iDODDLE

The Impacts of Digitalised Daily Life on Climate Change

SYNTHESIS REPORT

October 2025

iDODDLE.org

eci UNIVERSITY OF OXFORD
Environmental Change Institute
School of Geography and the Environment

erc
European Research Council
Established by the European Commission
Consolidator Grant 101003083

0.1 Introducing iDODDLE: a four year research project on digitalisation in daily life and climate change.

WHAT IS THE iDODDLE PROJECT?

iDODDLE is a scientific research project based in Oxford that ran from 2021 to 2025. iDODDLE stands for 'The Impacts of Digitalised Daily Life on Climate Change'.

WHAT IS THE PREMISE OF THE iDODDLE PROJECT?

Digitalisation is a major trend shaping daily life that needs to align with efforts to tackle climate change. This means understanding the ways in which digitalised daily life impacts energy use and carbon emissions, and the conditions under which these impacts are beneficial or detrimental.

WHAT IS THE AIM OF THE iDODDLE PROJECT?

iDODDLE seeks to understand the relationship between digitalisation and carbon emissions at both micro (household) and macro (systems) scales. Using new evidence generated through living lab field trials, nationally-representative surveys, online experiments, co-design and expert workshops, and other methods, iDODDLE aims to build an evidence-based programme of action for positive digital-climate futures.

WHO IS THE iDODDLE TEAM?

iDODDLE is a team of researchers based in the Environmental Change Institute at the University of Oxford. Prof Charlie Wilson is the Principal Investigator. Dr Emilie Vrain and Dr Mariana Gaytán Camarillo are postdoctoral researchers. Felippa Amanta, Poornima Kumar, and Marcel Seger are PhD researchers. The core iDODDLE team also benefitted from numerous contributions from and collaborations with other researchers including Uttara Narayan, Brendan Lawson, and Vinicius Juliani Pereira.

HOW IS iDODDLE FUNDED?

The iDODDLE project was made possible by generous funding support from the European Research Council (ERC) through Consolidator Grant #101003083.

WHAT IS IN THIS SYNTHESIS REPORT?

Most of this report is dedicated to the insights generated by new research conducted by the iDODDLE team. These insights are organised in six sections, each framed by a question on digitalised daily life and climate change. An introductory section provides an overview of the methods and approaches used throughout the project, including the iDODDLE team's major data collection efforts.

HOW SHOULD I CITE THIS SYNTHESIS REPORT?

Wilson C., F. Amanta, M. Gaytán Camarillo, P. Kumar, M. Seger and E. Vrain (2025). iDODDLE synthesis report on digitalisation of daily life and climate change. Oxford, UK.

0.2 iDODDLE insights on digitalised daily life and climate change, organised by research questions.

CONTENTS

0.3 iDODDLE empirical focus on household activities as part of digitalised daily life.

Label*	Activity	Energy or carbon footprint	Extent of digitalisation	New empirical research in iDODDLE on digitalised daily life	Additional secondary data analysis in iDODDLE
ACT-1	Communication, socialising	low	high	agentic AI	yes
ACT-2	Information search, provision	low	high	-	yes
ACT-3	Entertainment, media	low	high	on-demand media services	yes
ACT-4	Recreation, leisure, hobbies	low	medium	-	-
ACT-5	Health, fitness	low	low	-	-
ACT-6	Work (paid)	medium	medium	-	yes
ACT-7	Education, study, learning	low	medium	-	-
ACT-8	Retail				
ACT-8.1	Retail - food & drink	medium	medium	on-demand food services	yes
ACT-8.2	Retail - other	medium	medium	e-commerce next day delivery	yes
ACT-9	Managing home				
ACT-9.1	Managing home - energy: heating, cooling, hot water, own energy (e.g., PV)	high	low	smart thermostats, demand flexibility	yes
ACT-9.2	Managing home - devices: lighting, appliances, tech	high	medium	smart plugs, peer-to-peer platforms	yes
ACT-9.3	Managing home - food-related: cooking, dishwashing, other	high	low	agentic AI, meal kit delivery, food waste reduction apps	yes
ACT-9.4	Managing home - routines: cleaning, washing, childcare, finances, other	high	low	automated vacuum cleaners	yes
ACT-10	Travel				
ACT-10.1	Work-related	high	medium	electric vehicle smart charging	yes
ACT-10.2	Not work-related	high	low	ridehailing, bike sharing	yes

* ACT = activity categorisation synthesised from different fields: energy sociology, household expenditure, time use, energy demand modelling, digital services

0.4 iDODDLE analytical perspectives on digitalisation in daily life with relevance for climate change.

TABLE I. MAIN FEATURES OF SOCIAL SCIENCE APPROACHES STUDYING DIGITAL DAILY LIFE

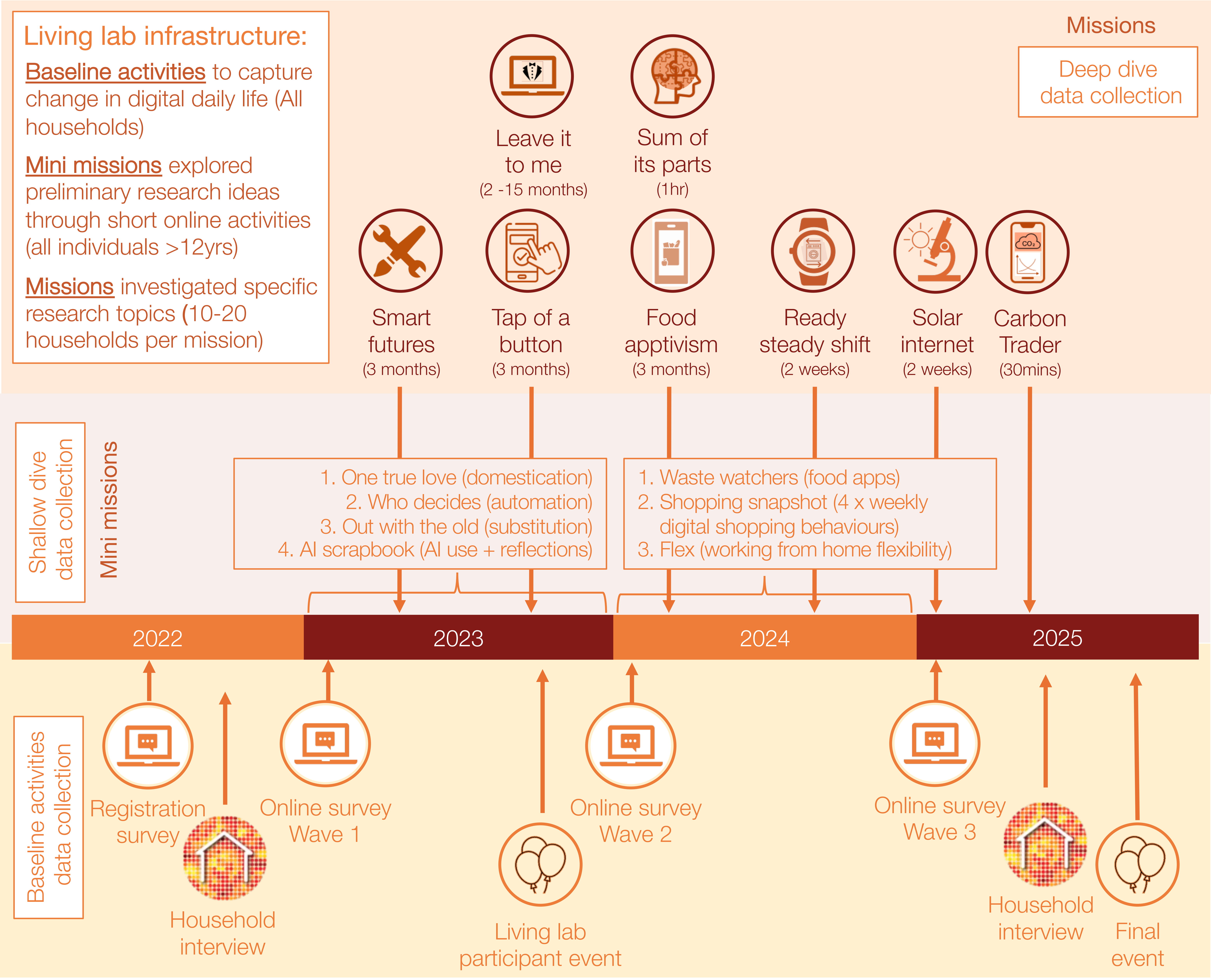
	Time use	Social practice	Innovation adoption	Domestication theory	Digital anthropology
Key research question	How do individuals spend their time?	What meanings do people ascribe to their practices?	What are the reasons for innovation adoption?	How do technologies and users co-evolve?	What do digital devices do to the experience of human being?
Methods: Main research methods	Self-reported time diaries	Interviews	Online surveys	Field trials, interviews, observations	Ethnography (online and offline)
Analysis: Main variable(s) and units of analysis	Time allocation of activities, activity type	Practice(s), materials, competences, meanings	Adoption propensity, attributes, personal characteristics, social system	Cognitive, practical, symbolic learning, technology usage and experiences	Individual’s context
Insights: How ICT shapes daily life?	Saves and fragments time, relaxes time constraints, increases multitasking	Practices emerge, persist, shift or disappear	Dependent upon the adoption of digital devices	Users and the technologies co-evolve, shaping each other in an on-going process	Provide autonomy, shift gender roles and power dynamics, enable capabilities
Insights: Why digitalisation is integral to daily life?	Increased pace of life	Changes in competences and meanings	Perceived positive innovation attributes	Familiarisation of functionality	New norm formation, cultural contexts

0.5 iDODDLE research methods used to collect and analyse data.

Page #	Page title	Data collection	Data analysis
How can the energy and climate impacts of digitalisation be assessed?			
1.1	Digital-climate impact mechanisms	literature review	(conceptual framework)
1.2	Quantitative digital-climate impact estimates	secondary data on impact estimates and uncertainties	comparative synthesis
1.3	Testing for bias in digital-climate impact estimates	secondary data on impact estimates and co-variates	statistical analysis (difference testing)
What are the opportunities and risks for climate from new digital applications?			
2.1	Automation, control, and energy use	living lab field trials, videos, behavioural logs, smart plugs	mixed methods (qual-quant triangulation)
2.2	Agentic AI for reducing carbon footprints	online survey experiment on agentic AI	statistical analysis (ANOVA, linear regression)
2.3	Electric vehicle workplace charging objectives	field trial with automotive manufacturer	optimisation modelling
2.4	Expectations of digital on-demand services	living lab field trials, interviews	thematic coding
2.5	Home automation and time rebound	living lab field trials, time use diaries, automation apps	mixed methods (qual-quant triangulation)
Why do people use climate-beneficial digital applications?			
3.1	Predictors of digitalised daily life in households	omnibus survey on digitalised daily life	statistical analysis (structural equation modelling)
3.2	Rebound effects of cost-saving digital applications	participatory system dynamic mapping	causal loop diagrams
3.3	Workplace charging decision support systems	firm interviews & system useability surveys	mixed methods (qual-quant triangulation)

Page #	Page title	Data collection	Data analysis
What underlying mechanisms explain digital impacts on climate?			
4.1	Mapping digital-climate impact mechanisms	secondary data on impact linkages	relationship mapping & visualisation
4.2	Interacting social and technological learning	secondary data on household heterogeneity	system dynamic modelling
4.3	AI data privacy concerns	online survey experiment on AI data use	statistical analysis (structural equation modelling)
4.4	Trust in digital-climate adoption	omnibus survey on digitalised daily life	statistical analysis (factor analysis, linear regresssion)
How do households vary in their digitalised daily life relevant to climate?			
5.1	Households' digital life trajectories	living lab longitudinal study, multi-wave surveys	mixed methods (qual-quant triangulation)
5.2	Time scarcity and use of digital on-demand services	online survey of digital service users and nonusers	statistical analysis (linear regression)
5.3	Predictors of digitalised daily life to reduce carbon footprints	omnibus survey on digitalised daily life	statistical analysis (clustering & factor analysis)
What are the opportunities and risks of digitalisation for climate at a systems scale?			
6.1	Digital-climate futures	expert workshop	causal loop diagrams
6.2	Electric vehicle workplace charging tradeoffs	electricity load profiles, charging tariffs	trade-off analysis
6.3	Global digital divides	secondary data on digital transformation	statistical analysis (fixed effect panel model)
6.4	AI-climate systemic risks	literature review and database	relationship mapping & visualisation

0.6 iDODDLE new data collection (1): field trials with living lab households.



Living lab composition:

	Recruited 2022	Completed 2025
Total households	47	41
Modern: 25 - 45yr old(s)	16	16
Modern: 25 - 45yr old(s) with child(ren)	8	6
Postmodern: 46 - 65yr old(s)	7	6
Postmodern: 46 - 65yrs with older children	9	8
Seniors: +65yr old(s)	7	5
Total Individuals	101	72
Adults (over 18 yrs old)	73	59
12 – 18 yrs old	9	6
Under 12 yrs old	19	7

Mission descriptions:

Name	Topic	Mission Type
Smart futures	Imaginaries of digital homes	Co-design workshop
Leave it to me	Automation acceptance & impacts on time + energy	Automation trial
Tap of a button	Domestication of on-demand services	On-demand service trial
Sum of its parts	Systems mapping of factors influencing acceptance of digital tech	Interview
Food apptivism	Food app impacts on household routines	11th hour food app trial
Ready steady shift	Flexibility of household energy use	Shift use of appliances challenge
Solar internet	Internet use under constraints	Restricted internet trial
Carbon Trader	Acceptance of digitally enabled personal carbon trading	Interview

Data availability: https://idoddle.org/living-labs

0.7 iDODDLE new data collection (2): omnibus survey on digitalised daily life.

Independent Variables

- Agency, control
- Technology attitudes
- Social influence
- Technology acceptance

Control Variables

- Trust
- Privacy, data
- Contextual factors
- Personal situation

Dependent Variables = components of digitalised daily life (DDL)

- Digital devices, access
- Digital activities
- Digital skills, confidence
- Digital culture

Digitalised daily life for climate change (DDL-CC)

0.8 iDODDLE new data collection (3): agentic AI experiment.

Overview

July 2025

Online survey

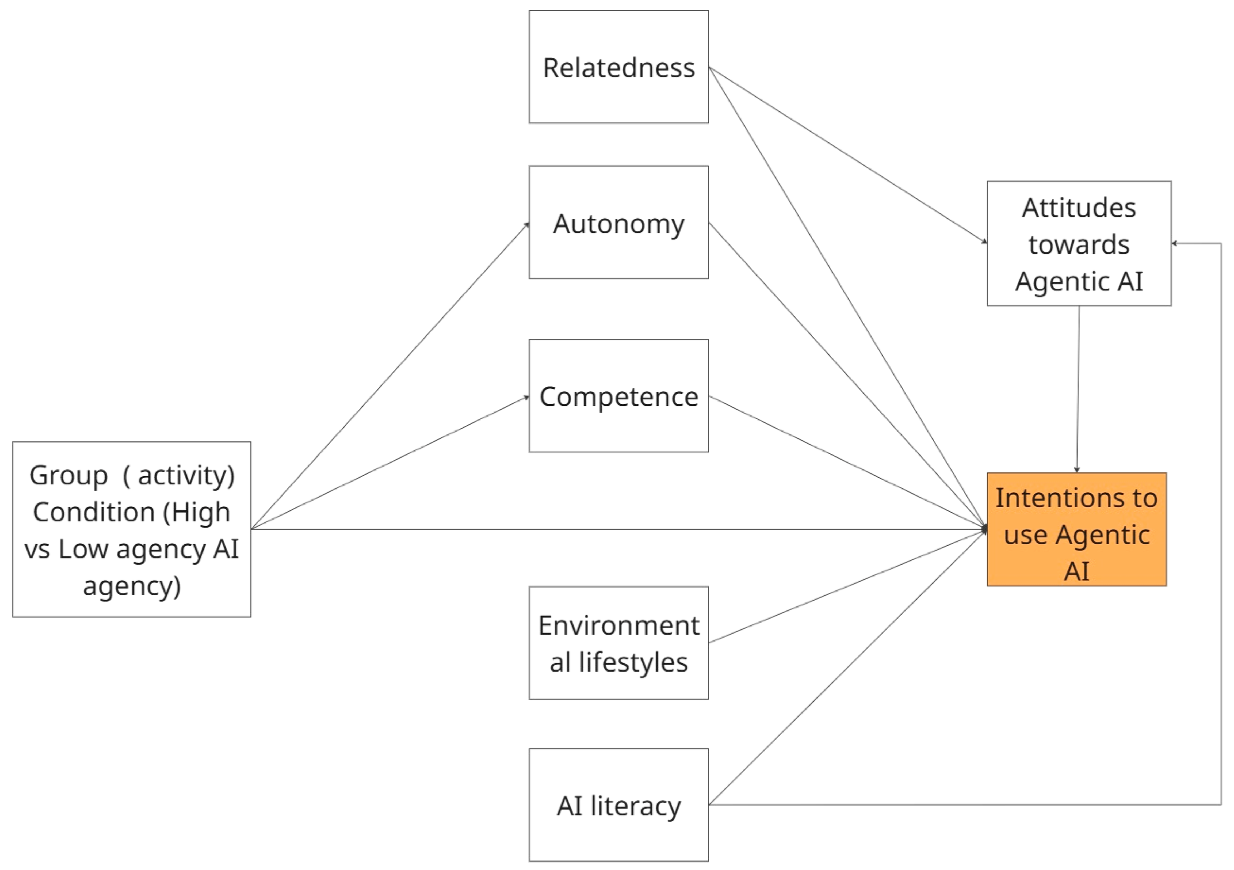
UK nationally representative on gender, age

N=1522

https://zenodo.org/records/16752046

Data availability

Hypothesised influence of psychological needs on intentions to use agentic AI



Agentic AI vignettes for 3x2 experimental groups

	High agency AI	Low agency AI
Scenario 1: Food Choices	*Roboshop* analyses your dietary preferences, past grocery purchases, and local seasonal availability. It then **autonomously sets** weekly plans and grocery lists, selecting sustainable ingredients. *Roboshop* **places grocery orders without you needing to approve** the purchase.	*Roboshop* analyses your dietary preferences, past grocery purchases, and local seasonal availability. It then **suggests** weekly plans and grocery lists selecting sustainable ingredients. Roboshop **asks you to review and approve** them before purchase.
Scenario 2: Digital Footprints	While streaming a movie, you see a notification: "Streaming in 4K emits 3x more CO_2 than 1080p. To lower your digital carbon footprint, *ClearCloud* **has switched** your video to 1080p. Estimated savings: 40% less energy."	While streaming a movie, you see a notification: "Streaming in 4K emits 3x more CO_2 than 1080p. To lower your digital carbon footprint, *ClearCloud* **recommends switching** your video to 1080p. **Would you like to do this?** Estimated savings: 40% less energy."
Scenario 3: Email Management	*TidyTom* categorises, deletes, and prioritises emails **without requiring your approval**.	*TidyTom* scans your inbox and **suggests** how you should categorise, delete, and prioritise emails, **but you have the final say**.

