



Automation acceptance for sustainable digital daily life

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The Impacts of Digitalised Daily Life on Climate Change



European
Research
Council

Consolidator Grant #101003083

Digital daily life and automation

“Machine execution of functions or operations previously carried out by humans”



Photo by Héctor Achautla on Unsplash



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Automation and decarbonisation

Automation of domestic activities creates opportunities for decarbonisation



Manage, control, learn about energy
e.g., smart home technologies



Integrate homes into renewable grids
e.g., smart EV charging, time-of-use tariffs



Substitute for physical activity
e.g., shopping trips, route optimisation

Research objective

To improve understanding of the **factors which influence people's attitudes and acceptance of different activity automation** across daily life.

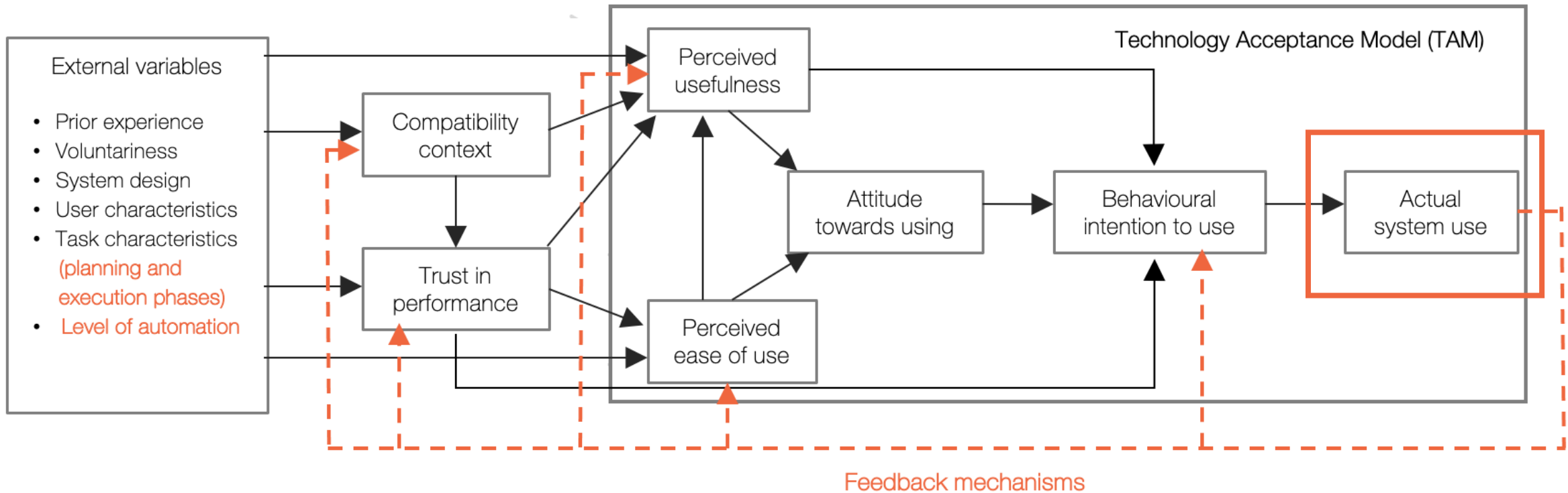
We investigate whether acceptance occurs, and whether it is more likely to occur:

1. at specific phases of activities (Bieser and Hilty, 2020);
2. with particular influencing factors (Ghazizadeh, Lee, Boyle, 2012)

Planning or
execution

Automation acceptance

Automation acceptance model (AAaaaM) (Ghazizadeh, et al., 2012)



iDODDLE Living Lab - Oxford

Households with wide ranging characteristics in real-world conditions in their own homes but committed to **trial, learn, interact and share data with the research team.**



- 47 households
- Longitudinal data (2022-25)
- In-depth qualitative data
- Exploratory research

Floor
cleaning



Grocery shopping



Data collection

June – Nov 2023

1



BEFORE
Home interview

2



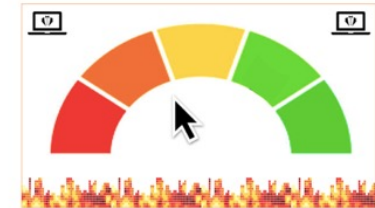
DURING
weekly tasks and app tracking

3

iDODDLE

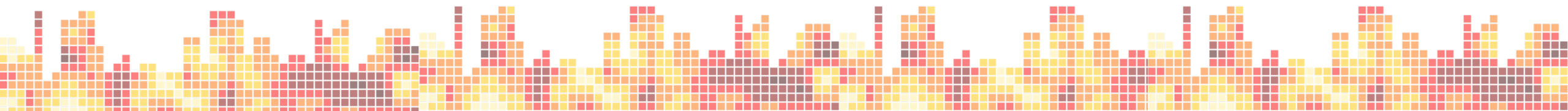
About your experience

During the home visit you were given a coloured dial and asked about your expectations BEFORE the trial.



