

OKE, A., MCDONALD, S. and KOROBILIS-MAGAS, E. 2021. Demystifying the complexity and heterogeneity of recycling behavior in organizational settings: a mixed-methods approach. *Waste management* [online], 136, pages 337-347.
Available from: <https://doi.org/10.1016/j.wasman.2021.10.020>

Demystifying the complexity and heterogeneity of recycling behavior in organizational settings: a mixed-methods approach.

OKE, A., MCDONALD, S. and KOROBILIS-MAGAS, E.

2021

“Demystifying the complexity and heterogeneity of recycling behavior in organizational settings: A mixed-methods approach”.

Author 1 and Corresponding Author:

Dr Adekunle Oke

Aberdeen Business School

Robert Gordon University, Garthdee Road, Aberdeen AB10 7QE, UK.

Email: a.oke1@rgu.ac.uk

Phone: +44 (0)1224263974

Author 2:

Prof Seonaidh McDonald

Smart Sustainable Plastic Packaging Challenge, Innovate UK

UK Research and Innovation, UK.

Email: seonaidh.mcdonald@iuk.ukri.org

Author 3:

Dr Evangelos Korobilis-Magas

School of Creative and Cultural Business

Robert Gordon University, Garthdee Road, Aberdeen AB10 7QE, UK

Email: e.korobilis-magas@rgu.ac.uk

Phone: +44 (0) 1224 263133

Conflict of Interest: The authors declare that they have no conflict of interest.

Abstract

Research on recycling has advanced across different disciplines, although the current knowledge about recycling behaviors at the corporate level remains elusive. While most studies on recycling are focused on households, there is no indication that people who recycle at home engage in similar behavior when at work. To understand how to facilitate recycling at work, this study investigates recycling behavior at work and its antecedents. The study adopts a sequential exploratory mixed method (MM) approach as its methodological framework, using semi-structured interviews and statistical analysis through structural equation modelling (SEM). According to the findings, factors such as types and volumes of waste, responsibility/accountability, personal control, recycling schemes, institutional supports, and group harmony contribute to recycling behavior in organizational settings. The study demonstrates contextual attributes' contribution, particularly organizational support and social context of recycling to employees' recycling behavior. For recycling to be normative at the corporate level, this MM study argues for the need to harmonize schemes within and across contexts. There is a need to install similar recycling schemes and facilities within and across waste generation contexts to reduce the recycling complexity and maintain consistency in recycling behavior. This study's findings could assist waste planners and policymakers in designing effective waste management schemes that would contribute to the circular economy initiatives. We further discussed the implication of the study.

Keywords: Mixed Methods Research; Pro-environmental Behavior; Recycling at Home; Recycling at Work; Organizational Support; Structural Equation Modeling (SEM).

1 **1.0. Introduction**

2 The past decades have witnessed an exponential increase in the number of published
3 papers on recycling behavior and how to promote it. The trend has resulted in
4 interdisciplinary research efforts (Miafodzyeva and Brandt, 2013; Oke, 2015) and the
5 proliferation of legal- and market-based instruments. It further shows the importance of
6 recycling in achieving a circular economy (Soukiazis and Proença, 2020). However, the
7 lack of comprehensiveness, fixation on the Theory of Planned Behavior (TPB) (Yuriev et
8 al., 2020), application of wrong assumptions about decision criteria (Tudor et al., 2008),
9 and overly restricting research contexts to households affect the translation of theory to
10 practice (Coşkun and Özbük, 2020; McDonald and Oke, 2018). Besides, consumers' waste
11 generation potential is another important issue often neglected by scholars when
12 analyzing recycling behavior (Soukiazis and Proença, 2020).

13 Another obvious challenge when investigating recycling is the disparity in recycling
14 schemes within and across countries, thus making studies and their findings difficult to
15 compare. Although recycling policies and schemes are different across municipalities,
16 even within a country (Soukiazis and Proença, 2020), previous studies have mostly
17 addressed household recycling (Ofstad et al., 2017; Ones and Dilchert, 2012) and its social
18 contexts (Knickmeyer, 2020). This approach may affect the effectiveness of waste
19 management practices, especially recycling behavior across different organizations from
20 municipalities to municipalities. Also, many studies adopted recycling intention as a
21 proxy for the actual recycling behavior (Miafodzyeva and Brandt, 2013; Osbaldiston and
22 Schott, 2012). With many studies investigating behavioral intentions, the intention-
23 behavior gap (Ng, 2020; Zhang et al., 2021) suggests that our knowledge of promoting
24 recycling behavior, especially at work, is insufficient.