Basic psychological needs

Relatedness:
connecting with or caring about other people or systems

Autonomy:
free decision-making power over one's own actions, which generates internal motivation

Competence:
perceived ability to perform tasks effectively while also achieving desired outcomes

SECTION 1.

How can the energy and climate impacts of digitalisation be assessed?

CONTENTS

1.1 Digitalisation can either help or hinder energy-reduction efforts depending on user behaviour and systemic preconditions of access, trust, control, and agency.

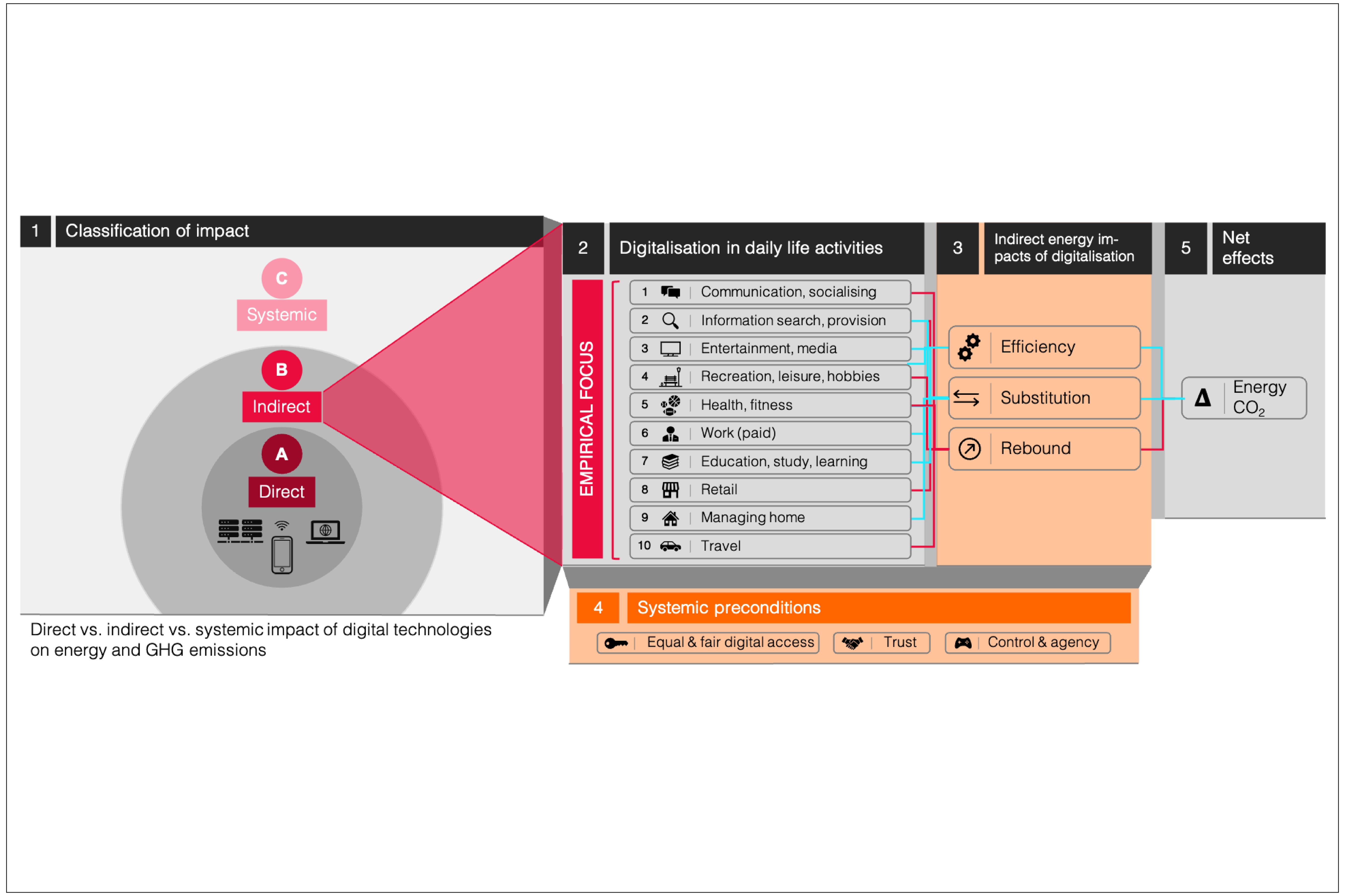


Figure. Conceptual framework of the indirect impacts of digitalisation in daily life on energy and greenhouse gas (GHG) emissions through efficiency, substitution, and rebound effects. The indirect impacts are shaped by wider systemic preconditions.

WHAT WE DID

- We mapped the indirect energy impacts of household activities being transformed through digitalisation.
- We synthesised evidence on the environmental impacts of digitalisation for each activity under different conditions.

WHAT WE FOUND

- Digital innovations can increase efficiency, substitute energy-intensive activities, or facilitate low-carbon lifestyle changes, but can also induce more consumption.
- Digitalisation in home energy management, mobility, and retail have significant implications for energy use.
- Communication and information search can enable or inhibit other energy-intensive activities.
- The extent to which people integrate digital applications into daily life depends on enabling factors such as trust, fairness, and control that are systemic preconditions.

SO WHAT?

- Steer digitalisation towards reducing energy consumption through policies that align digital growth, environmental impacts, and social wellbeing.
- Assess indirect and systemic energy impacts of digitalisation to understand climate impacts.

OUTPUT

Amanta, F., P. Kumar, M. Seger and E. Vrain (2024). “The impacts of digitalised daily life on climate change”. The British Academy. London, UK.
https://doi.org/10.5871/digital-society/9780856726880.001

LINKS

https://iDODDLE.org/new-paper-the-impacts-of-digitalised-daily-life-on-climate-change/

https://www.thebritishacademy.ac.uk/documents/5500/Digital-Society-Amanta-et-al.pdf

1.2 Digital applications are a double-edged sword for climate, with both beneficial and detrimental impacts.

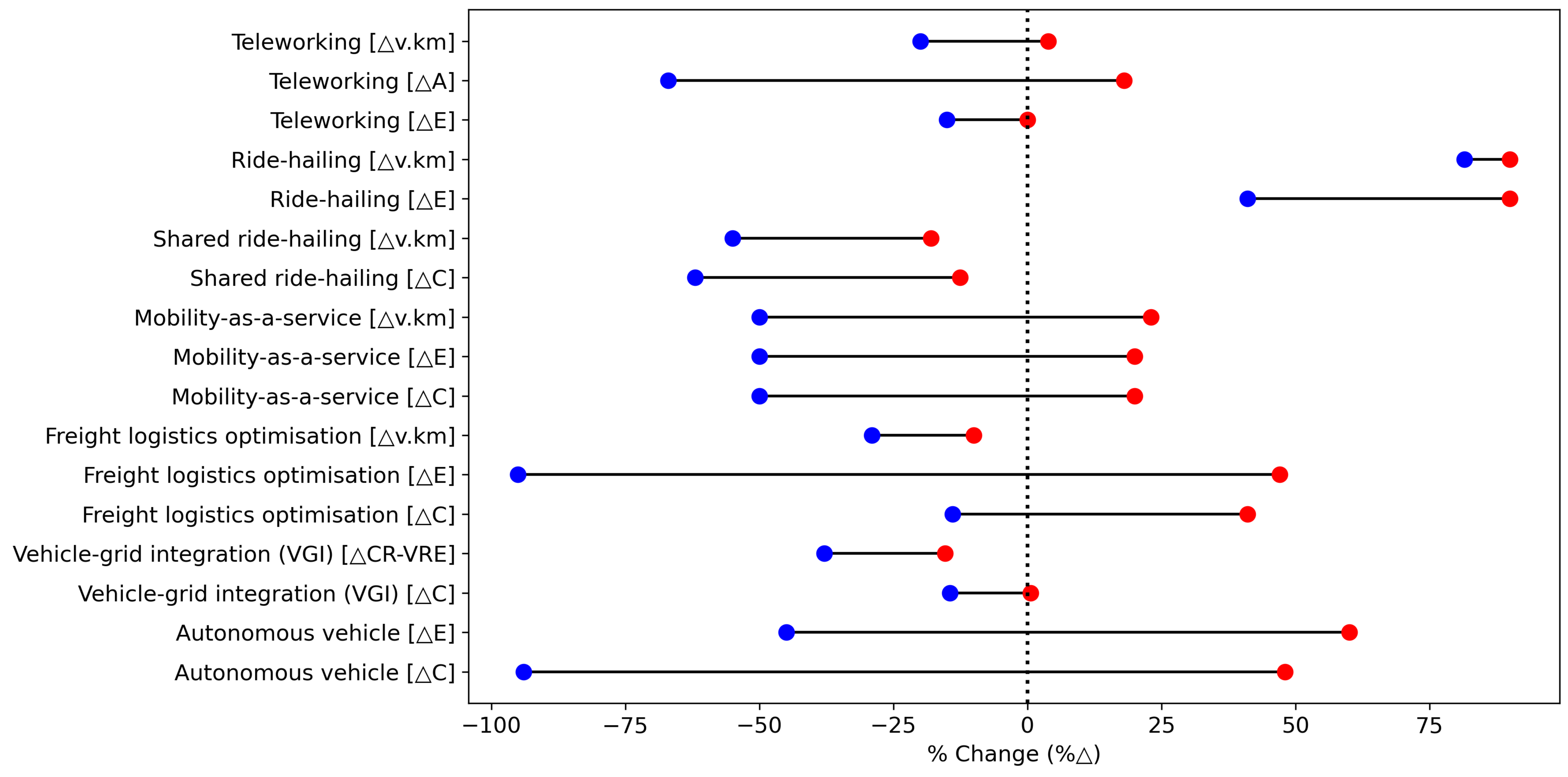


Figure. Indirect impacts of transport-related digital applications on activity (ΔA or Δv.km), energy (ΔE), or carbon emissions (ΔC = change in carbon emissions, ΔCR-VRE = change in curtailment rate of variable renewable energy).

WHAT WE DID

- We synthesised evidence from 150 studies that quantified the energy and climate impact of over 25 digital applications in buildings, transport, and industry.
- We analysed the conditions explaining both the most beneficial energy-reducing impacts and the most detrimental energy-increasing impacts for each application.

WHAT WE FOUND

- Normalising impact estimates into % changes relative to a no-digitalisation reference case allows impacts to be compared across digital applications and contexts.
- Most digital applications can have either beneficial or detrimental impacts for climate depending on their deployment context and users' behavioural response.
- Digital applications in the transport sector like shared ridehailing apps and mobility-as-a-service platforms have particularly wide impact uncertainty ranges.
- Beneficial impacts are diluted when scaling from applications to sectors, so in isolation are not transformative for climate.

SO WHAT?

- Shape the deployment context of digital applications to limit or manage rebound and induced demand effects.
- Exploit synergies between digital impacts on energy use and other decarbonisation enablers like flexible electricity demand to maximise beneficial impacts.

OUTPUT

Wilson, C., M. Agnew, F. Amanta, Y. V. Fan, P. Kumar and M. Seger (2024). "Evidence synthesis of indirect impacts of digitalisation on energy and emissions". ICT4S 2024: ICT for Sustainability. Stockholm, Sweden. 24-28 June 2024. https://doi.org/10.1109/ICT4S64576.2024.00021

LINK

https://iDODDLE.org/how-does-digitalisation-impact-energy-demand-our-synthesis-of-the-evidence/

1.3 Study designs bias insights on digitalisation's climate impacts - the narrower the system boundaries, the more beneficial the estimated impact.

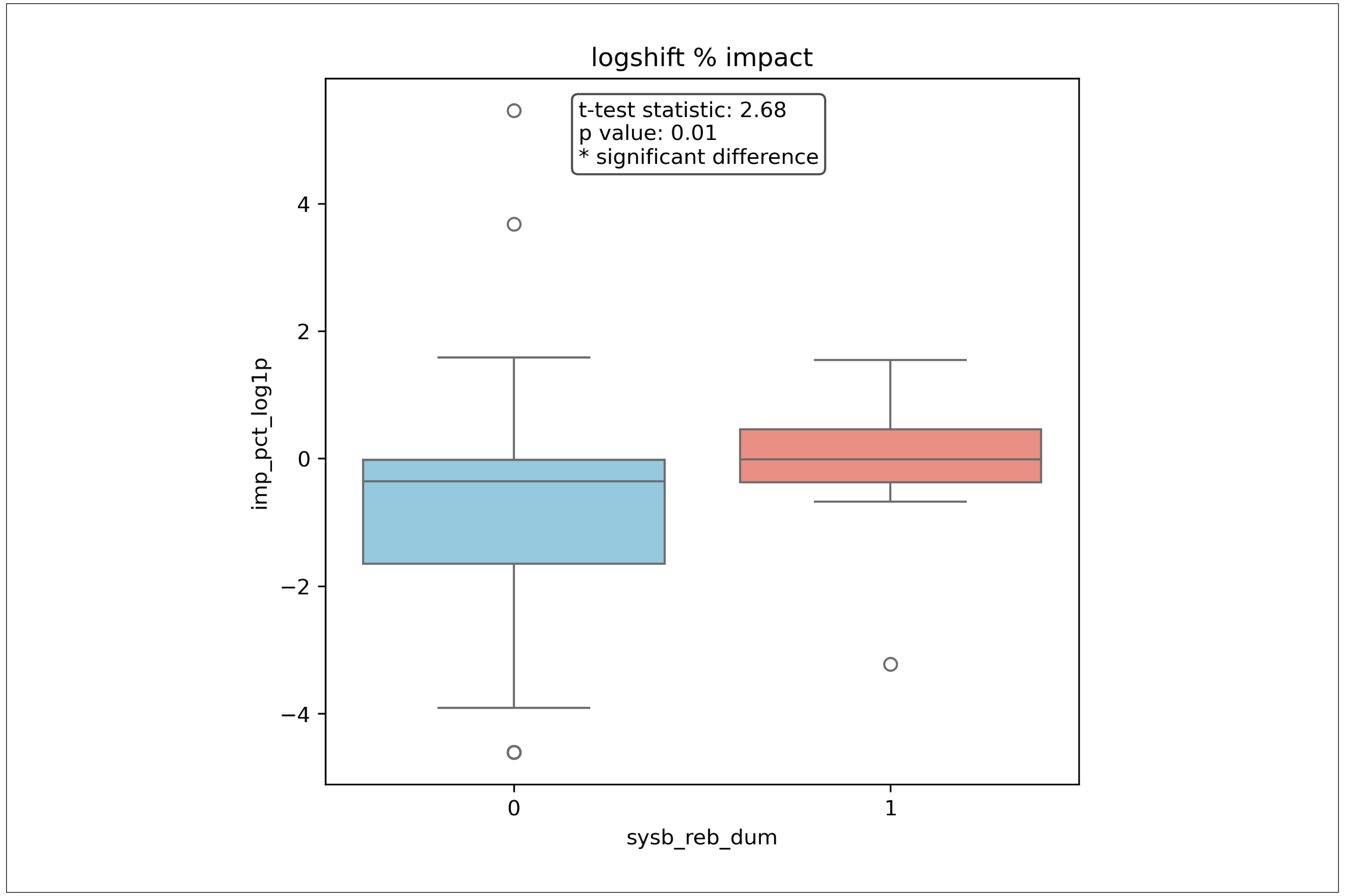


Figure. Significant difference in logshift transformed impact estimates between studies that do (=1) and do not (=0) include rebound effects within their system boundaries.