Now that you have experienced the automation of meal planning and grocery shopping...

AFTER
Online survey



Results: Automation usage during trials

Activity aspects	Level of automation (LoA)		
	Pre-trial	Potential from trial innovation	Actual use during trial
Floor cleaning - Planning			
Awareness of dirt/dust	100%		100%
Decide when to clean	100%	Schedule	100%
Decide where to clean	100%	Schedule	80-99%
Remove items from floor	100%	100%	100%
Floor cleaning - Execution			
Retrieve brush/vacuum from storage	100%	Autonomous	Autonomous
Use brush or vacuum in desired area	100%	Autonomous	Autonomous
Follow a pattern (avoid missing areas)	100%	Autonomous	Autonomous
Empty dust collector	100%	100%	100%
Return brush/vacuum to storage	100%	Autonomous	Autonomous

Activity aspects	Level of automation (LoA)		
	Pre-trial	Potential from trial innovation	Actual use during trial
Grocery shopping - Planning			
Assess dietary needs	100%	Schedule	100%
Create meal plan	80-99%	Autonomous	80-99%
Make a shopping list	80-99%	Autonomous	Autonomous
Decide when to get ingredients	100%	Schedule	Schedule
Decide where to go shopping	100%		
Grocery shopping - Execution			
Travel to the store	100%		
Compare products/prices	100%	Autonomous	80-99%
Check expiry dates in store	100%	Autonomous	Autonomous
Select ingredients	100%	Autonomous	80-99%
Review cart before checkout	100%	Autonomous	80-99%
Go through checkout	100%	Schedule	Schedule
Pack ingredients	100%	Autonomous	Autonomous
Transport ingredients	100%	Autonomous	Autonomous
Unpack/store items	100%	100%	100%

LoA Key: 100% manual (L1), Schedule (L3), Autonomous (L5)

