50%  
of their day...***

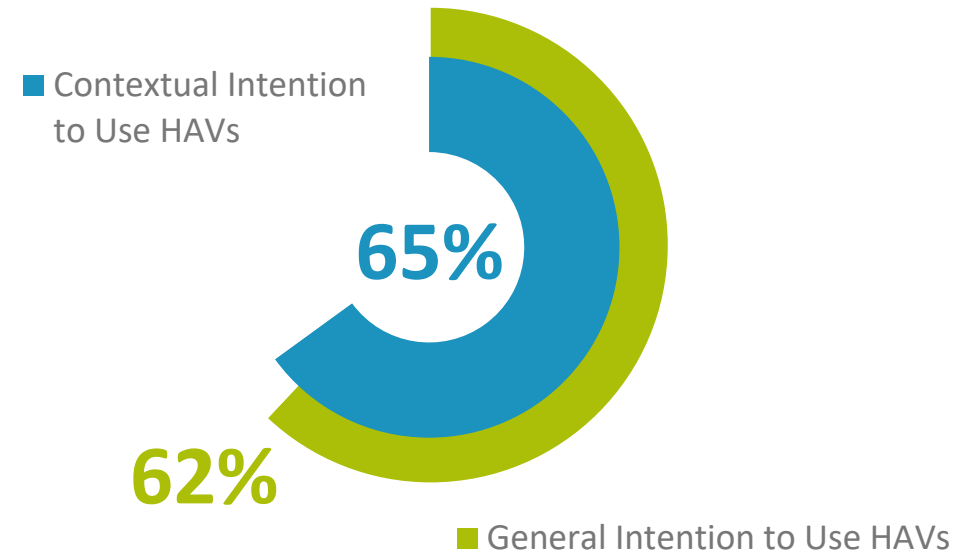
# 4 Results and Discussion

## Global-model fit assessment

Goodness of fit statistics/indexes	Estimated values	Reference values
$\chi^2/gf$	5.22	$\leq 5.00$ (reasonable fit)
CFI	0.95	$\geq 0.95$ (very good fit)
PCFI	0.83	$\geq 0.80$ (very good fit)
RMSEA	0.04	$\leq 0.05$ (very good fit)
Sample size/number of free parameters	14/1	5/1 (satisfactory)

Legend:  $\chi^2$  - Chi-square statistics; gf - degrees of freedom; CFI - Comparative Fit Index, PCFI - Parsimony CFI; RMSEA - Root Mean Square Error of Approximation

### Propose model's variance explained



***The model presents an adequate fit***



# 4 Results and Discussion

## Effects on general intention to use due to exogenous variables

01

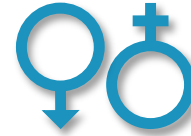


### AGE

**Older** motorway users

- show more knowledge, greater receptivity and trust towards HAVs
- consider HAVs easier to use and less risky
- feel HAVs like a status symbol

02



### GENDER

**Female** motorway users

- are more likely to prefer using HAVs
- are more likely to consider HAVs less risky
- found HAVs more difficult to use

03



### EDUCATION

**Higher educational level**

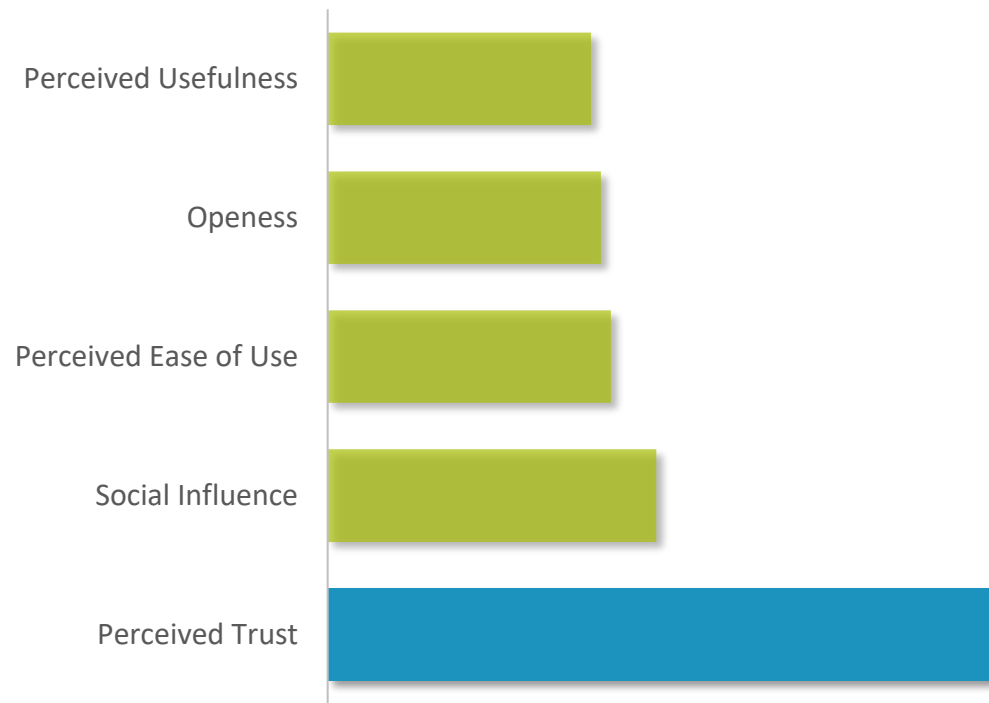
- correlates negatively with perceived risk
- drives new innovative technologies acceptance, such as HAVs