WHAT WE DID

- We synthesised evidence from 60 studies that yielded over 100 quantitative impact estimates of 8 digital applications in finance and retail. We did this evidence synthesis in collaboration with Vlad C. Coroamă and Oana Dumbravă from the Roegen Centre for Sustainability (RC4S).
- For each impact estimate we assigned values to a set of 11 study design characteristics including robustness, generalisability, system boundary, sample size, and assessment method.

WHAT WE FOUND

- Six study design characteristics explained statistically significant differences in impact estimates.
- Studies that accounted for indirect, rebound, and/or induced demand effects within their system boundaries found digital applications were significantly less beneficial for climate.
- Studies by independent organisations and that were scored as having high generalisability or external validity also reported significantly less climate-beneficial impacts.

SO WHAT?

- Account for study designs when interpreting impact estimates of digital applications to ensure apples-to-apples comparisons.
- Standardise assessment methodologies in digitalisation impact studies to ensure wide system boundaries that include indirect rebound and induced demand effects.

OUTPUT

Coroama, V., O. Dumbrava and C. Wilson (2025). "Direct and indirect environmental impacts of solutions across the digital ecosystem". Roegen Centre for Sustainability & University of Oxford, Switzerland & UK. https://iDODDLE.org/coroama-v-o-dumbrava-and-c-wilson-2025-direct-and-indirect-environmental-impacts-of-solutions-across-the-digital-ecosystem-roegen-centre-for-sustainability-university/

LINKS

https://iDODDLE.org/study-designs-explain-whether-climate-impacts-of-digital-tech-are-beneficial-or-detrimental/

https://www.roegen.ch/projects

SECTION 2

What are the opportunities and risks for climate from new digital applications?

CONTENTS

2.1 Automation of domestic activities can have beneficial climate impacts but users resist losing control of activity planning.

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

Key: manual, schedule, autonomous

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

Table. The level of automation for each aspect of the two activities trialed: 1) pre-trial; 2) potential from trial innovation; 3) actual use during the trial (final column, black icon indicates 100% of participants and grey icon indicates 80-99% of participants).

WHAT WE DID

- We ran two one-month experimental trials in living lab households to investigate acceptance of automation in the home.
- Using a mixed-methods approach based on the 'Automation Acceptance Model' we analysed pre-, during-, and post-trial data from surveys, interviews, videos, and behavioural logs.

WHAT WE FOUND

- Automation acceptance varies significantly between activity phases, with users more willing to cede control of activity execution than planning.
- When automation exceeded expectations - especially in terms of usefulness and convenience - acceptance increased.
- Trust in automation performance, compatibility with routines, and perceived usefulness were key drivers of broader automation acceptance.
- Positive experiences spilled over into increased willingness to automate other activities, while negative experiences reduced trust and acceptance more broadly.

SO WHAT?

- Design automation systems that preserve user control over planning while offering clear value in execution to maximise acceptance for energy-reducing automation solutions.
- Prioritise transparency, personalisation, and reliability to build trust in automation and encourage broader uptake.

OUTPUTS

Vrain, E. and C. Wilson (2024). "Automation acceptance for sustainable digital daily life". ICT4S 2024: International Conference on ICT for Sustainability. Stockholm, Sweden. 24 -28 June 2024.
https://iDODDLE.org/automation-acceptance-for-sustainable-digital-daily-life-ict4s-2024/

Vrain, E. (2023). "Me or the machine, who decides? Acceptance spillover of digital automation for a sustainable transition". Research-in-progress Paper, European Network of Living Labs, Open Living Lab Days Conference. Barcelona, Spain. 21-23 Sept 2023.
https://iDODDLE.org/vrain-e-2023-me-or-the-machine-who-decides

LINK

https://iDODDLE.org/communicating-through-converstations/

2.2 Delegating control to agentic AI for climate choices depends on how it affects competence and autonomy.

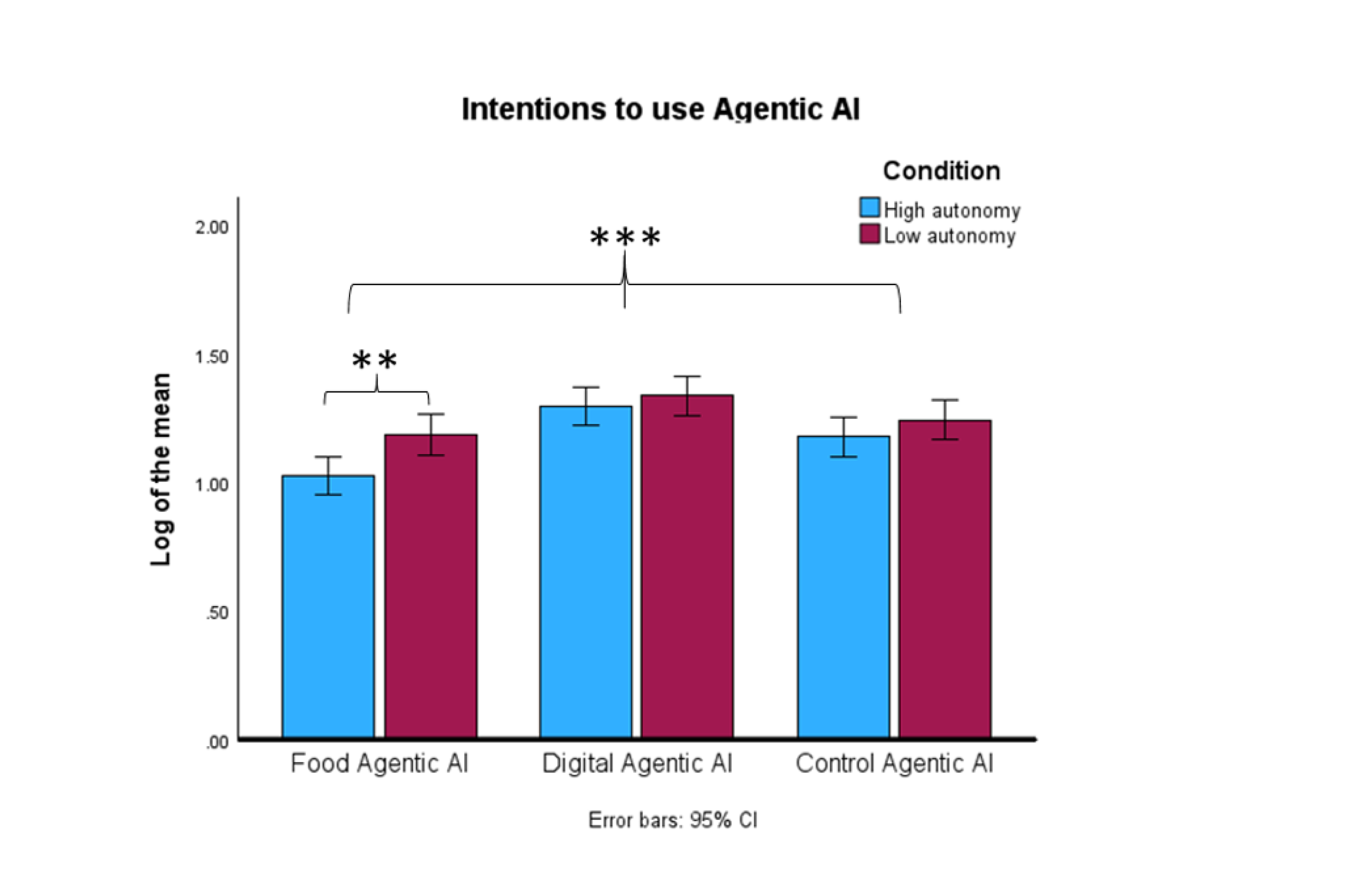


Figure. Mean log-transformed intentions to use agentic AI across domain and autonomy conditions. Bars represent the log of the mean intentions to use agentic AI for each group, with 95% confidence intervals. Participants in the low-autonomy condition consistently showed higher intentions compared to those in the high-autonomy condition across domains. Significance: ** p<.05, ***p <.001.

WHAT WE DID

- We conducted an online randomised controlled trial in the UK (n=1,522) to understand people's intentions to delegate carbon-intensive decisions to agentic AI systems.
- We assigned people to one of three agentic AI scenarios related to food, digital footprints, or email management in which the AI system was given either high or low agency.

WHAT WE FOUND

- People were less willing to use agentic AI for food-related choices than for more neutral tasks like digital decluttering and task management.
- In general people preferred low-autonomy systems that kept them in control regardless of task type.
- Perceived autonomy, competence, and being able to relate - all core psychological needs - successfully predicted people's intentions to delegate control to agentic AI.
- In particular people value personal competence and control depending on the task and this determines acceptance of agentic AI systems.

SO WHAT?

- Target agentic AI applications in contexts where AI support is seen as minimally invasive and involves practical, objective goals.
- Design transparent agentic AI systems that clearly communicate both the decision processes and users' control options, particularly in more intrusive and hedonic domains.

OUTPUT

Gaytán Camarillo M. and C. Wilson (in preparation). "Agentic AI and the carbon footprint of everyday activities". https://iDODDLE.org/Gaytán-camarillo-m-and-c-wilson-in-preparation-agentic-ai-and-the-carbon-footprint-of-everyday-activities/

LINK

https://iDODDLE.org/delegation-of-second-order-agency-to-agentic-ai-effects-of-competence-and-autonomy-on-acceptance-of-pro-environmental-agentic-ai/

2.3 Smart charging algorithms for electric vehicles can cut peak demand, lower costs, and reduce emissions.

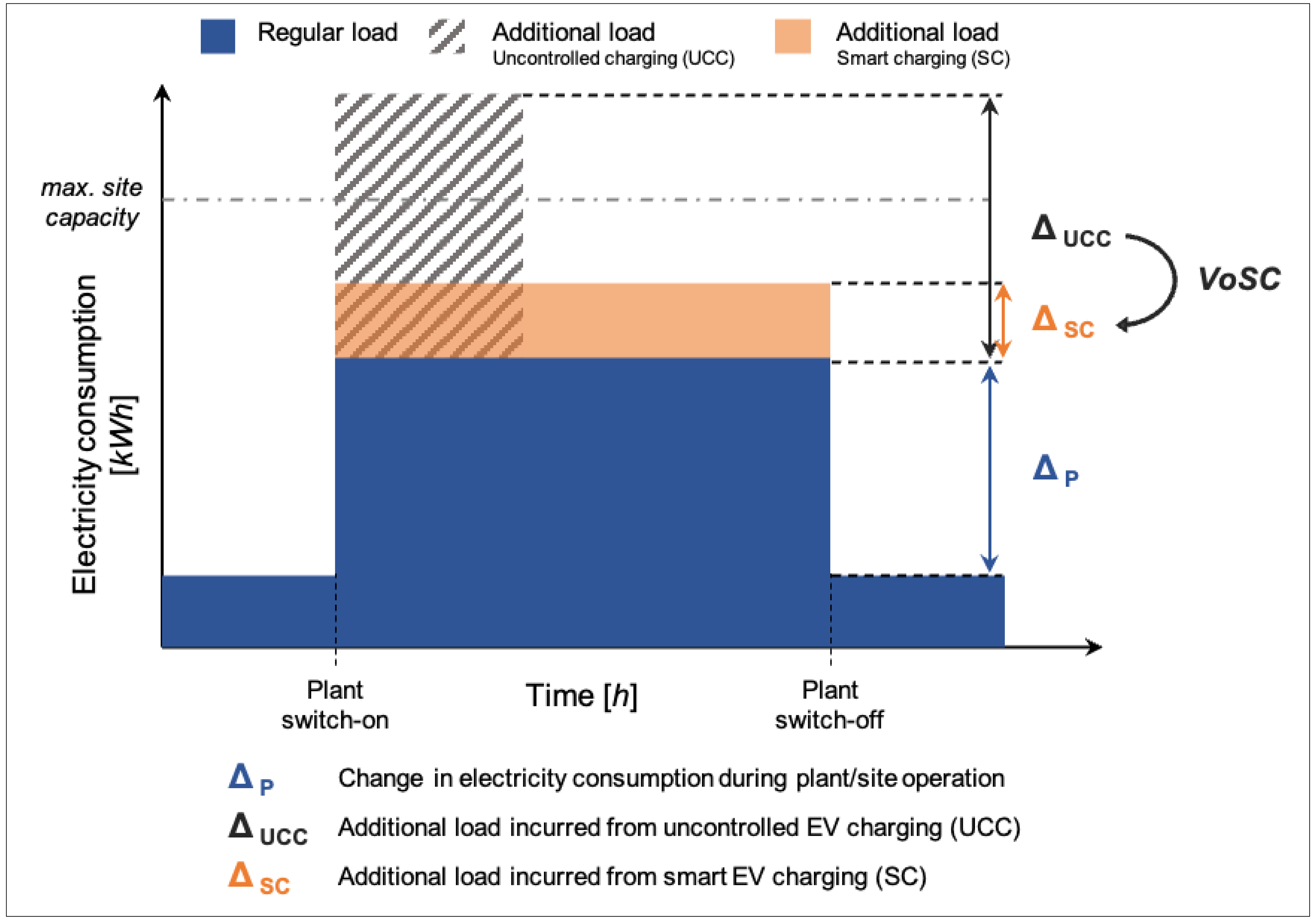


Figure. Schematic electricity consumption profile of an industrial site, illustrating the impact of electric vehicle (EV) workplace charging. The blue area represents the site's baseline load during regular (non-)production hours. The grey hatched area shows additional demand from uncontrolled charging (UCC), while the orange area indicates the load-shifted demand under smart charging (SC). The difference between UCC and SC is expressed as the Value of Smart Charging (VoSC), highlighted by the bent arrow.

WHAT WE DID

- We built a modelling framework to simulate electric vehicle (EV) workplace charging impacts on firms' energy-demand profiles as EVs become more widespread.
- We quantified optimal trade-offs between peak demand, cost, and emissions objectives using real-world data from a global car manufacturer in southeast England.

WHAT WE FOUND

- Uncontrolled workplace charging of EVs drives higher peak demand, higher costs, and higher carbon emissions.
- Smart charging with advanced control strategies delivers substantial savings and co-benefits for firms and the power system.
- Optimised charging reduces peak loads by 28% and cuts costs and emissions by 9% compared to uncontrolled, convenience charging.
- Single-objective optimisation sacrifices performance on other outcomes, emphasising trade-offs necessary between competing goals.

SO WHAT?

- Plan workplace charging with smart controls to limit peak load impacts and unlock co-benefits.
- Integrate EV demand forecasting, firm-specific cost and carbon budgeting, and electricity network planning to ensure EV charging aligns with the low-carbon transition.

