Sustainable Digital Consumer

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Motivation

> 60% of global GHG emissions are attributable to consumption (Ivanonva, 2016; Murakami, 2022)

> 12% of Germany's annual GHG emissions are due to **online shopping** (Statista, 2022)

> Ecologically sustainable shift could reduce online shopping's emissions by **half** (Siikavirta et al., 2002)

> Sustainable product (from cradle to grave): mode of production, origin of product(s), packaging and waste management (Wikström et al., 2014)

Opportunities for HCI

> Challenge: to increase sustainability competence and **bridge behaviour-intention gap** (Vermeir et al., 2008)

> Wealth of digital options to support consumers in sustainable online shopping and increase sustainability competence

Background: Right Information

Support provision for sustainable online shopping

> **Behaviour-Intention Gap**: many want to shop sustainably but do not know how (Vermeir et al., 2008)

> Consumers need not only information on *what* to by but also **how** to find it (Forwood et al., 2015)

> **Behaviour Change Techniques:** support consumers effectively (Michie et al., 2011) by targeting barriers and employing appropriate mechanisms to overcome these barriers

> Important to preserve user's **freedom of choice** whilst avoiding feelings of loss (Carmichael, 2019)

> Successful interventions: present the **right information at the right time**

> **Wealth of technology-mediated** behaviour interventions have been developed and studied; varying success → **lack basis in** behaviour change theory (Hedin et al., 2019)

Background: Right Information

Nudge

> **Choice architecture:** organising the context in which people make decisions

> Nudges tap into *fast* and *automatic* mental processes

> e.g. visually highlighting sustainability of products (Michels et al., 2022)

Think

> Given the right context and right information, consumers can think themselves (i.e. deliberate) towards a better understanding of sustainability

> Think solutions target the *reflective* mind (conscious, slow, effortful, and goal oriented)

> e.g. running total and carbon budget (Kanay et al., 2021)

Incentivise

> Offer reward and punishment

> Limitations: what is the scale of reward and punishment for wasting carbon through unsustainable consumption?

> e.g. carbon tax (Kanay et al., 2021)

Background: Right Information at the Right Time

Path-to-purchase

Preference-based suggestion of alternatives (Lawo *et al.*, 2021)

Healthy recommendations vai notifications(Stawarz et al., 2015)

Point-of-purchase

Visually highlighting sustainable products (Shakeri et al., 2021)

Carbon budget (Kanay et al., 2021)
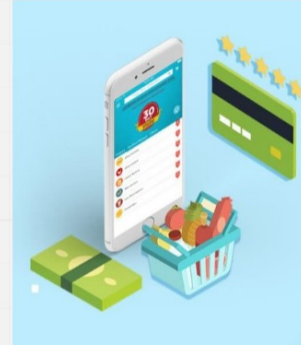
Point-of-sale

Last-minute healthy alternatives (Forwood et al., 2015)

Post-purchase

Organic purchases: summaries of shopping behaviour (Katzeff et al., 2021)

Right Information at the Right Time with the Right Tool

Augmented and Virtual Reality (XR)
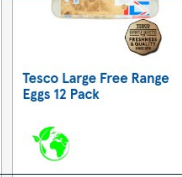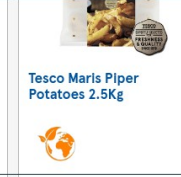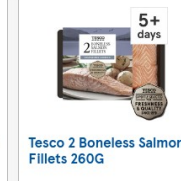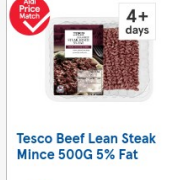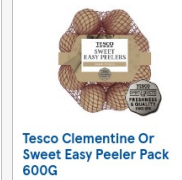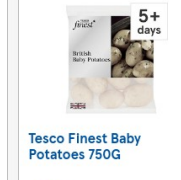
> XR can enhance customer shopping experience (Zimmermann et al., 2022)

> Increase personal response efficacy beliefs (Meijrs et al., 2022)

> Advancement of XR will increase ICT sector's footprint

> Online retail is expanding e.g. Amazon, Metaverse, Subway, …

> Savings from sustainable consumption may offset XR's carbon footprint

> However, rebound effect of saving CO2 → frugal computing

Envirofy: Tool to Support Sustainable Grocery Shopping

Behaviour interventions at the point-of-purchase when grocery shopping

> Webbrowser extension Envirofy (Shakeri et al., 2021)

> Injection of a catalogue of *think* and *nudge* behaviour interventions into a real online shopping environment

> Tesco; one of Europe's largest online grocery store (polished look and feel of original website; wealth of products; real-world shopping)

> 8-week real-world study with British consumers

Envirofy: Motivational Messages

Behaviour Change Technique: Traffic Light Icons

> Information about social and environmental consequences; prompts/cues; conserve mental resources

Main Function

> Education

Behaviour Change Technique: Ordering by Sustainability

> Prompts/cues; restructuring physical environment; conserving mental resources

Main Function

> Environmental Restructuring

Behaviour change technique: Alteration of Colour Saturation

> Recude prompts/cues; graded tasks

Main Function

> Environmental restructuring, persuasion

Envirofy: Real-time feedback & Budgetting

Behaviour Change Technique: Real-time feedback

> Self-monitoring of outcomes of behaviour; feedback on outcome of behaviour; information about social and environmental consequences; salience of consequences