25 While there is a dearth of research efforts on recycling in organizational settings (Blok et
26 al., 2015; Ng, 2020; Ones and Dilchert, 2012), the difficulty in assessing employees'
27 behavior increases the complexity of explaining recycling at work. However, reviews of
28 different pro-environmental behavior studies showed that scholars commonly adopt TPB
29 and NAM (Miafodzyeva and Brandt, 2013; Knickmeyer, 2020; Osbaldiston and Schott,
30 2012; Yuriev et al., 2020). Although previous studies focused more on recycling at home,
31 factors influencing recycling behavior are different across contexts (Blok et al., 2015;
32 Ones and Dilchert, 2012; Ng, 2020). Not only because policies are different across
33 municipalities (Soukiazis and Proença, 2020; Knickmeyer, 2020) but also due to policy
34 and structural differences in recycling practices between home and work (Oke, 2015; Ng,
35 2020). Although many factors such as attitudes, economic status, gender, recycling
36 scheme, and waste collection times have been reported to influence recycling behavior,
37 especially at home (Escario et al., 2020; Knickmeyer, 2020; Soukiazis and Proença, 2020),
38 research findings are mixed and fragmented.

39 With the mixed findings in the recycling literature, we broadly categorized factors (Figure
40 1) contributing to recycling at home into socio-demographics, psychological, and
41 situational factors through our extensive review of relevant literature. These factors are
42 conceptualized and interpreted differently by investigators (Soukiazis and Proença,
43 2020; Yuriev et al., 2020), which may explain the mixed findings in the literature. Also,
44 there is no clarity in the literature on whether survey respondents are reporting personal
45 or household recycling behavior. There is no tendency that these factors would have the
46 same effects, outside the home settings, especially at work, due to structural and
47 infrastructural differences in recycling schemes.

48 **Insert Figure 1 Here**

49 Besides, the available extant studies on recycling at work mostly addressed a single
50 organization (Oke, 2015) using experimental methods (Osbaldiston and Schott, 2012)
51 that may reduce the external validity of findings across different organizations. Despite
52 the contributions of employees to corporate greening (Alzaidi and Iyanna, 2021; Mesmer-
53 Magnus et al., 2013), the lack of clarity on how to facilitate recycling at work (Ng, 2020;
54 Oke, 2015; Ones and Dilchert, 2012) shows the need to gain further insights into recycling
55 at work using employees' accounts.

56 Considering the issues mentioned above coupled with the dearth of research on waste
57 management outside the home settings (Coşkun and Özbük, 2020; Ng, 2020), especially
58 recycling behavior in organizational contexts (McDonald and Oke, 2018; Ones and
59 Dilchert, 2012), there is a need to understand recycling at work better. As a result, this
60 study explores and confirms employees' recycling behavior at work using an exploratory
61 sequential mixed methods research (MMR) design. The study aims to establish how
62 recycling in organizational settings can be facilitated using the employees' account of
63 their recycling behavior when at home and work. Using the employees' accounts of their
64 behavior is plausible because people usually make sense of and construct their pro-
65 environmental behaviors based on the behavioral context (Wan et al., 2021). Recycling
66 at work is of research interest due to the disparity between recycling policies, schemes
67 (Waste (Scotland) Regulations, 2012) and motivations within and across settings
68 (Soukiazis and Proença, 2020), especially in the UK (McDonald and Oke, 2018). It is worth
69 noting that this study is designed not to fill the gaps in recycling research but to address
70 the fundamental issues and challenges of enhancing recycling behavior in corporate
71 settings. Therefore, the following research questions are addressed to achieve the goals
72 of this study: (1). What are the employees' perceptions of recycling, and how do they

73 frame their recycling behavior? (2). What are the antecedents of recycling behavior at
74 work, and to what extent does recycling behavior at home translates to recycling at work?

75 **2.0 Theoretical foundation and hypotheses**

76 In the past decades, theories and models, predominantly from psychology, sociology, and
77 marketing, have provided insights into how people behave. The available theories are
78 diverse in predicting pro-environmental behaviors, such as recycling (Chao et al., 2021;
79 Yuriev et al., 2020). However, TPB and NAM remain the prominent theories/models
80 when investigating pro-environmental behaviors, including recycling (Miafodzyeva and
81 Brandt, 2013; Chao et al., 2021; Yuriev et al., 2020).

82 With the lack of a strong theoretical foundation to understand recycling behavior,
83 especially in organizational settings (Francoeur et al., 2019), studies have combined
84 theories to enhance the validity of their investigation (Botetzagias et al., 2015; Park and
85 Ha, 2014). Rather than combining theories, TPB and NAM served as the basis to explain
86 the hypothesized model (Figure 2) that emerged from the exploratory phase of this study.
87 We validated the qualitative findings through a combination of inter-rater reliability and
88 participants' validation to develop the hypothesized model (Miles and Huberman, 1994).

