Chapter 8
Behavioural AI for Sustainable Wardrobes: Insights and Innovations in Fashion Tech

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ABSTRACT

This chapter explores how behavioural science and AI can be integrated to foster sustainable wardrobes by addressing overconsumption and high return rates in fashion e-commerce. It pursues four objectives: linking behavioural theories (nudges, habits, social influence) to AI design; assessing tools like virtual try-ons, recommender systems, and sustainability apps; identifying interventions to reduce excess buying and returns; and providing strategic brand guidelines. Using literature, industry cases (ASOS, Zalando, H&M, Patagonia, Nike), and a survey of 300 shoppers, the study finds fit uncertainty, promotions, and social influence drive unsustainable behaviours. Consumers respond positively to AI-driven size tools and try-ons, with moderate willingness to pay premiums for verified sustainable products. The chapter offers actionable recommendations to align commercial objectives with measurable sustainability outcomes.

INTRODUCTION

Fashion is a dynamic industry that represents the value of art linked with the prevailing culture. It is one of the most pollution-generating sectors across the entire planet (Garcia 2022). The boost in fast fashion trends along with the expansion of

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the e-commerce industry and high return rates on the products has further increased the pollution effects associated with this industry. It has turned into a major concern across the entire planet with regards to sustainable consumption (George 2024). As reported by the United Nations Environmental Program, the fashion industry contributes nearly 10% of the entire carbon emissions on a global scale along with 20% of the entire wastewater created across the planet. Millions of tons of fashion waste are produced annually with the short lifespan of the products created within the fashion industry (UNFCCC 2018).

Conventional sustainability initiatives practiced in the fashion sector, including eco-labeling schemes, recycling initiatives, and corporate social responsibility initiatives, have raised awareness but not enough to induce behavior change among consumers (Wijewardena & Bhowmik, 2025). Despite the growing awareness of the environment, consumers are still engaging in impulse purchases, over-purchasing, and return deliveries that work against the sustainability agenda. To bridge the gap between intention and behavior, sustainable fashion needs not only the provision of information answers but also needs to appeal to the cognitive, emotional, and social dimensions that govern the behavior of consumers. Such demands from the field have encouraged the current literature on the adoption of AI in sustainable fashion behavior (Koul & Jasrotia, 2025).

Behavioral science offers important information regarding the discrepancy between the behavior and the values that consumers hold regarding the environment (Mahmoodi et al., 2021). Behavioral principles like nudging, habit, choice, and social influence are utilized to create sustainable behaviors without undermining personal choice and freedom (Prits, 2023). For example, highlighting social proof, like the number of people choosing environmentally responsible goods, can normalize eco-friendly behaviors, and default options like focusing on environmentally responsible clothing can nudge customers towards environmentally responsible clothing choices (Tran, 2024).

Artificial intelligence raises these behavioural strategies to higher levels by providing real-time interventions. These AI-related systems help make recommendations to consumers using data from past users and work on virtual trials that can decrease uncertainties. They use predictive analytics and help promote purchasing and return actions before they happen (Singh, 2024). Recommendation systems that use style preferences and behavioural actions can help modulate purchasing actions, while virtual trials help diminish overpurchasing and returning products. The integration of AI algorithm capacity and behavioural strategies has the power to create a new behavioural pattern regarding consumerism among individuals as well as groups.

Empirical work and real-world applications illustrate the engagement AI can have with the process of consumer choice transformation (Abrardi et al., 2022). Virtual try-on applications enable consumers to see how clothes fit and look, decreasing