OUTPUTS

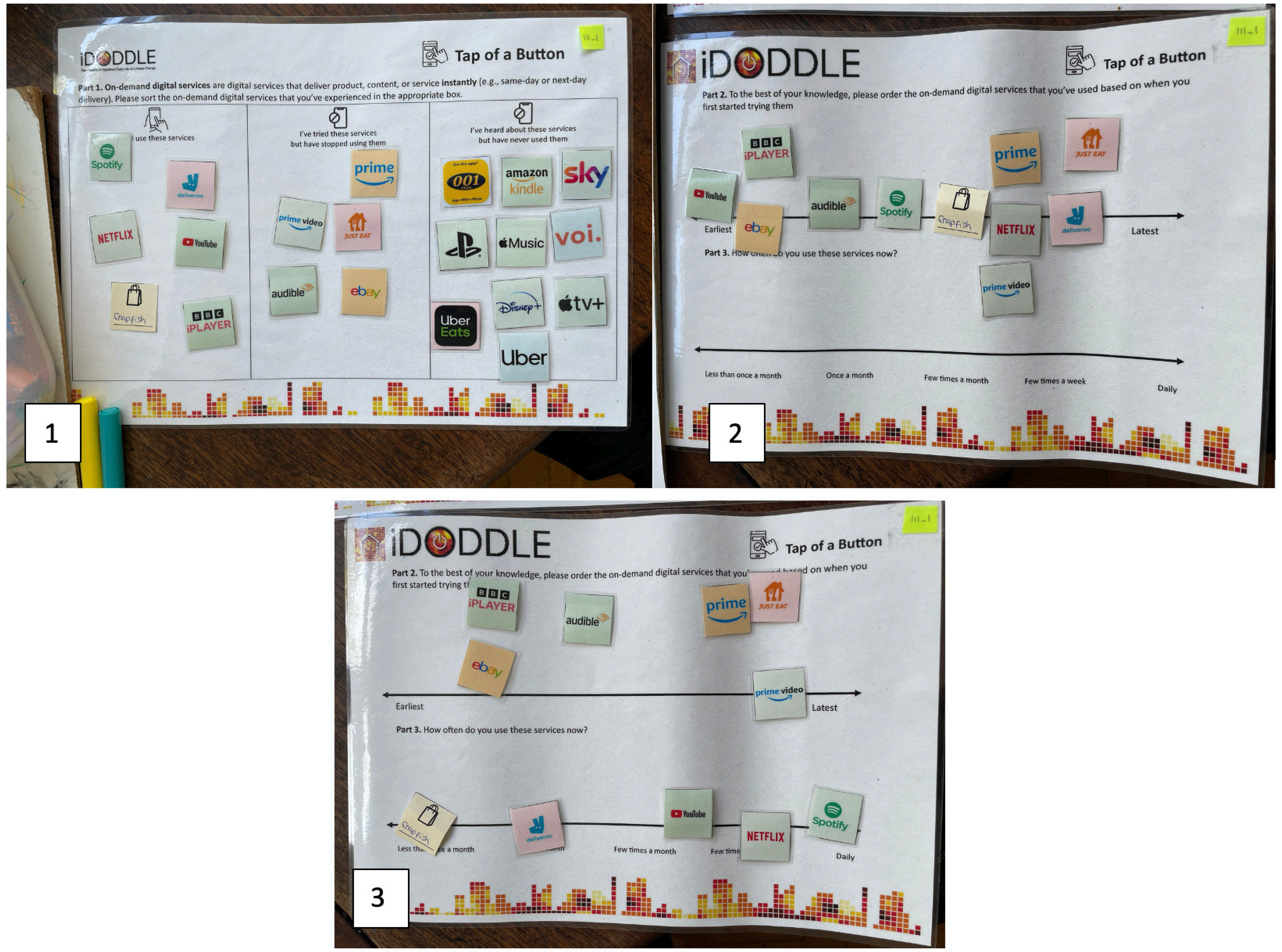
Seger, M., C. Brand, C. Clement, J. Dixon and C. Wilson (2025). "Firm level optimisation strategies for sustainable and cost effective electric vehicle workplace charging". npj Sustainable Mobility and Transport. 2, 11. https://doi.org/10.1038/s44333-025-00032-w

Seger, M. (2025). "Firm-level optimisation of EV workplace charging: Trade-offs, impacts, and tools". E-Mobility Power System Integration Symposium. Berlin, Germany. 06 October 2025. https://iDODDLE.org/seger-m-2025-firm-level-optimisation-of-ev-workplace-charging-trade-offs-impacts-and-tools-e-mobility-power-system-integration-symposium/

LINK

https://iDODDLE.org/paper-alert-new-publication-in-npj-sustainable-mobility-and-transport/

2.4 Household adoption of digital services ratchets up expectations of convenience and speed across consumption domains.



WHAT WE DID

- We interviewed 14 living lab households about their use of on-demand digital services across media, food delivery, next-day retail, and ride-hailing.
- We analysed the factors explaining households' adoption of on-demand digital services and resulting impacts on their consumption behaviour.

WHAT WE FOUND

- Experience of digital media services and algorithmic recommendations drive adoption of on-demand digital food, retail, and mobility services.
- Households shift their consumption behaviours in response to digital service features while adapting the services to fit their needs.
- Expectations of convenience, immediacy, and abundance that characterise consumption of online media have diffused into food, retail, and mobility.
- Households view on-demand digital services as increasingly commonplace in everyday life, but are critical about their social and environmental impacts.

SO WHAT?

- Anticipate spillovers between consumption domains in households' integration of digital services in their everyday lives.
- Account for faster delivery and induced demand when measuring the environmental impacts of digital services.

OUTPUTS

Amanta, F., E. Vrain, and C. Wilson (under review). "Reconsidering conveniences: Domestication of on-demand digital services in everyday consumption". Consumption & Society. https://iDODDLE.org/amanta-f-reconsidering-conveniences-domestication-of-on-demand-digital-services-in-everyday-consumption/

Amanta, F. (2024). "Ridiculously now: Social and climate impact of on-demand digital services". British Sociological Association Conference, virtual. 4 April 2024. https://iDODDLE.org/amanta-f-2024-ridiculously-now-social-and-climate-impact-of-on-demand-digital-services-bsa-virtual-conference-4-april-2024/

LINK

https://iDODDLE.org/reconsidering-conveniences-through-on-demand-digital-services/

2.5 Automation in the home can reduce manual effort but also increase time spent on activities, pushing energy use up.

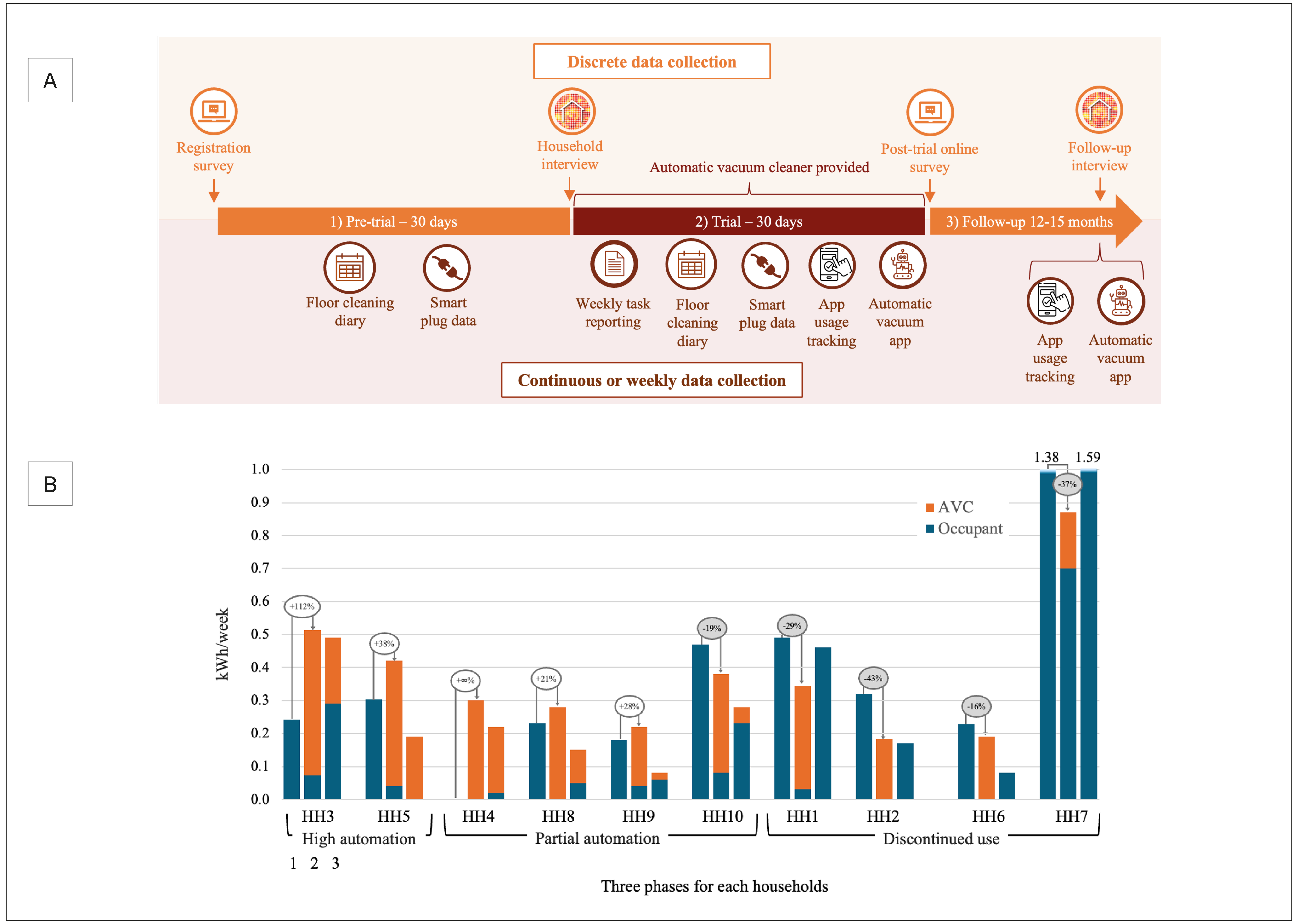


Figure. (A): Research protocol outlining the data collection timeline. (B): Stacked clustered bar chart showing the energy use in kWh/week from floor cleaning across the three study phases. Households are gruoped by automation uptake (high, partial, discontinued).

WHAT WE DID

- We used automatic vacuum cleaners (AVCs) in a longitudinal mixed-methods trial with 10 living lab households to study automation impacts on time and energy use.
- We collected diary, interview, app, and smart plug data over three phases (pre-trial, trial, and 12-month follow-up) to analyse time allocation, and direct and indirect energy impacts.

WHAT WE FOUND

- AVCs reduced occupant time spent cleaning by 45% during the trial but increased total cleaning duration by 189%.
- Planning and preparation activities increased initially, while long-term effects varied widely: some households discontinued use, others maintained or intensified it.
- AVCs primarily substituted manual vacuuming but also sweeping and mopping, increasing the use of electrical methods.
- During the trial, energy use increased on average, and led to rebound effects in several households; indirect energy use from parallel activities was often low but occasionally additive.

SO WHAT?

- Design devices to align with user routines, to provide feedback on both time and energy-use intensity, and to be responsive to time-of-use energy prices.
- Go beyond device energy efficiency ratings to include information on usage patterns and time-rebound risks.

OUTPUTS

Vrain, E., J. Bieser and C. Wilson (under review). "Automation in everyday life: Longitudinal insights on time use and energy demand". Technological Forecasting & Social Change.
https://iDODDLE.org/vrain-e-j-bieser-and-c-wilson-automation-in-everyday-life/

Vrain, E. and C. Wilson (2024). "Overlooked pitfalls and perks of automation unearthed through a living lab trial". European Council for an Energy Efficient Economy (ECEEE) Summer Study 2024. 10-14 June 2024. Laon, France.
https://iDODDLE.org/vrain-e-and-c-wilson-2024-overlooked-pitfalls-and-perks-of-automation/

LINK

https://iDODDLE.org/measuring-the-impacts-of-automation-in-daily-life/

SECTION 3

Why do people use climate-beneficial digital applications?

CONTENTS

3.1 Attitudes and neighbourhood effects are consistent predictors of intentions to use digital technologies to reduce carbon footprints.

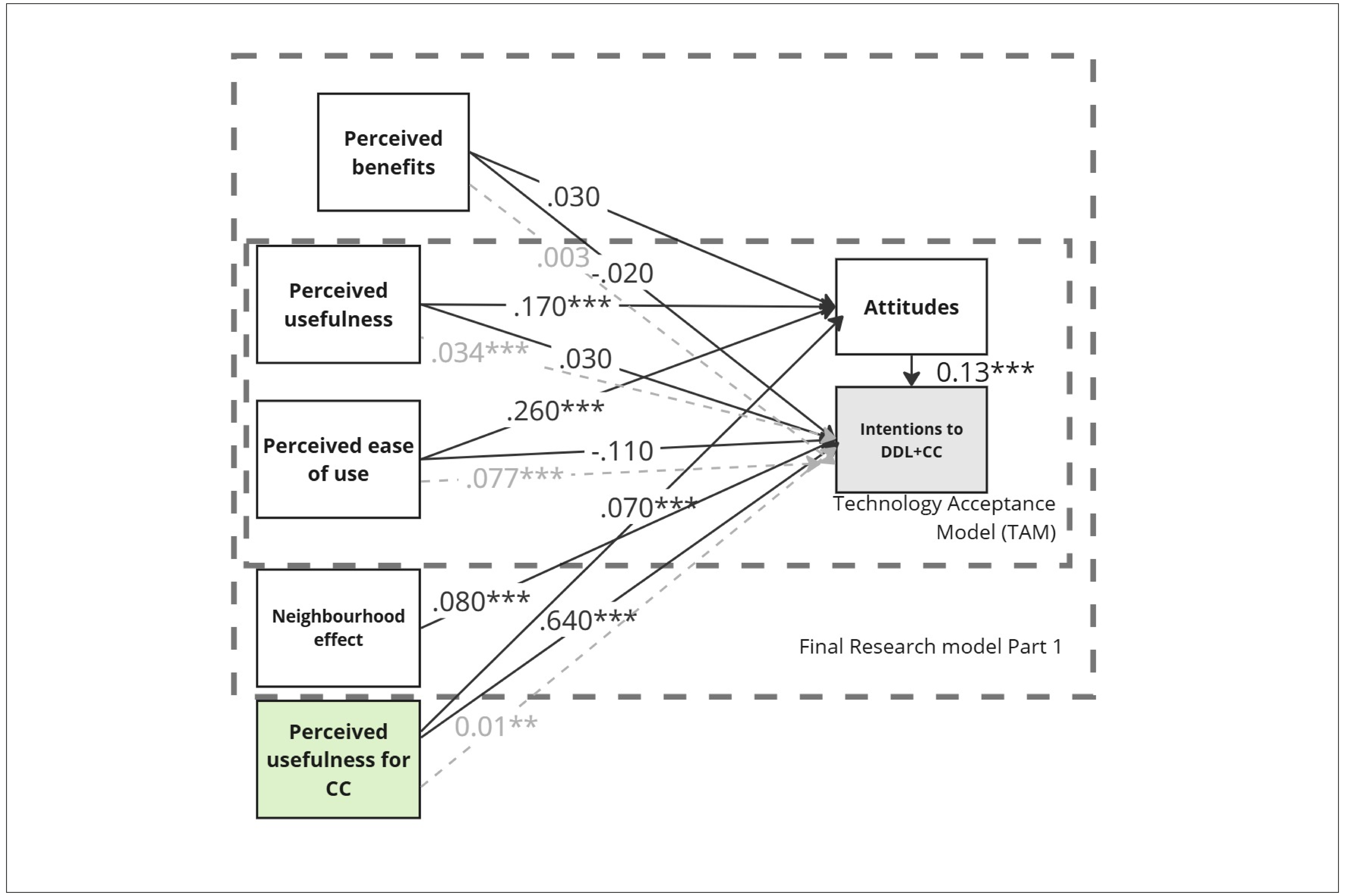


Figure. Standardised path coefficients in the extended Technology Acceptance Model predicting intentions towards digitalisation in daily life for tackling climate change (DDL+CC). Solid arrows represent direct effects (standardised Β estimates), and dashed arrows represent the indirect (mediation) effects of attitudes on relationship of perceived ease of use, usefulness, and perceived benefits. Dashed boundaries indicate the original model components. Direct and indirect effects: *p<0.05, **p<0.01, ***P=<0.001.

WHAT WE DID

- We conducted a nationally representative survey in the UK to understand why people integrate digitalisation into their daily activities, both in general, and for low-carbon living.
- We assessed perceptions of digitalised daily life using 'Technology Acceptance Model' variables: attitudes, perceived usefulness, trust, perceived risks, and social influence.

WHAT WE FOUND

- Perceived usefulness and attitudes were strong and consistent predictors of people's intentions to use digitalisation in their daily lives.
- Social influence from neighbours also significantly shaped intentions towards both general and climate-friendly digital applications.
- Neighbourhood effects had a stronger impact on older adults, while perceived usefulness more strongly influenced women.

SO WHAT?

- Engage early adopters and cultivate positive attitudes to accelerate digital technology adoption aligned with climate goals.
- Tailor communication and engagement strategies for groups with lower intention levels, including older adults and women.