Main Function

> Education, training, persuasion

Behaviour Change Technique: Budgetting

> Goal setting (outcome); discrepancy between current behaviour and goal; behavioural contract;

Main Function

> Education

Conclusion & Future Work

Current State

> Investigation of efficacy of behaviour interventions and their combinations in a factorial trial-design (Guastaferro et al., 2019), 8-week, real-world online study with 30 participants per condition

> Initial insights: **decrease of a shop's carbon footprint by 14%**

> Digital behaviour interventions are effective, are low-cost, rapid, and upscalable to a national level (Reynolds, 2019)

> If online citizens were supported in sustainable consumption today, Germany's GHG emissions can be reduced by 1.7% (eq. aviation industry)

Future Work

> Design, develop, and evaluate various digital behaviour interventions along the 4 decision points to successfully support sustainable online consumption

> Different technologies (e.g. AR), behaviour intervention strategies (e.g. recommendations), shopping domains (e.g. fashion)

The „Wrong" Information?

Nudges and Dark Patterns

> Dual research of concern: research that is intended **to provide benefit**, but could be easily **misapplied to do harm**

> Spill-over effect: research can contribute to benevolent and malicious applications

> Culture of awareness and responsibility

> Conduct regular risk assessments and develop mitigation strategies (e.g. ethics assessments)

> Deliberation with stakeholders e.g. public, government and policy makers, and experts

> User perspective: transparency

Last thoughts: My Research, a Marriage of Convenience
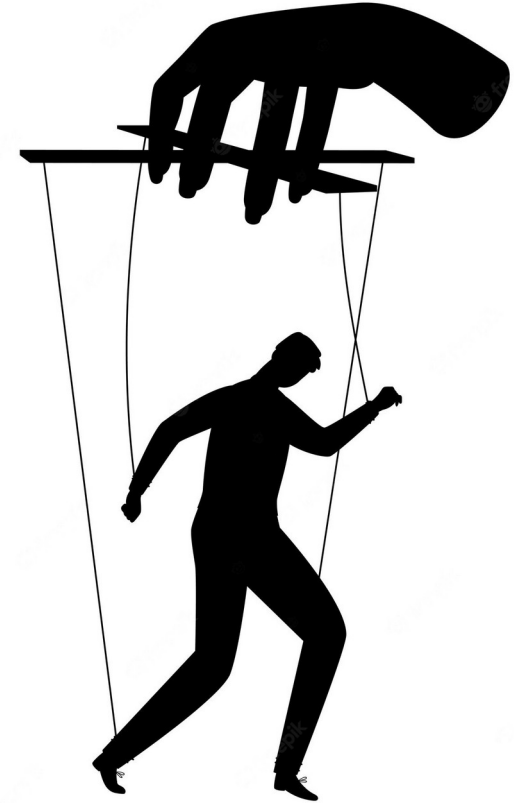
Techno-fixing the Environment?

> Techno-fix: attemtp to use engineering or technology to solve a problem that was created by technolgoy in the first place

> Dream: interventions that actively **discourage shopping** and encourage other means of consumption (e.g. sharing)

> Politicisation of climate change

> Business as usual: research community should find ways of „fixing it"

> Techno-fixes: or preferring not to change anything

> We need radical societal changes, not a „green-washed" status-quo.

TECHNO-FIX

Why Technology Won't Save Us
or the Environment

Michael Huesemann and Joyce Huesemann
FOREWORD by PAUL R. EHRLICH and ANNE H. EHRLICH
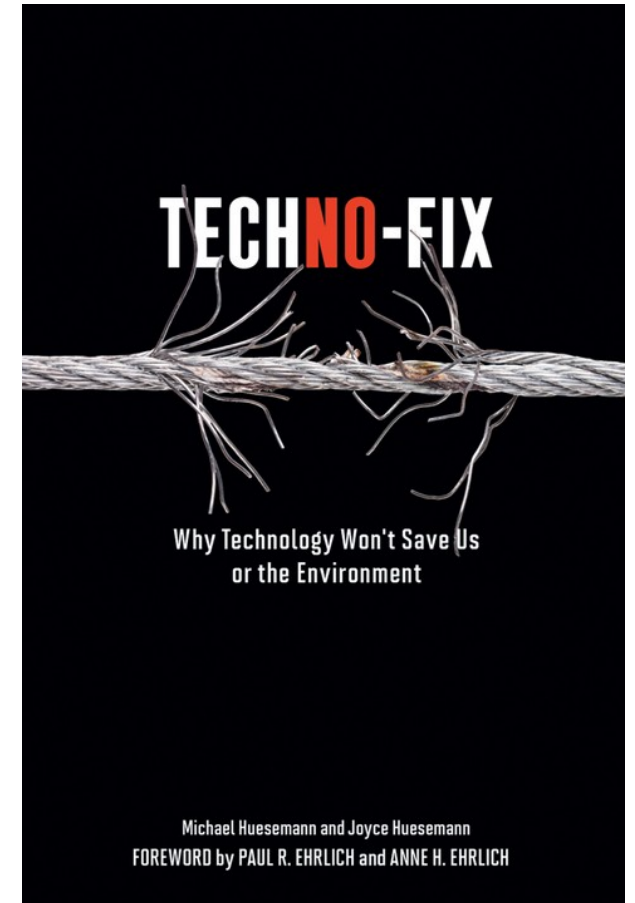
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