80-99% of participants

100% of participants

Results: Expectations vs. experience

1

3



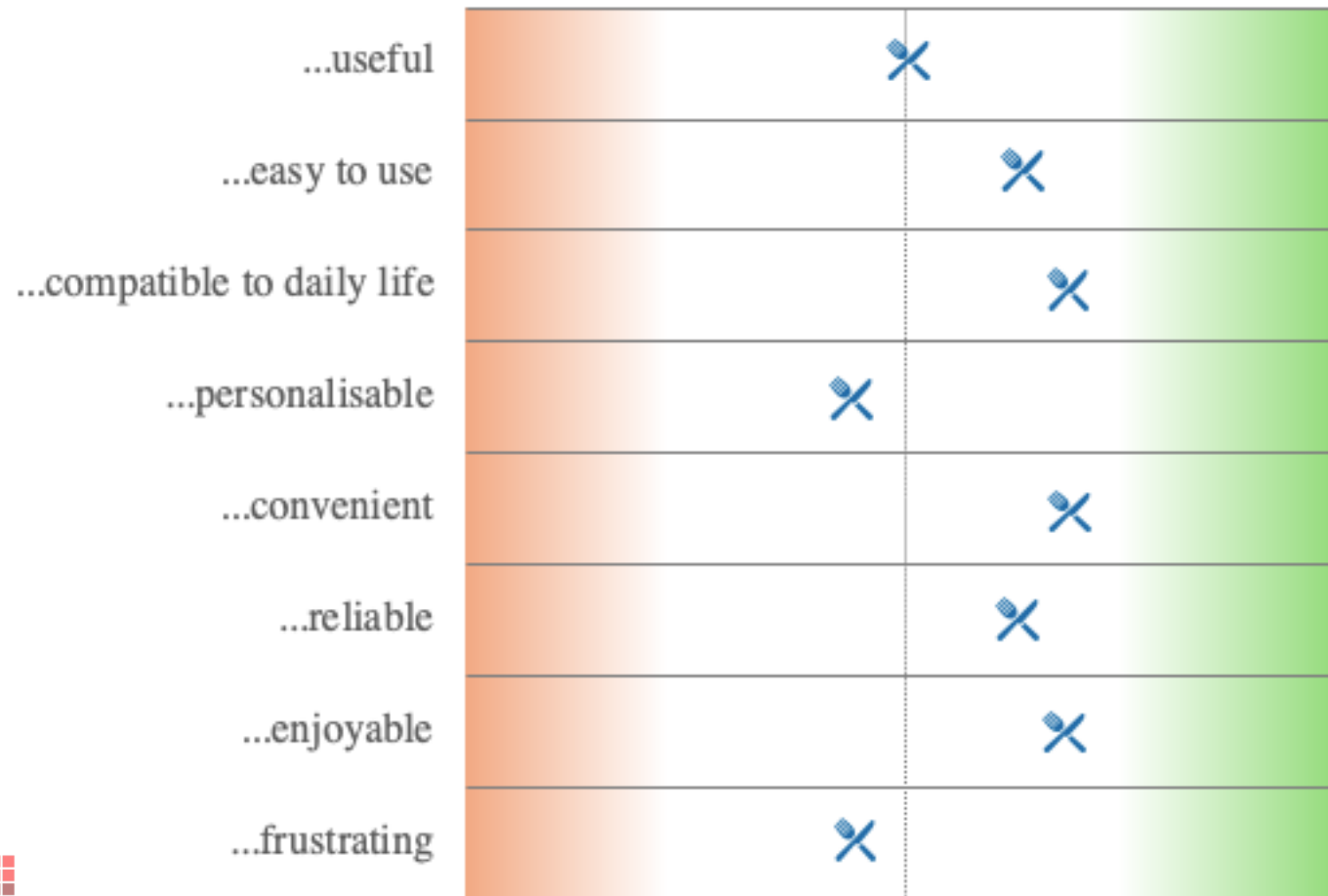
Post trial - "How ... was the[meal kit delivery/
robotic floor cleaner]?"

Less than expected

As expected

More than expected

Positive



Results: Expectations vs. experience

1

3

Post trial - "How ... was the[meal kit delivery/
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As expected