*Older female users,  
with a college degree,  
are more likely to accept HAVs*

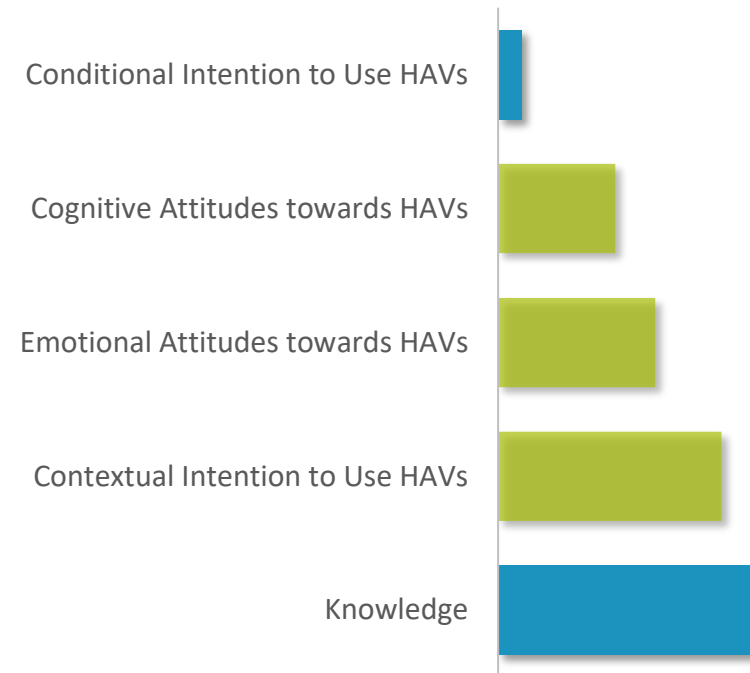
# 4 Results and Discussion

## Effects on general intention to use due to endogenous variables

### Key Drivers



■ Total Effect on General Intention to Use HAVs



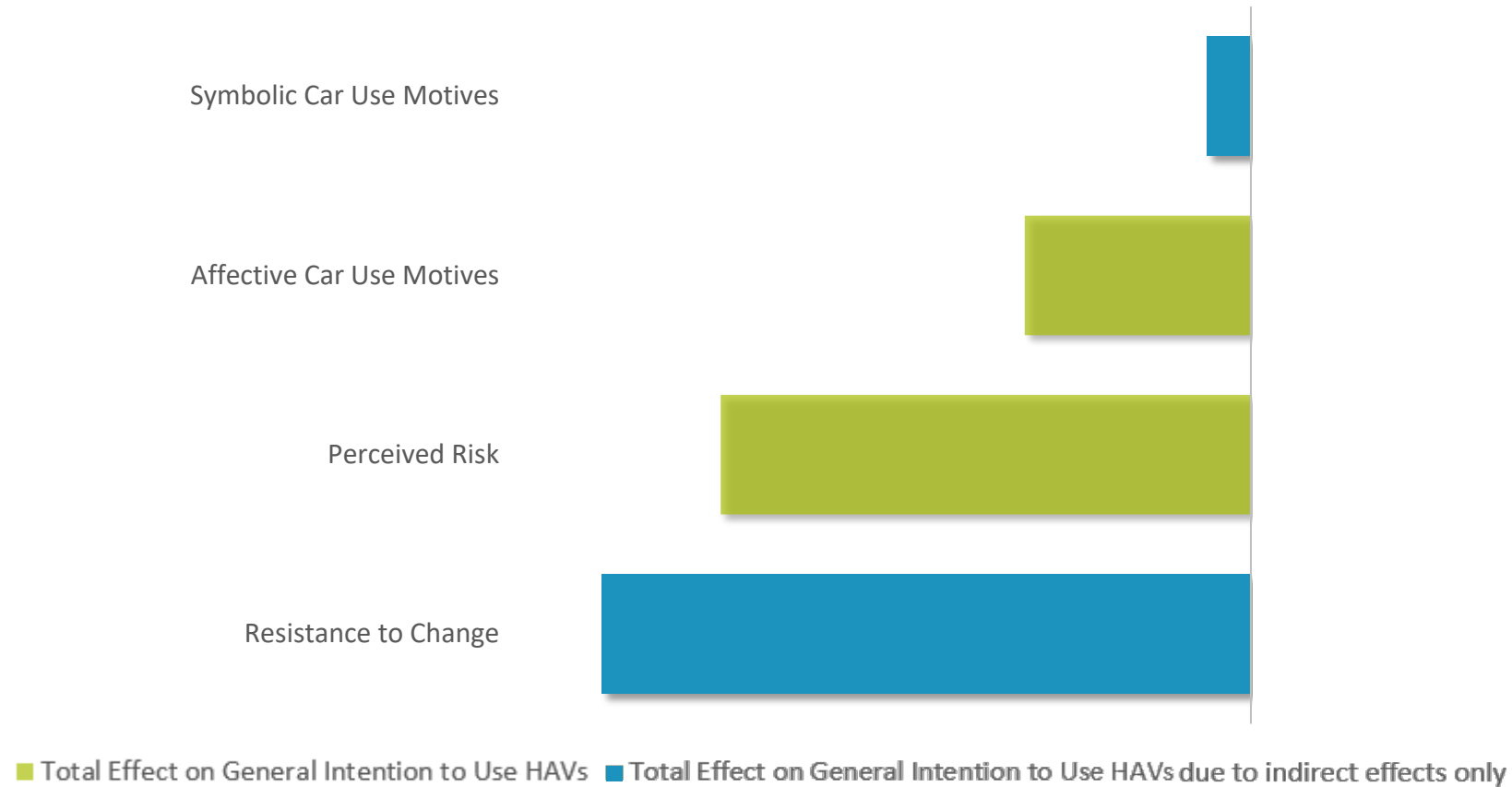
■ Total Effect on General Intention to Use HAVs due to indirect effects only

***Perceived trust  
is the strongest key driver of  
General Intention to use HAVs***

## 4 Results and Discussion

### Effects on general intention to use due to endogenous variables

#### Key Inhibitors



***Resistance to change  
is the strongest inhibitor of  
General Intention to use HAVs***



# 5 Conclusions and Recommendations

## Conclusions

01 | *Perceived trust* was found to be the most important factor that affects HAVs acceptance by motorway users

02 | *Social influence* had the second biggest effect on general intention to use HAVs

03 | *Perceived ease of use, Openness, Perceived usefulness, Knowledge* and *Contextual intention to use HAVs* are equally influential

04 | *Knowledge* alone is not enough to support the decision to use HAVs

# 5 Conclusions and Recommendations

## Conclusions

05

*Motorway users* prefer using HAVs both on motorways and in congested and monotonous driving situations

06

The *key inhibitors of HAVs acceptance* are found to be how receptive motorway users are to embrace new technologies, and the danger levels perceptions associated with these vehicles

07

*Affective car use motives are also inhibitors*, albeit with a substantially smaller magnitude

08

*Motorway users' passion for driving does not seem to be a barrier* to HAVs use

# 5 Conclusions and Recommendations

## Conclusions

09 | *Motorway user's socio-demographic profile* has a small effect size on *General Intention to Use HAVs*

10 | *Portuguese motorway users* have similar HAVs acceptance perception levels to those already evidenced in other countries

***Clearly communicate the  
technology's strengths  
and weaknesses***

***Increasing social pressure  
through marketing campaigns  
to promote autonomous driving as  
being safer than manual driving***

***Concentrate efforts on showing both the user-friendliness, the capabilities, and the benefits of using HAVs on motorways***



# *Providing motorway users with accurate and easy to understand information about HAVs*

***Encouraging the implementation of HAVs on motorways and/or on congested roads first***

***Carry out studies assessing  
AVs impact on road safety on  
congested motorways***

**Thank you!**