OUTPUT

Gaytán Camarillo M., E. Vrain, and C. Wilson (under review). "Attitudes and social influence powering acceptance of digital technologies to reduce individual carbon emissions". Environment and Behavior.
https://iDODDLE.org/Gaytán-camarillo-m-e-vrain-and-c-wilson-attitudes-and-social-influence-powering-acceptance-of-digital-technologies-to-reduce-individual-carbon-emissions/

LINK

https://iDODDLE.org/digital-technologies-in-daily-life-and-to-reduce-impact-on-climate-change/

3.2 Reinforcing and balancing feedbacks influence people's decisions to adopt cost-saving digital technologies.

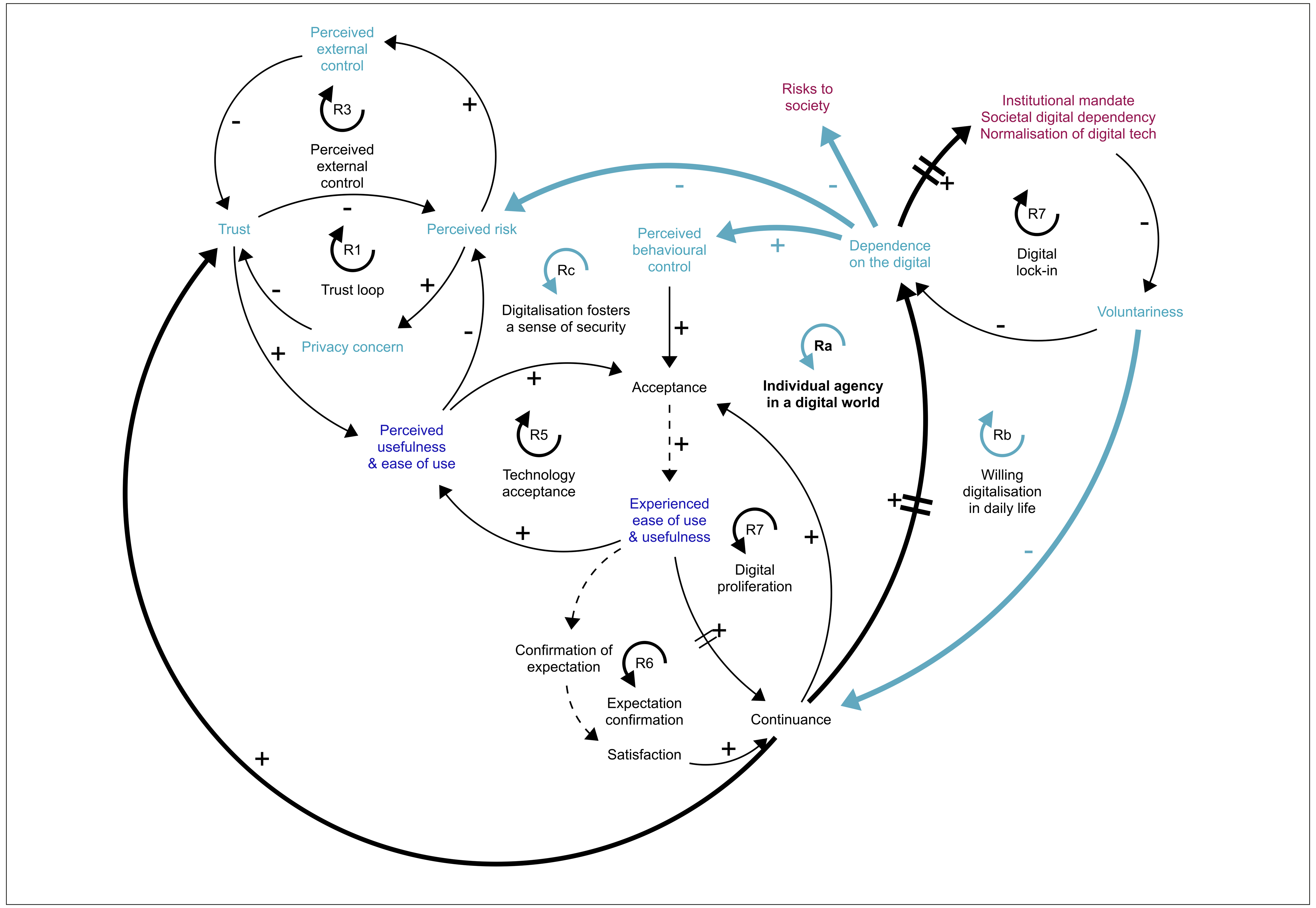


Figure. Causal loop diagram of 'Type 1' adopters, for whom digitalisation enhances perceived control and safety. Arrows with (+) and (-) indicate positive and negative causal relationships respectively. (R) and (B) indicate reinforcing and balancing feedbacks. Bold blue arrows highlight links whose polarity is reversed for Type 2 (digitally reluctant) adopters. Node colour denotes level of influence: maroon = societal, dark blue = technological, light blue = individual.

WHAT WE DID

- We used participatory systems mapping to capture mental models of cost-saving digital technology adoption, focusing on trust, risk perception, and privacy concerns.
- We synthesised these into a single generlisable causal loop diagram using adjacency matrices to aggregate across different people's mental models.

WHAT WE FOUND

- Propensities to adopt digital technology are shaped by interdependent feedbacks among societal, individual, and technological factors.
- These feedback loops vary in dominance and polarity for different types of adopter.
- Privacy cynicism and word-of-mouth act as proxies for trust and lead to adoption despite strong feedbacks from perceived risks.
- Rebound effects that undermine energy-saving benefits from digital technology adoption depend on which user types and feedback loops dominate.

SO WHAT?

- Curb digital rebound by activating adoption mechanisms in different types of adopter.
- Use habituation to reinforce tangible benefit feedbacks and dampen intangible risk feedbacks.

OUTPUT

Kumar, P., Barbrook-Johnson, P., and Wilson, C. (in preparation). "Interactions between cross-level feedbacks shaping digital technology acceptance".
https://iDODDLE.org/interactions-between-cross-level-feedbacks-shaping-digital-technology-acceptance-output/

LINK

https://iDODDLE.org/international-sustainability-transitions-conference-2025/

3.3 Business executives value data-driven decision support for electric vehicle workplace charging.

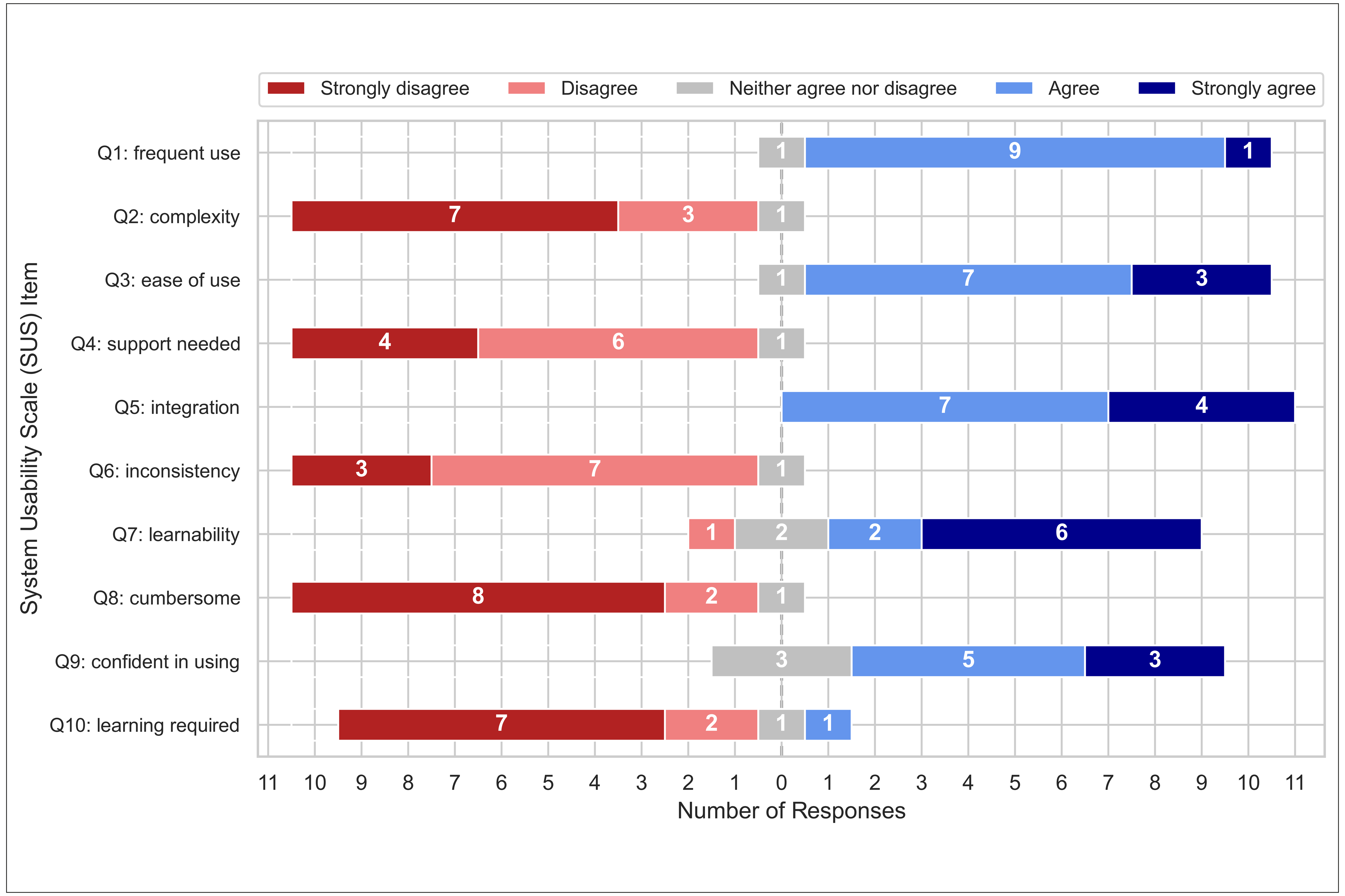


Figure. Firm managers' responses on 'System Usability Scale' questionnaire items.

WHAT WE DID

- We designed, tested, and evaluated an open-source decision support system using interviews with firm managers and a system usability scale.
- Across three design cycles, we refined the web application based on feedback from eight medium- to large-sized manufacturing firms in Germany.

WHAT WE FOUND

- The decision support system proved strongly usable, with positive ratings for ease of use, simplicity, integration, consistency, and frequent use intention.
- Respondents confirmed low barriers to adoption, reporting minimal need for training or support and rejecting perceptions of complexity.
- Participants expressed confidence in using the system and expected most people to learn it quickly, with some scope to improve user guidance.

SO WHAT?

- Provide executives with context-sensitive decision support to coordinate EV workplace charging internally across departments and externally with grid operators.
- Use decision support systems to bridge communication gaps between industry stakeholders and policymakers by quantifying electrification challenges.

OUTPUT

Seger, M., C. Brand, C. Clement, M.-F. Körner and C. Wilson (under review). "Navigating the Sustainable Mobility Transition: Designing a Data-Driven Decision Support System for Planning and Operating Electric Vehicle Workplace Charging Infrastructure". Decision Support Systems.
https://iDODDLE.org/seger-m-c-brand-c-clement-m-f-korner-and-c-wilson-navigating-the-sustainable-mobility-transition-designing-a-data-driven-decision-support-system/

Seger, M. (2025). "From Data to Decisions: Optimising Electric Vehicle Workplace Charging". Poster Presentation at Oxford Energy Day 2025. 24 September 2025. Oxford University. Oxford, UK.
https://iDODDLE.org/seger-m-2025-from-data-to-decisions-optimising-electric-vehicle-workplace-charging-poster-presentation-at-oxford-energy-day-2025-24-september-2025-oxford-university-oxford/

LINK

https://iDODDLE.org/from-data-to-decisions-poster-presentation-at-oxford-energy-day-2025/

SECTION 4

What underlying mechanisms explain digital impacts on climate?

CONTENTS

4.1 Digital applications impact energy use through a variety of mechanisms of which substitution is the most beneficial.

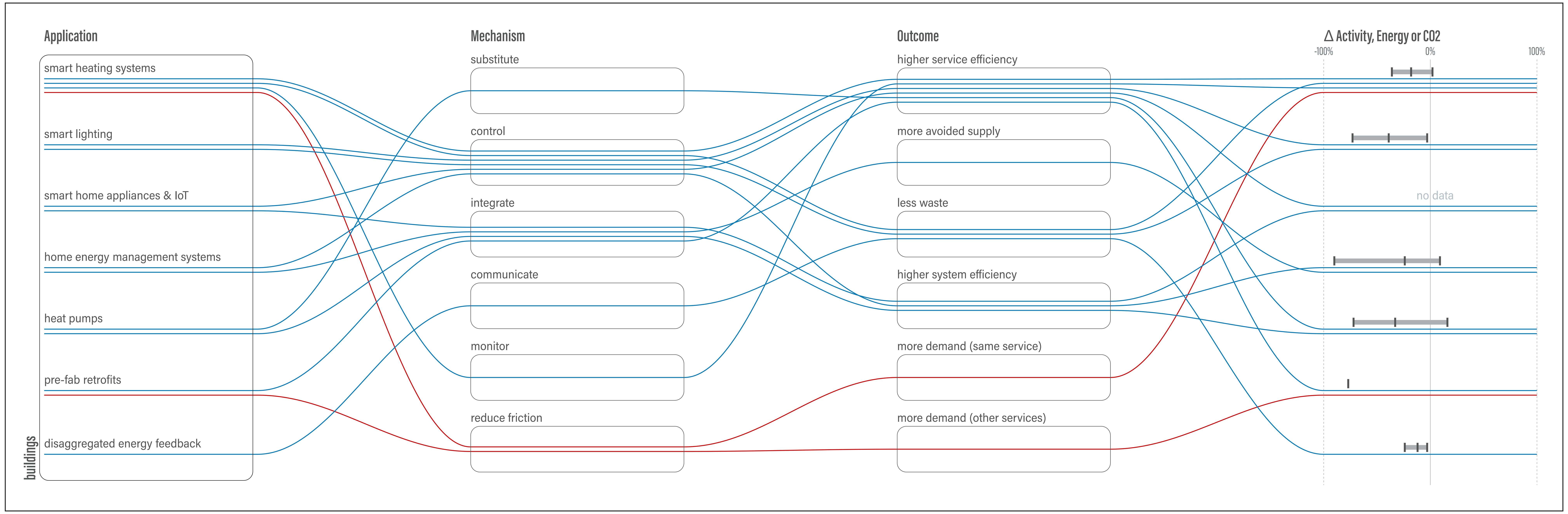


Figure. Causal mechanisms and impact pathways for six digital applications in the buildings sector. Blue lines denote net energy-reducing pathways; red lines denote net energy-increasing pathways.

WHAT WE DID

- Using wire diagrams we mapped causal mechanisms linking digital applications to outcomes that explain reductions or increases in energy use.
- We used statistical meta-regression to identify which mechanisms had the largest effect in a sample of 135 impact estimates across 22 digital applications.

WHAT WE FOUND

- Mapping impact mechanisms gives explanatory power to common impact taxonomies for digital applications that focus narrowly on efficiency and rebound effects.
- Digital applications that influence user behaviour through substitution mechanisms have the largest beneficial impact (44% mean reduction in energy use).
- Digital applications that coordinate between providers and users (17% mean reduction) or that offer control functionality (20% mean reduction) also have net beneficial impacts.

SO WHAT?

- Target digital substitution of energy-intensive physical activity to maximise energy-reducing benefits.

OUTPUTS

Wilson, C., H. Pettifor, M. Agnew and V. Coroama (2024). "Mapping and quantifying the impacts of digital applications on energy use". European Council for an Energy Efficient Economy (ECEEE) Summer Study 2024. Conference Paper #8-199-24. 10-14 June 2024. Laon, France. https://iDODDLE.org/c-wilson-pettifor-h-agnew-m-and-coroama-v-2024-mapping-and-quantifying-the-impacts-of-digital-applications-on-energy-use-european-council-for-an-energy-efficient-economy-eceee-summe/

Pettifor, H., M. Agnew, C. Wilson and L. Niamir (2024). "Disentangling the carbon emissions impact of digital consumer innovations". Journal of Cleaner Production 485: 144412 https://doi.org/10.1016/j.jclepro.2024.144412

LINK

https://iDODDLE.org/visualising-and-assessing-the-different-ways-in-which-digitalisation-impacts-energy-demand/

4.2 Interactions between social and technological learning dynamics determine the climate impact of digital technologies in the home.