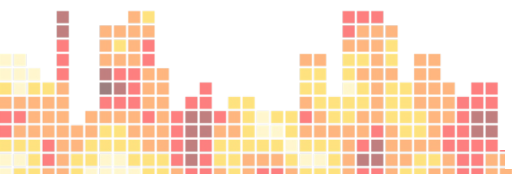
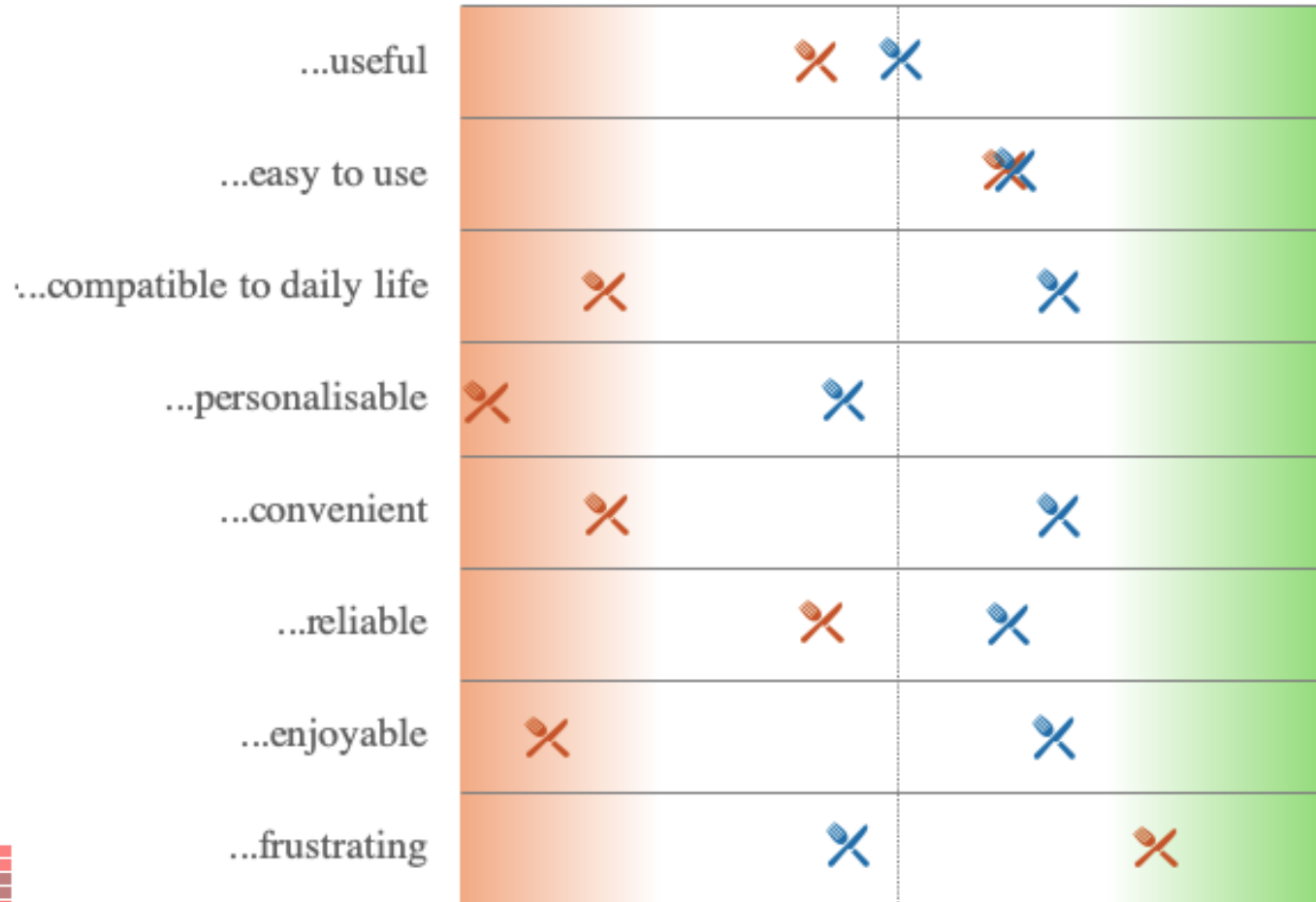
More than expected



Positive

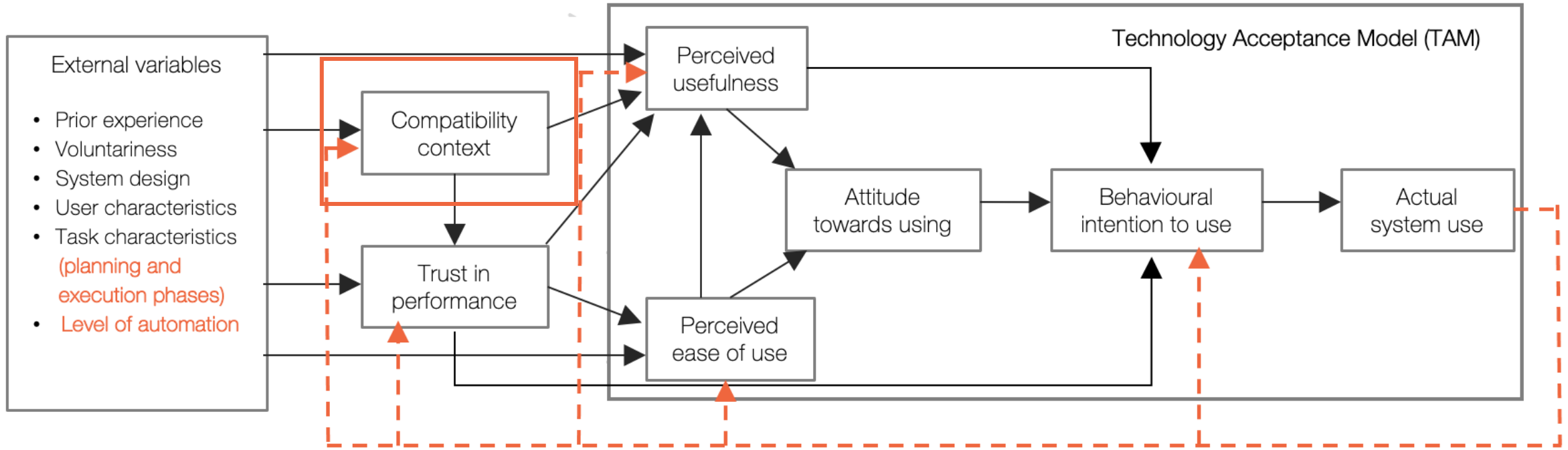


Negative

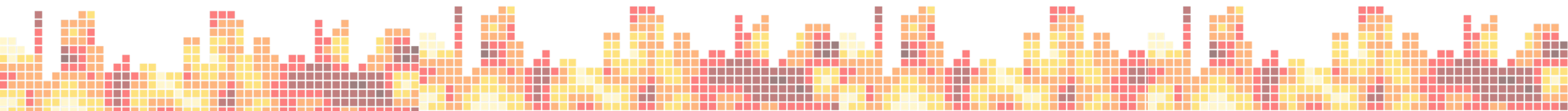


Results: Feedback mechanisms

2 3

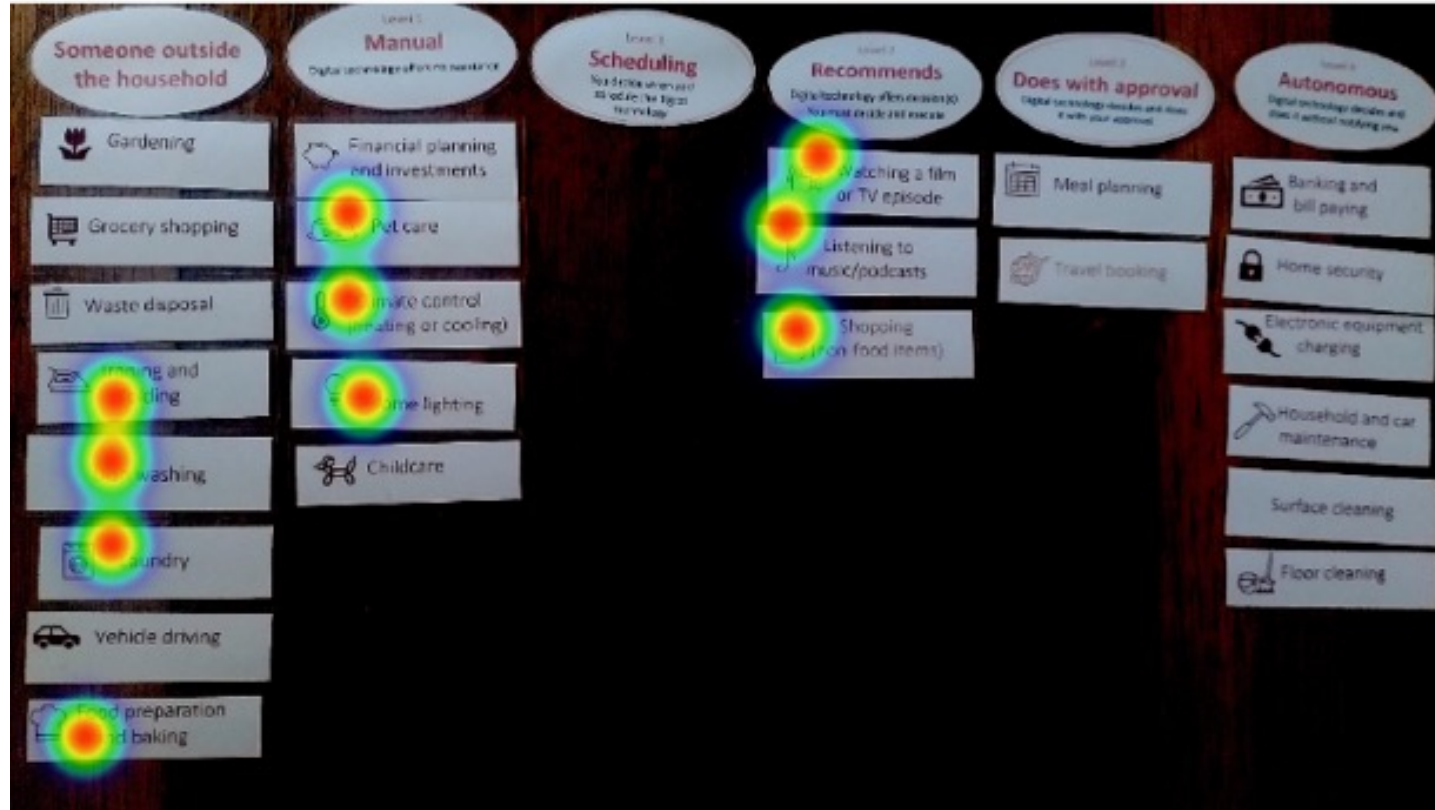


Feedback mechanisms



Results: Acceptance of additional activities

3



Example screenshot of the post-trial online survey hot spot mapping, eliciting change: increased automation acceptance.