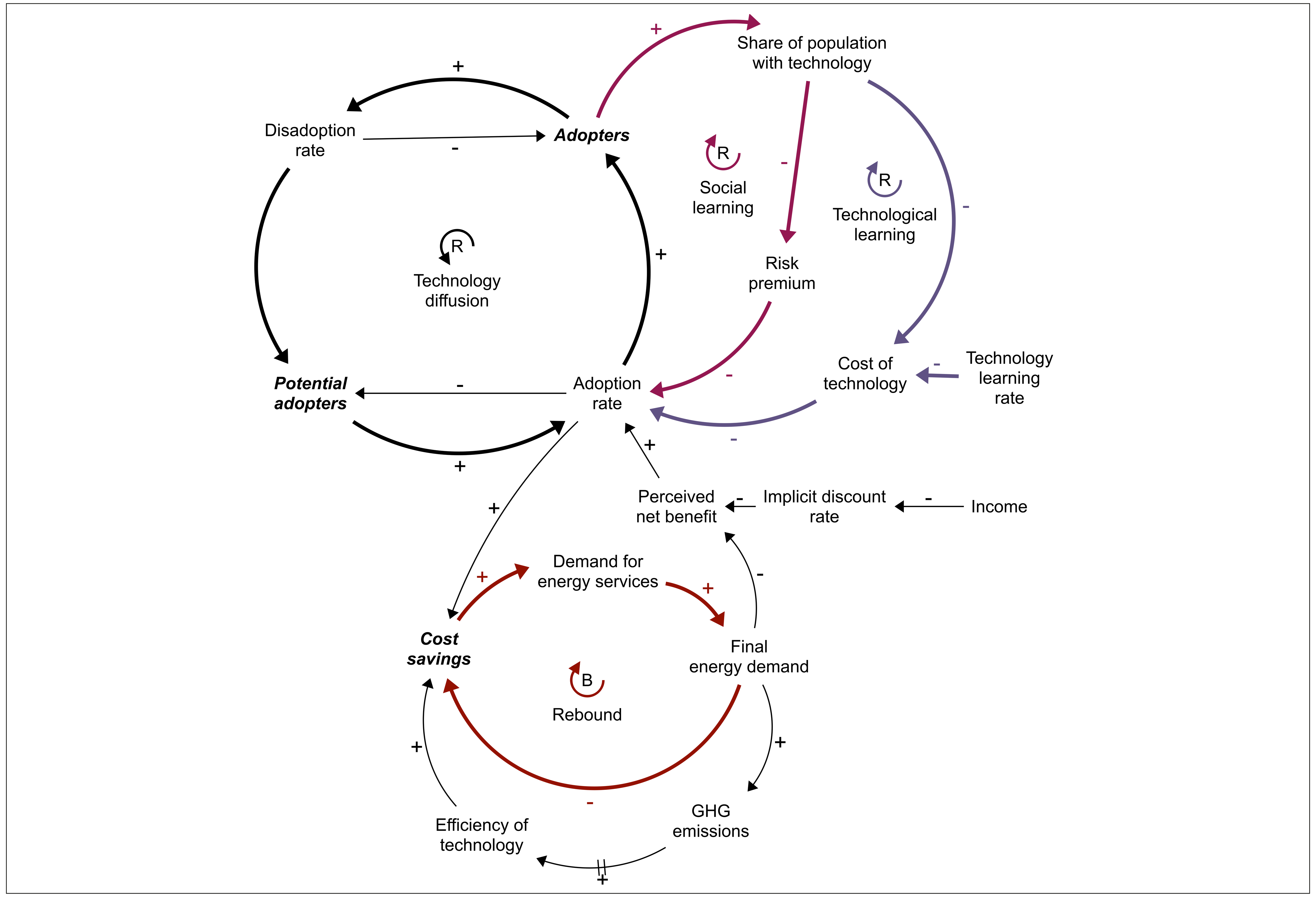


Figure. Causal loop diagram of a stock-and-flow model, illustrating how social and technological learning shape digital technology adoption. Bold italicised elements indicate stock variables. Arrows with (+) and (–) represent positive and negative causal relationships respectively. (R) and (B) denote reinforcing and balancing feedback loops. Technology diffusion (R) is driven by social learning (R) and technological learning (R). Compounding rebound effects (B) reduce the perceived benefits of adopting energy-efficient technologies.

WHAT WE DID

- We built a quantitative system dynamics model to simulate heterogeneous digital technology adoption in the residential sector using smart heating systems as a test case.
- We explored the impacts of social and technological learning on digital technology adoption and rebound effects.

WHAT WE FOUND

- Capital cost reductions through technological learning-by-doing alone are insufficient to explain technology adoption dynamics.
- Strong aversion to delayed benefits adversely affect perceptions of energy-saving digital technologies compared with conventional alternatives.
- Social factors such as peer influence and how perceived risks are transmitted through interpersonal networks can outweigh monetary costs and benefits.
- There is a risk of exacerbating fossil-fuel dependence if smart thermostats paired with gas boilers are perceived as less risky than cleaner alternatives such as heat pumps.

SO WHAT?

- Accelerate technology uptake by targeting positive reinforcement through social learning while limiting misinformation that feeds perceived risks.
- Account for adopter-specific rates of time preference to facilitate uptake of energy-saving digital technologies.

OUTPUT

Kumar, P., C. Wilson, P. Barbrook-Johnson, Q. Ye, R. Tan and S. Eker. (in preparation). "Exploring the indirect energy impacts of digitalised daily life".
https://iDODDLE.org/interactions-between-social-and-technological-learning-residential-digital-technology-adoption/

LINK

https://iDODDLE.org/a-summer-of-modelling-adoption-dynamics-the-young-scientist-summer-programme/

4.3 Data privacy concerns shape public willingness to use climate-beneficial AI applications.

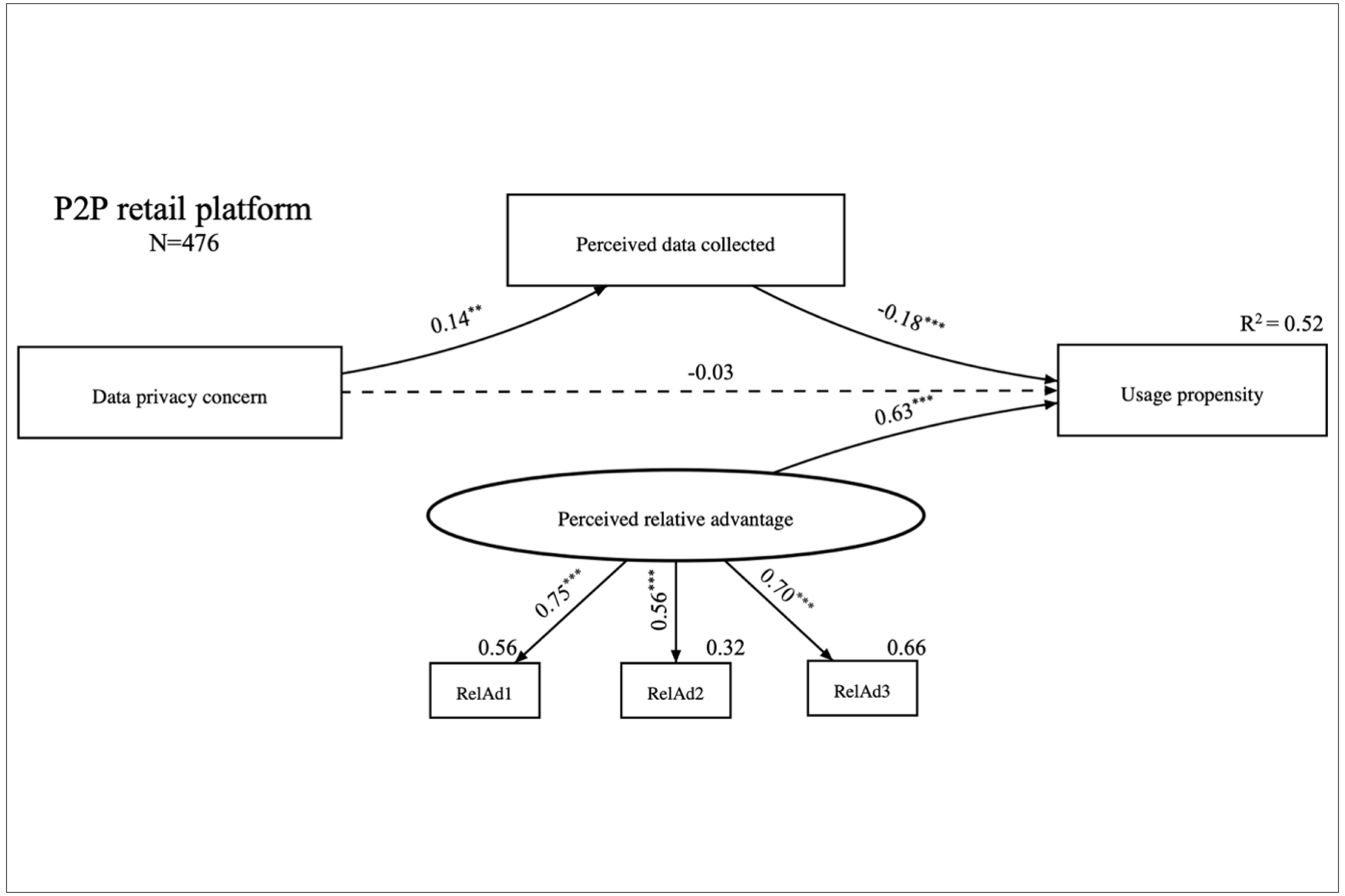


Figure. Structural equation model results for peer-to-peer (P2P) retail platforms. The latent variable 'perceived relative advantage' consists of: RelAd1 'better than alternatives', RelAd2 'easy to use' and RelAd3 'useful'. Numbers adjacent to the arrows are standardised path coefficients and indicative of the effect size of the relationship. Dashed lines indicate nonsignificant relationships. *p<0.05, **p<0.01, ***p<0.001. R2 is the proportion of variance explained by the relations in the path model.

WHAT WE DID

- We ran three empirical studies using a nationally representative UK sample (n=2,078) to investigate how data privacy concerns affect usage of climate-beneficial AI applications.
- We used experimental vignettes and structural equation modelling to test mediation by perceived data collection, relative advantage, familiarity with AI, and protective behaviours.

WHAT WE FOUND

- AI salience increased perceptions of data collection, which significantly reduced usage propensity for climate-beneficial applications, especially when perceived benefits were low.
- Data privacy concerns do not directly deter usage but operate through perceptions of data collection, with protective behaviours fully mediating this effect for most applications.
- Proactive engagement with AI—such as using ChatGPT or seeking AI-related information—significantly reduces perceived AI risks.
- In some cases (e.g., bike share and meal kit apps), privacy concerns still negatively impact usage, indicating residual distrust or lack of user control over data.

SO WHAT?

- Communicate clear personal and climate benefits from AI apps to counter privacy concerns and enhance perceived relative advantage for users.
- Strengthen users' agency through privacy-by-design features and digital literacy that empowers individuals to engage safely with AI-enabled tools.

OUTPUTS

Vrain, E. and C. Wilson (under review). "Data concerns undermine AI applications for climate". npj Climate Action.
https://iDODDLE.org/vrain-e-and-c-wilson-data-concerns-undermine-ai-applications-for-climate/

Vrain, E. and C. Wilson (2025). "AI's shadow: Risk perceptions and their impact on sustainable consumption". SCORAI conference: Mainstreaming sustainable consumption. Lund, Sweden. 8–10 April 2025.
https://iDODDLE.org/vrain-e-and-c-wilson-2025-ais-shadow-risk-perceptions/

LINK

https://iDODDLE.org/is-chat-gpt-hindering-progress-on-climate-change/

4.4 Trust is not a good predictor of intentions to use digitalisation in daily life.

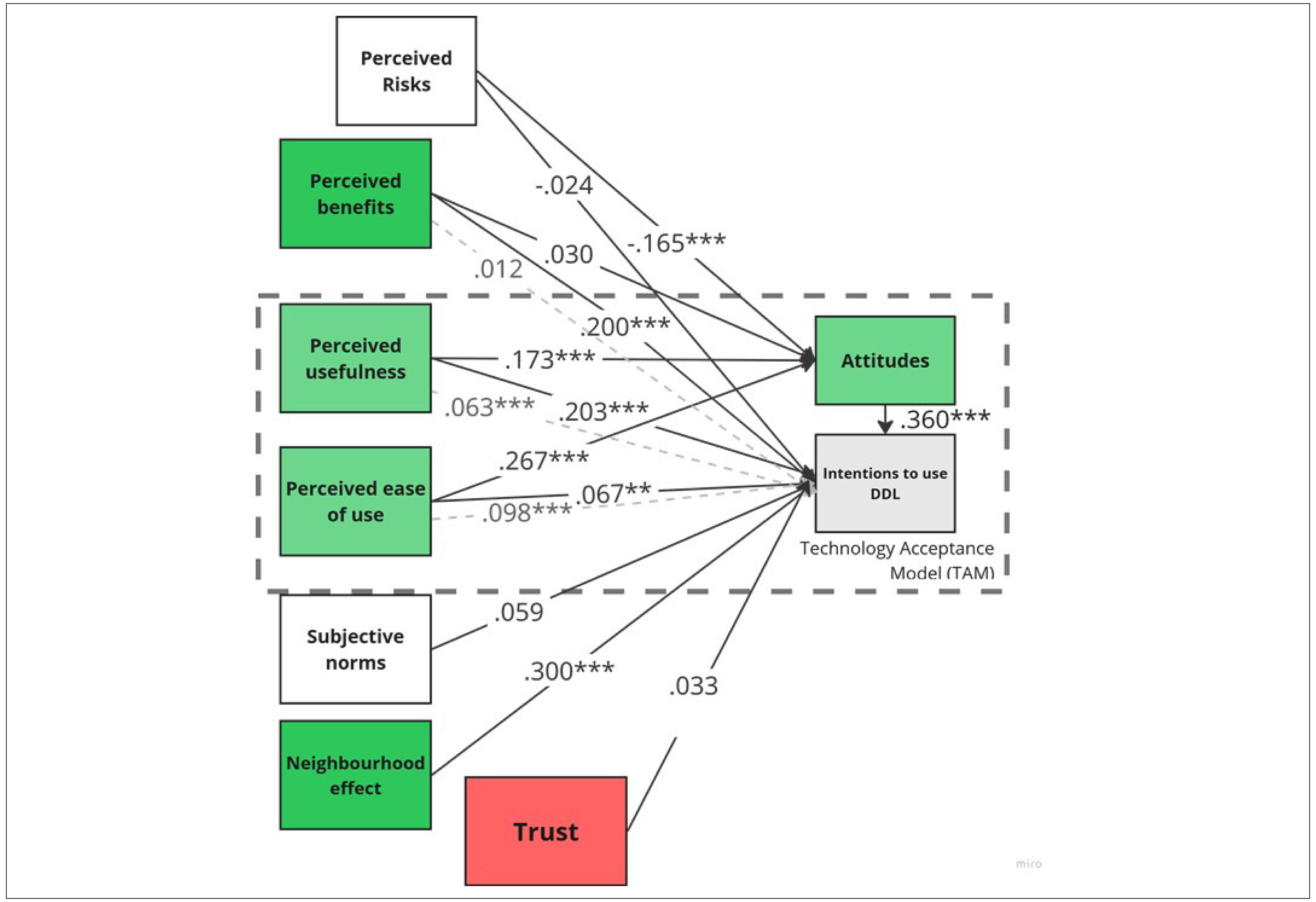


Figure. Standardised path coefficients in the extended Technology Acceptance Model predicting intentions towards digitalisation in daily life (DDL). Solid arrows represent direct effects (standardised B estimates), and dashed arrows represent the indirect (mediation) effects of attitudes on relationships from perceived ease of use, usefulness, and perceived benefits. Dashed boundaries indicate the original model components. The full model includes external variables such as trust, neighbourhood effects, and perceived risks and benefits. Direct and indirect effects: *p<0.05, **p<0.01, ***P=<0.001.

WHAT WE DID

- We used nationally representative UK survey data to assess whether levels of trust in digital technologies predicted usage intentions.
- We defined trust as a multi-dimensional construct that includes security, safety, and data privacy.

WHAT WE FOUND

- Contrary to expectations, trust did not predict intentions towards digitalised daily life once people had considered how they used digital technologies in everyday routines.
- Other factors including attitudes, social norms, and usefulness more consistently explained intentions.
- People justify using digital applications and services despite mistrusting the service providers.

SO WHAT?

- Look beyond security and privacy concerns to encourage digital adoption based on the psychological and practical factors that actually motivate use.
- Don't generalise scare stories about mistrust of digital service providers without good evidence.

OUTPUT

Gaytán, M. (2023). "Assessing the role of digitalisation of daily life on energy efficiency and climate crisis – a technology acceptance perspective". BEHAVE Conference: 7th European Conference on Behaviour and Energy Efficiency. Maastricht, Netherlands. 27 November 2023.
https://iDODDLE.org/Gaytán-m-c-2023-assessing-the-role-of-digitalisation-of-daily-life-on-energy-efficiency-and-climate-crisis-a-technology-acceptance-perspective-maastricht-netherlands-27-november-2023/

LINK

https://iDODDLE.org/trust-in-tech-exploring-attitudes-and-adoption-of-digital-technologies-in-daily-life/

SECTION 5

How do households vary in their digitalised daily life relevant to climate?

CONTENTS

5.1 Households' digitalisation trajectories are not one-way but selective, uneven, and shaped by life stage and shifting motivations.