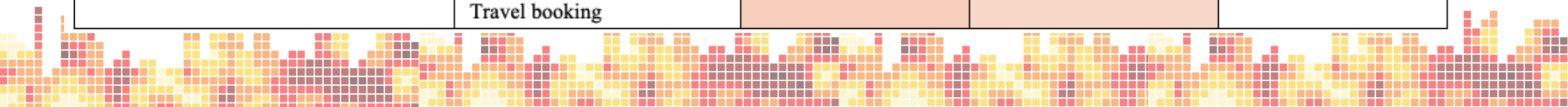


Results: Acceptance of additional activities

Activity domain	Activity	Robotic floor cleaner (positive)	Meal kit delivery (positive)	Meal kit delivery (negative)
Entertainment, media	Listening to music/ podcasts			
	Watching a film/ TV episode			
Managing home - non-energy intensive	Waste disposal			
	Surface cleaning			
Retail - other	Shopping			
Retail - food & drink	<u>Grocery shopping</u>			
Managing home - lighting, devices, appliances (exc. food-related)	<u>Floor cleaning</u>			
	Laundry			
	Ironing and folding			
	Gardening			
	Charging devices			
	Home security			
	Home lighting			
Managing home - cooking, dishwashing, other food-related	Meal planning			
	Food prep and baking			
	Dish washing			
Managing home – heating, cooling, etc.	Climate control			
Travel	Vehicle driving			
	Travel booking			

1

3



The novelty and unique contributions

- 1) empirical mixed methods data using AAM
- 2) considering the automation of different phases of an activity and their acceptance
- 3) a focus on automation of daily life activities which are under researched through the lens of sustainable energy system

Key reflections

- *Offer customisable levels of automation*
- *Address expectation-reality gaps*
- *Challenges for acceptance spillover*



Thank you for listening!

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Extra slides



Levels of automation

Level of automation	Description	Explanation
L1	Manual	No ICT automation
L2	Recommends	ICT offers decision, user decides and executes
L3	Schedule	User decides planning, ICT executes
L4	Autonomous with approval	ICT decides and executes with user's approval
L5	Autonomous with override	ICT decides, executes but user can override if desired

Living lab households

Activity automation trial	ID	Household composition (f=female, m=male, age)	Prior automation experience ^a	Prior activity intensity ^b
Floor cleaning – Smart robotic floor cleaner	101	Couple (f,m 30s) one toddler	Medium	High
	103	Couple (f,m 40s) two children <12	Low	High
	106	Couple (f,m 50s) empty nesters	High	Medium
	112	Couple (f,m 30s)	Medium	Low
	119	Couple (f,m 40s) one teenager	Medium	High
	132	Couple (f,m 60s)	Low	High
	136	Couple (f,m 40s) two children <12	High	Medium
	142	Couple (f,m 30s)	High	Medium
	143	Single (f, 50s) empty nester	Low	Low
	144	Single (f, 40s) one child <12, one teenager	Low	Low
Grocery shopping - Meal kit delivery	107	Couple (f,m 40s) two children (<12)	High	Medium
	110	Single (f, 30s)	Low	Low
	115	Couple (f,m 40s) one child <12, two teenagers	High	High
	121	Couple (f,m 30s) one toddler	High	Medium
	122	Single (f, 40s) two children <12	Medium	High
	123	Single (m, 70s)	Low	Medium
	125	Couple (f,f 20s)	Low	Medium
	130	Couple (f,m 20s)	Medium	Low
	139	Couple (f,m 50s) three teenagers	Medium	High
	147	Single (f, 70s)	Low	Low

Results: Expectations vs. experience



Pre-trial - "How ... do you think the [meal kit delivery/
robotic floor cleaner] will be?"



Post trial - "How ... was the [meal kit delivery/
robotic floor cleaner]?"