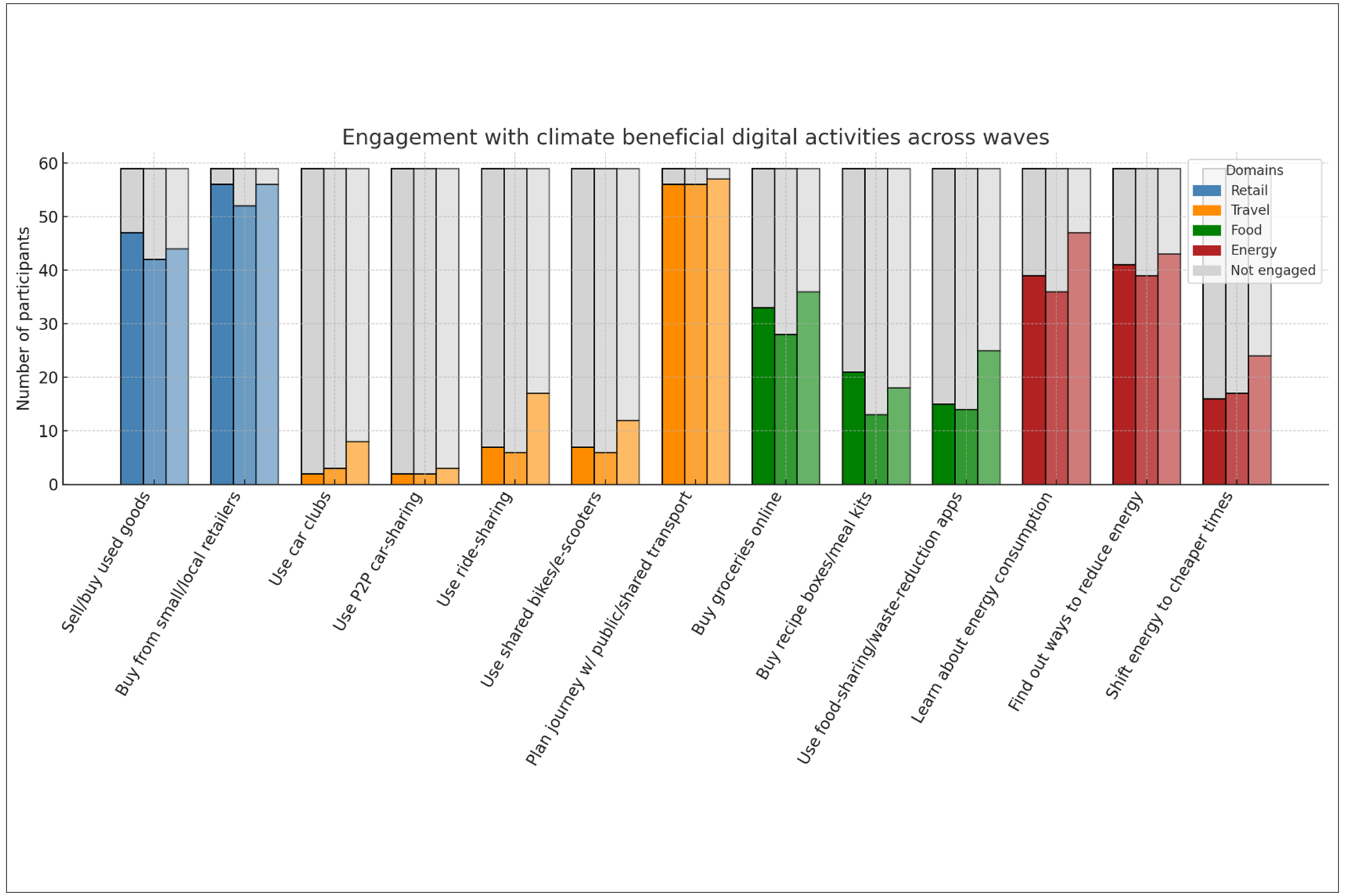


Figure. Number of living lab households engaging in climate-beneficial digital activities over three years (shown as grouped columns) in four consumption domains.

WHAT WE DID

- We conducted a three-wave longitudinal survey as well as pre- and post-living lab interviews with 41 households over a three-year period.
- We combined data on digital activities, attitudes, capabilities and opportunitiess to map and track households' digitalisation trajectories.

WHAT WE FOUND

- Engagement with climate-beneficial digital activities was selective and domain-specific: strongest in retail and home energy management, persistently low in travel.
- Confidence with digital skills associated with climate-beneficial activities varied as a function of age, with middle-aged households (45-65yrs) gaining most over time.
- Flexibility in daily routines constrained opportunities for engagement, shaping when and how climate-beneficial activities could be pursued.
- Households with children increasingly valued the internet for efficiency and escape, while older households found it frustrating given their different motivations.

SO WHAT?

- Sustain households' engagement with digital technologies as resulting benefits for climate are real but fragile.
- Accelerate climate-beneficial digital engagement by targeting low uptake in travel, declining confidence in older age groups, and motivational gaps.

OUTPUT

Vrain, E. and C. Wilson (in preparation). "Digital-climate interactions over a 3 year period in living lab households".
https://iDODDLE.org/vrain-e-and-c-wilson-digital-climate-interactions-over-a-3-year-period/

LINK

https://iDODDLE.org/how-and-why-engagement-with-climate-beneficial-digital-activities-change/

5.2 Adoption of on-demand digital services is infuenced by time scarcity and pace of life.

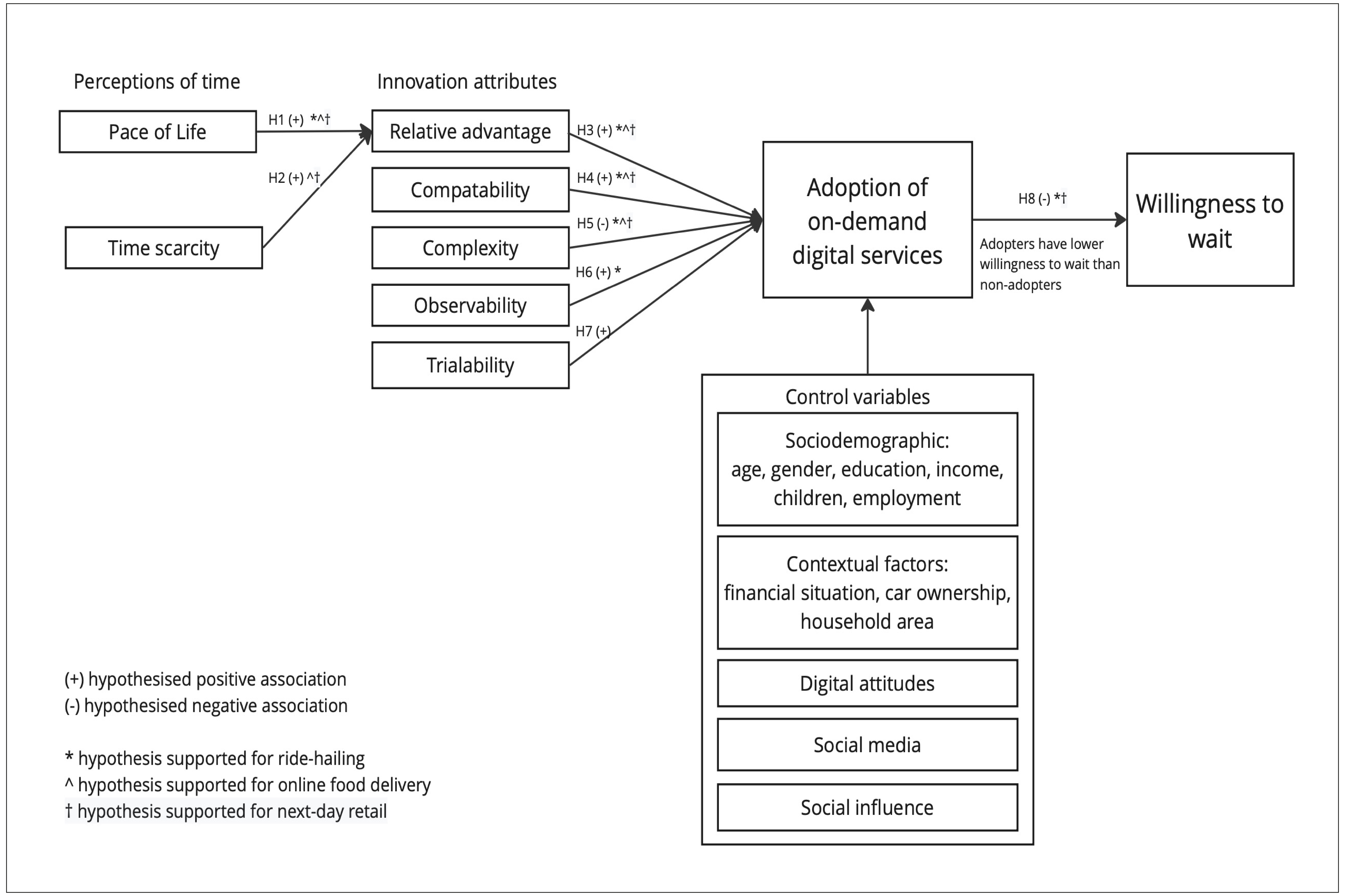


Figure. Summary of hypotheses and results from survey on the association between perceptions of time and adoption of ride-hailing, online food delivery, and next-day retail. Pace of life and time scarcity are associated with relative advantage of the innovation which predicts adoption. Adoption of services are associated with differences in willingness-to-wait for delivery.

WHAT WE DID

- We conducted a cross-sectional UK survey (n=1,512) of both adopters and non-adopters of food delivery, next-day delivery retail, and ride-hailing digital services.
- We used regression models and difference testing to identify the factors influencing adoption and willingness to wait.

WHAT WE FOUND

- People with a higher pace of life perceive stronger relative advantage of on-demand digital services, which drives adoption.
- Time scarcity affects perceived relative advantage of online food delivery and retail, but not ride-hailing.
- Adopters of ride-hailing and next-day delivery have shorter willingness to wait than non-adopters, but the reverse is true for online food delivery.

SO WHAT?

- Manage expectations of fast delivery in order to reduce the carbon footprint of delivery services.
- Design low-carbon digital services to appeal to people's time sensitivity to encourage adoption.

OUTPUT

Amanta, F., E. Vrain, and C. Wilson (under review). "Perceptions of time and adoption of on-demand digital services". Time & Society.
https://iDODDLE.org/amanta-f-e-vrain-and-c-wilson-perceptions-of-time-and-adoption-of-on-demand-digital-services/

LINK

https://iDODDLE.org/instant-gratification-from-on-demand-digital-services/

5.3 Use of digital technologies to reduce carbon footprints depends more on pro-environmental motivation than technological readiness.

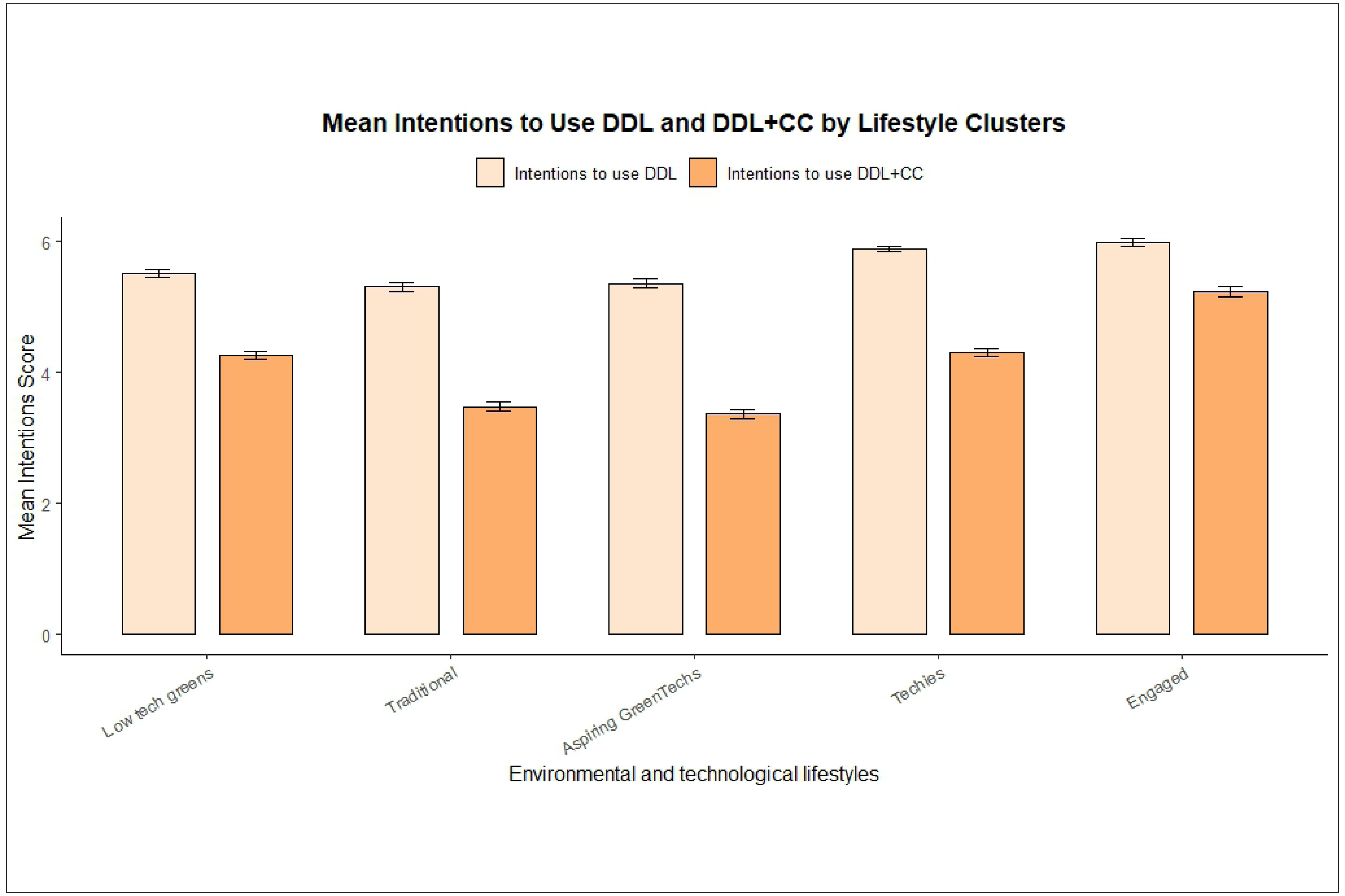


Figure. Mean intentions by lifestyle clusters towards digitalisation in daily life (DDL, light colours) and digitalisation to reduce carbon emissions (DDL+CC, dark colours). Error bars represent ±1 standard error of the mean. Clusters based on Axsen et al. (2012): Low Tech Greens, Traditional, Aspiring GreenTechs, Techies, and Engaged.

WHAT WE DID

- We used the technology-environment lifestyle cluster framework to understand how different lifestyles relate to digital low-carbon activities.

WHAT WE FOUND

- Five lifestyle clusters vary along digital and climate dimensions, with differences between clusters explaining digitalisation propensities.
- Techies (technologically engaged but not environmentally) and the Engaged (high in both) exhibited highest levels of digital adoption overall.
- Engaged and Low Tech Greens (environmentally engaged but not technologically) were more open to using digital technologies for with reducing carbon emissions.

SO WHAT?

- Connect digitalisation to climate benefits for environmentally-engaged groups but to digital skills for tech-savvy groups
- Promote sustainable mindsets rather than the latest digital innovation for reducing carbon emissions.

OUTPUT

Gaytán Camarillo M. and C. Wilson (in preparation). "Lifestyle segmentation and digitalisation: Environmental motivations outweighs technological readiness in shaping intentions to digitalise daily life for carbon emission reduction".
https://iDODDLE.org/Gaytán-camarillo-m-and-c-wilson-lifestyle-segmentation-and-digitalisation-environmental-motivations-outweighs-technological-readiness-in-shaping-intentions-to-digitalise/

LINK

https://iDODDLE.org/who-adopts-digitalisation-how-uk-lifestyles-shape-technology-and-sustainability-choices/

SECTION 6

What are the opportunities and risks of digitalisation for climate at a systems scale?

CONTENTS

6.1 Digital futures will be consequential for climate futures - there's a compelling need to govern digital-climate risks.

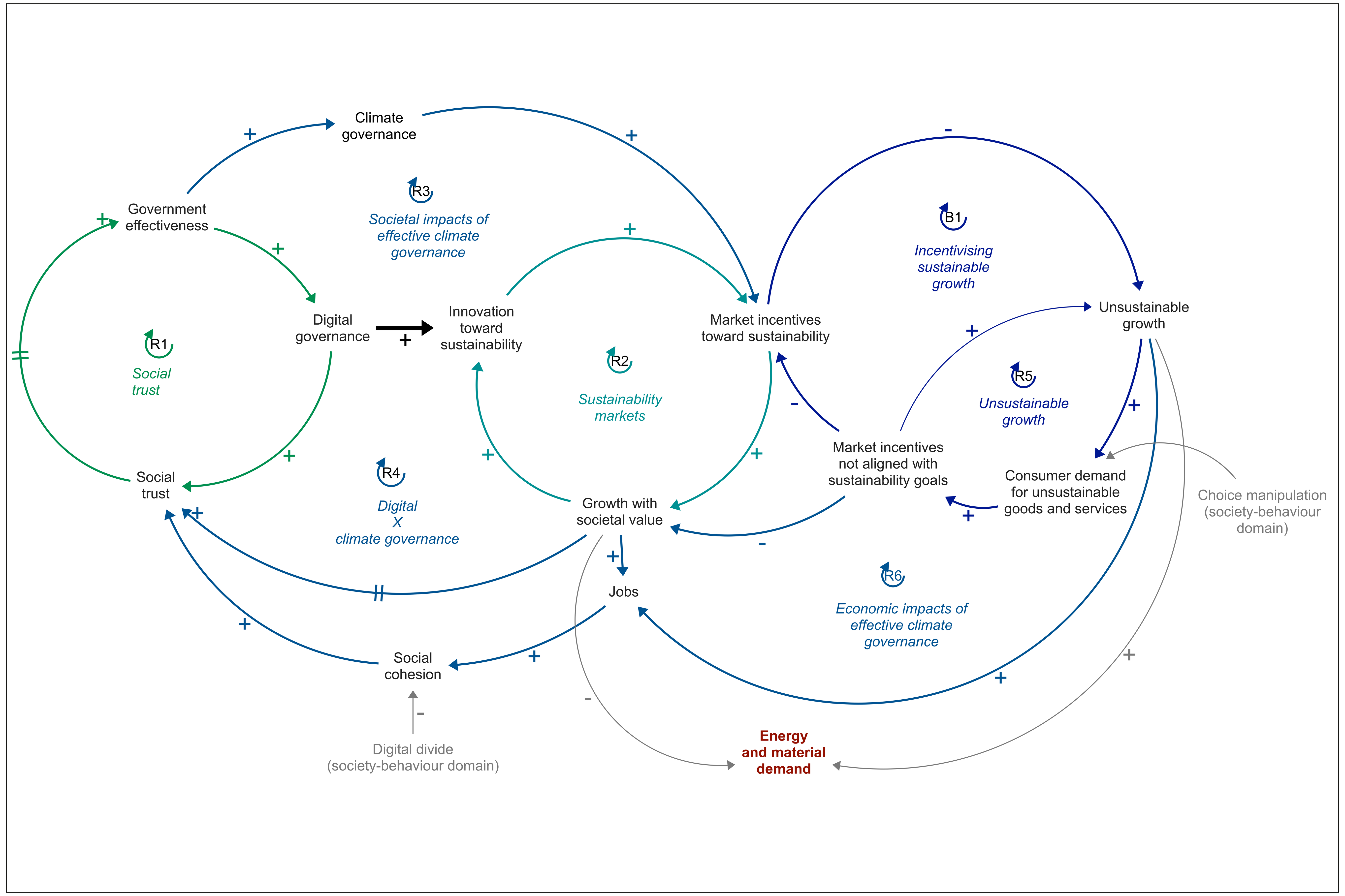


Figure. System map of digitalisation impacts on governance and markets. R denotes reinforcing (positive feedback) loops; B denotes balancing (negative feedback) loops.

WHAT WE DID

- We convened an expert workshop bringing 35 scientists and industry representatives together to explore how future digital trajectories impact emission-reduction efforts.
- We used participatory system dynamics techniques to map out the complexity of digitalisation impacts across society and the economy.

WHAT WE FOUND

- Digitalisation impacts on consumer behaviour, firm activity, markets, and governance institutions are complex when seen from a systems perspective.
- Digitalisation acts as an amplifier of both beneficial and adverse changes throughout socioeconomic systems, and as both the cause and the effect of change.
- Extreme best- or worst-case scenarios of digital-climate alignment or misalignment are the result of self-reinforcing dynamics with only weak balancing forces to keep them in check.
- The speed and scope of AI developments pose particular challenges for digital governance that can be tackled upstream in the AI industry or downstream in multiple application domains.

SO WHAT?

- Plan for desirable digital-climate outcomes while mitigating risks of unfavourable outcomes.
- Don't accept polarised digital-utopia or digital-dystopia arguments on climate, as reality entwines the two extremes.

OUTPUT

Wilson, C., E. Verdolini, P. Kumar, and S. Eker (2025). "Expert Workshop on Digitalisation Narratives and Climate Change Mitigation: Synthesis Report". IIASA, Austria.
https://doi.org/10.5281/zenodo.15024068

LINKS

https://iDODDLE.org/synthesis-report-on-digital-climate-futures/

https://iiasa.ac.at/blog/jun-2024/expert-workshop-on-digitalization-narratives-and-climate-change-mitigation

6.2 Scaling smart electric vehicle charging across firms unlocks significant system co-benefits.

Figure. Screenshot of the decision support system (DSS) after the final design cycle. The left sidebar enables firm-specific data input. The central line charts show electricity demand profiles under three charging strategies: peak minimisation & valley filling (PM-VF), charging cost minimisation (CCM), and carbon emission minimisation (CEM). The grey line indicates the site's current demand curve, the red line shows additional load from uncontrolled charging (UCC), and the blue, orange, and green lines represent smart charging (SC) outcomes under PM-VF, CCM, and CEM, respectively. The bar charts on the right quantify the Value of Smart Charging (VoSC) in terms of maximum peak reduction (blue), charging cost savings (orange), and carbon emission reductions (green).

WHAT WE DID

- We computed the Value of Smart Charging (VoSC) as the savings potential from smart charging electric vehicles (EVs).
- Using real electricity profiles and workplace-specific data from a sample of German firms, we compared the value of smart charging in different adoption scenarios.

WHAT WE FOUND

- Cost- or carbon-minimal charging delivered stable savings independent of adoption rates.
- Peak-minimal charging consistently achieved the lowest peak demand profiles across all firms, with higher savings potential as EV adoption increased.
- Variability across firms was substantial, showing that smart charging outcomes are strongly context-dependent.

SO WHAT?

- Encourage workplace operators to adopt smart charging strategies tailored to their context to realise savings and co-benefits.
- Aggregate workplace charging flexibility to integrate higher shares of renewable electricity generation into the grid.

OUTPUT

Seger, M., C. Brand, C. Clement, M.-F. Körner and C. Wilson (under review). "Navigating the Sustainable Mobility Transition: Designing a Data-Driven Decision Support System for Planning and Operating Electric Vehicle Workplace Charging Infrastructure". Decision Support Systems.
https://iDODDLE.org/seger-m-c-brand-c-clement-m-f-korner-and-c-wilson-navigating-the-sustainable-mobility-transition-designing-a-data-driven-decision-support-system/

LINK

https://iDODDLE.org/how-data-and-smart-algorithms-can-transform-electric-vehicle-workplace-charging/

6.3 Digital transformation is unfolding at varying speeds worldwide with a global digital divide amplifying other inequalities.

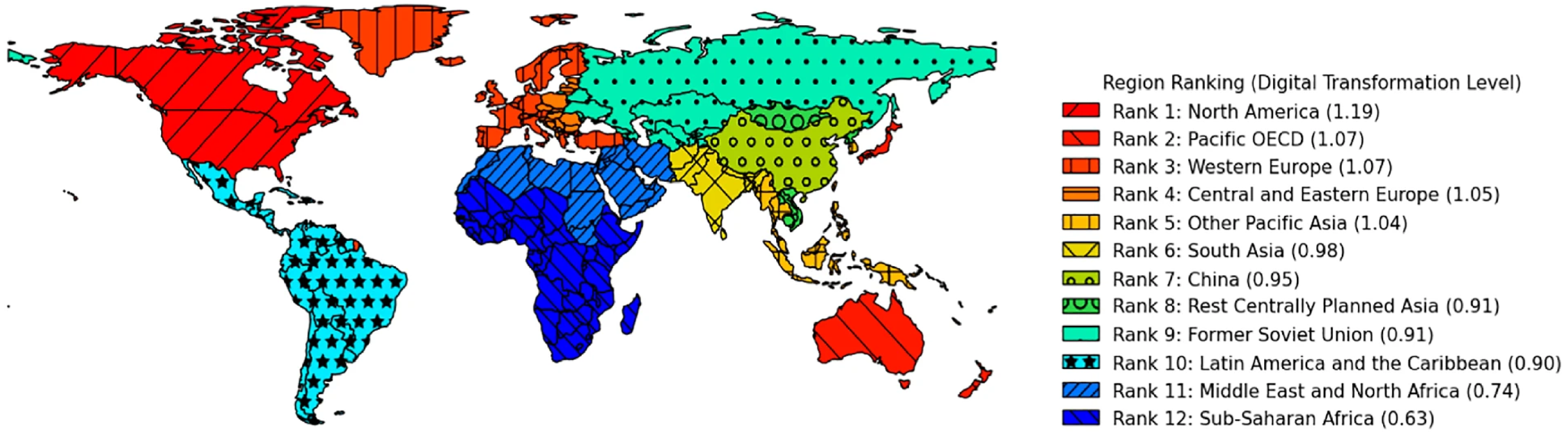


Figure. Digital transformation by 2050 under 'regional rivalry' development assumptions. Values in brackets in the legend show relative digital transformation levels.

WHAT WE DID

- We fitted statistical models to historical data on digitalisation measured by the UN's e-government development index for 62 countries in 12 world regions.
- We used our historically-calibrated models to project future digital transformation under different global socioeconomic development scenarios.

WHAT WE FOUND

- Digital transformation deepens in all scenarios into the future, but access to the benefits of digitalisation is very unevenly distributed.
- Under some assumptions, 45% of the world's population in 2050 have access to relatively low levels of digital transformation despite ever-deepening digitalisation in wealthier countries.
- Quantitative projections of digital transformation enable new analysis of how digitalisation contributes to climate mitigation and adaptation challenges.
- As an example, we used our projections to assess future energy demands of data centres that reveal localised concerns but manageable global impacts over the long-term.

SO WHAT?

- Capture digitalisation impacts on climate explicitly in future scenarios and quantitative pathways - both for better and for worse.
- Focus on the big stuff: digitalisation's indirect impacts on climate are of greater concern globally than data centres' operational footprint.

OUTPUTS

Fan, Y.V., C. Wilson, M. Andrijevic, H. Carlsen and S. Joshi (2025). "Digital transformation in the Shared Socioeconomic Pathways". npj Climate Action 4(1): 79.
https://doi.org/10.1038/s44168-025-00283-w

Wilson, C., Y.V. Fan and F. Amanta (2025). "AI's indirect impacts on climate outweigh concerns over its direct energy footprint". Oxford Energy Forum. Volume: Artificial Intelligence and its Implications for Electricity System, Issue 145, pp. 10–15. May 2025.
https://www.oxfordenergy.org/publications/artificial-intelligence-and-its-implications-for-electricity-systems-issue-145/

LINK

https://iDODDLE.org/iDODDLE-takes-to-the-airwaves-new-podcast-on-ai-and-energy/

6.4 Artificial intelligence (AI) creates systemic risks for climate action.

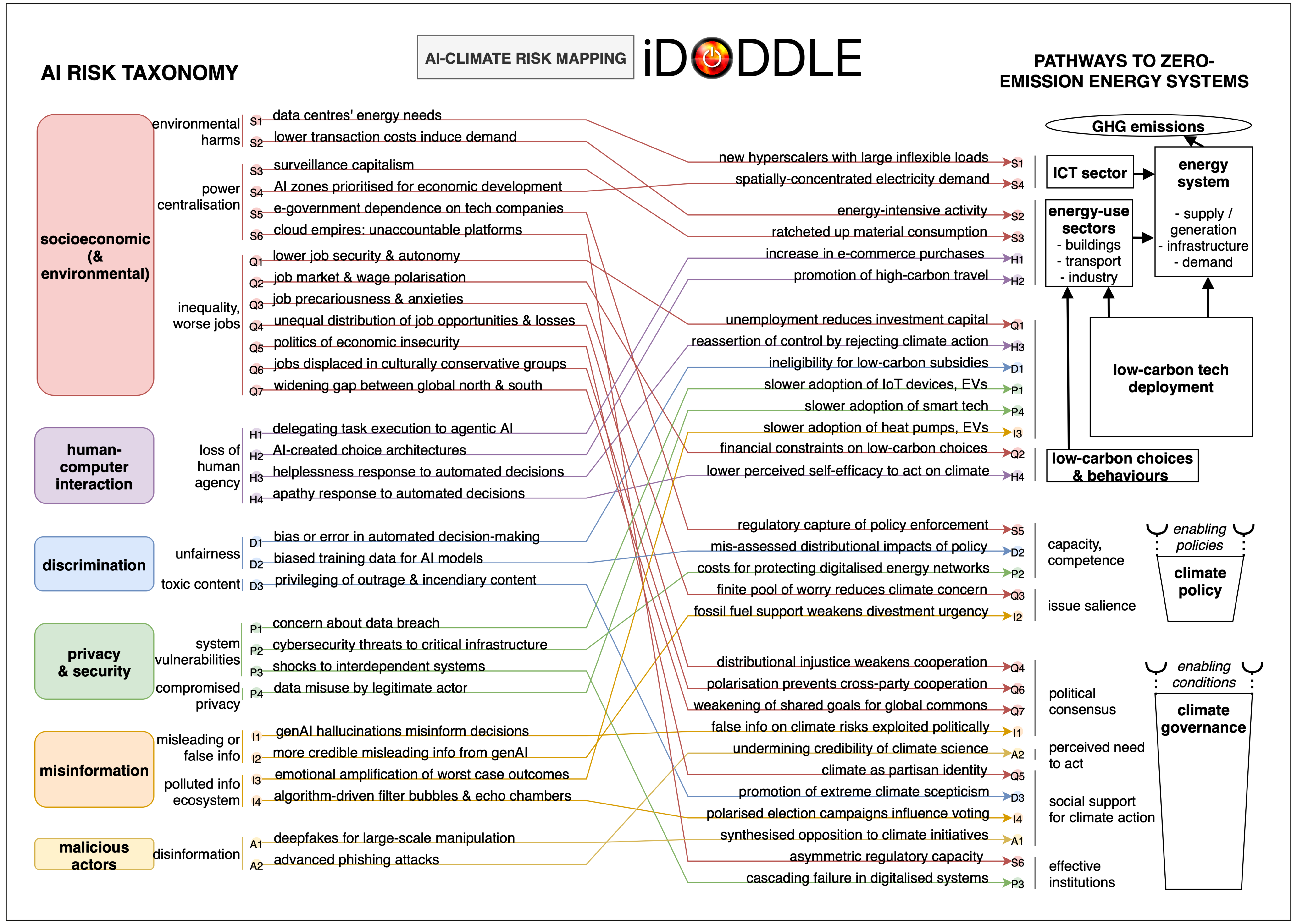


Figure. Linkages between AI risks (on the left) to building blocks of zero-carbon energy systems (on the right).

WHAT WE DID

- We mapped AI risk domains onto the building blocks of zero-carbon energy systems from direct drivers of emissions to broader policy and governance enablers.
- We built a database of AI-climate risks using evidence from journal articles, media reports, AI incident reports, industry and policy reports.

WHAT WE FOUND

- AI exacerbates the risks of digitalisation for climate, from undermining uptake of low-carbon technologies to weakening climate governance institutions.
- Linkages between AI risks and climate action are dense, complex, and diffuse as AI is a general-purpose technology.
- AI-climate risks can reinforce one another, affecting climate mitigation efforts at multiple levels.

SO WHAT?

- Integrate climate impacts into AI governance frameworks beyond the environmnental footprint of data centres.
- Balance 'AI for good' narratives with a comprehensive assessment of AI's systemic risks for climate action.

OUTPUT

Wilson, C. and F. Amanta (2025)."Mapping AI risks for climate." iDODDLE report.
https://iDODDLE.org/wilson-c-and-f-amanta-2025-30-ai-risks-for-climate-mitigation/

LINKS

https://iDODDLE.org/30-ai-risks-for-climate-mitigation/

https://www.techpolicy.press/the-overlooked-climate-risks-of-artificial-intelligence/

SECTION 7

Appendices

CONTENTS

7.1 The iDODDLE team

GET IN TOUCH! FOR FURTHER INFORMATION ON ANYTHING YOU'VE READ IN THIS REPORT, PLEASE LET US KNOW BY CONTACTING...

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7.2 iDODDLE outputs: publications, data, and more

HOW CAN I READ MORE ABOUT iDODDLE RESEARCH?

Throughout this synthesis report, we have referenced scientific journal articles, conference papers, and other outputs from the iDODDLE project. There are also many more outputs including blogs, talks, and media articles which we didn't have space to include in this synthesis report.

We believe strongly in open access research, and we have made all these outputs available for download on our website:

https://iDODDLE.org/category/outputs/

Please let us know if there is anything you cannot find or access, and we will send it.

HOW CAN I ACCESS THE DATA iDODDLE COLLECTED AND ANALYSED?

We are fully committed to making our anonymised datasets publicly accessible whenever possible, subject to the informed consent of our research participants.

All the datasets we are able to share on data repositories can be accessed via a dedicated page on our website:

https://iDODDLE.org/category/outputs/data-resources/

As with the outputs, please let us know if there is a dataset you cannot find or access, and we will help.

HOW CAN I FIND OUT MORE ABOUT THE iDODDLE LIVING LABS?

https://iDODDLE.org/living-labs/

The three year living lab field trials led by Emilie Vrain generated a wealth of data on digitalised daily life. A dedicated page on our website provides a starting point to explore what we did and what we learnt.