89 **Insert Figure 2 Here**

90 According to the model (Figure 2), perceptions of others, sense of control, awareness of
91 behavior, scheme knowledge, group harmony, organizational commitment, and recycling
92 experience (i.e. recycling at home) contribute to employees' recycling behavior in
93 organizational settings. Consistent with the hypothesized model, we assessed the
94 following hypotheses in this study:

95 **2.1 Awareness of Behavior (AB)**

196 Awareness of consequence is one of the key constructs in Schwartz's (1977) NAM and
197 contributes significantly to the activation of personal norms towards behavior.
198 Consistent with Oke and Kruijsen (2016), the qualitative findings of this study showed
199 that awareness of behavior through specific information about the consequences of
200 waste and recycling influences employees' recycling behavior. The lack of awareness can
201 result in the denial of responsibility for waste generation and may inhibit recycling
202 (Bissing-Olson et al., 2016; Onwezen et al., 2013), especially at work where responsibility
203 can be transferred to employers (Paillé and Boiral, 2013). The propensity to engage in
204 recycling is high when employees know the implications of their waste generation and
205 recycling behavior. As a result,

206 ***H1:** Awareness of behavior (AB) directly affects recycling behavior at work (RW).*

207 **2.2** Perception of Others (PO)

208 According to our model, the way employees perceive their colleagues' recycling behavior
209 influences recycling at work. As operationalized in this study, organizational context,
210 especially the social context of recycling, defines perception of others (PO) regarding
211 their recycling behavior. It accounts for the effects of recycling expectations and actions
212 of colleagues on recycling at work. The construct is analogous to Ajzen's (2002)
213 subjective norms that explain perceived normative pressure based on inferred behavior
214 and expectations of significant others. Consistent with earlier reviews (Miafodzyeva and
215 Brandt, 2013; Osbaldiston and Schott, 2012), the recent review (Knickmeyer, 2020) of
216 recycling behavior studies reported a significant effect of social factors on recycling at
217 home, especially when families and neighbors engage in recycling or support recycling
218 efforts. Also, studies have observed a positive effect of social norms on recycling behavior
219 in office settings (Lee et al., 1995) and the university environment (Largo-Wight et al.,

120 2012; Ofstad et al., 2017). While there is a dearth of studies about the social context of
121 recycling in corporate settings, the qualitative findings of this study show that reference
122 colleagues, such as green champions and a socially inclusive work environment, facilitate
123 recycling at work. Therefore,

124 ***H2: Perception of others (PO) positively impacts recycling behavior at work (RW).***

125 **2.3 Organizational Support (OS)**

126 For recycling behavior to be normative at work, organizations must facilitate recycling at
127 work. Like EU countries, recycling in the UK is governed by legal requirements where
128 businesses are expected to provide receptacles and collect recyclables separately.
129 Therefore, organizations can facilitate recycling by adopting a command and control
130 approach using a top-down system where recycling is mandatory in compliance with the
131 legal requirements. Our qualitative findings revealed that many workplaces indirectly
132 restrict recycling by providing receptacles only for materials, such as paper, of a high
133 economic value to their business activities and waste contractor's needs. On the contrary,
134 organizations can embrace a participatory method by using the principles of
135 organizational citizenship behavior for the environment (OCBE). According to studies
136 (Mesmer-Magnus et al., 2013; Paillé and Boiral, 2013), OCBE is a pro-environmental
137 behavior beyond employees' formal contractual (or role-based) obligations. While
138 recycling behavior at work is discretionary and altruistic (Chao et al., 2021), organizations
139 can support their employees' recycling behavior by committing to the idea of recycling.
140 In this study, support and commitment are synonymous and encompass recycling
141 information, incentives, facilities, and enabling conditions facilitating recycling at work.
142 The commitment of organizations to the environment, especially recycling, is perceived
143 by employees as a form of organizational responsibility and support to promote recycling

144 at work. Consistent with studies (Chao et al., 2021; Okonta and Mohlalifi, 2020; Soukiazis
145 and Proença, 2020) that have observed the effects of organizational commitment on
146 recycling behavior, we hypothesize that:

147 **H3:** *Perception of organizational support (OS) directly affects employees' recycling*
148 *behavior at work (RW).*

149 **2.4** Perception of Control (PC)

150 Another important theme that emerged from our qualitative study is the extent of control
151 over recycling at work as perceived by employees. It is worth noting that perceived
152 behavioral control (PBC) is one of the TPB constructs and is the only construct with direct
153 and indirect effects on behavior (Ajzen, 2002). Since its conceptualization, studies have
154 reported significant effects of PBC on pro-environmental behaviors in households
155 (Knickmeyer, 2020; Okonta and Mohlalifi, 2020) and organizational settings (Blok et al.,
156 2015; Ofstad et al., 2017; Yuriev et al., 2020). While PBC captures people's confidence to
157 perform a behavior (Ajzen, 2002; Knickmeyer, 2020), PC, as used in this study, reflects
158 employees' ability to engage in recycling based on recycling schemes and facilities,
159 including their set-up/convenience. We adopted perception of control in this study
160 instead of perceived behavioral control due to the latter's overlap with Bandura's (2012)
161 self-efficacy. While PBC and self-efficacy are synonymous (Ajzen, 2002), many scholars
162 have questioned the discriminant validity of PBC in TPB and concluded that self-efficacy
163 should replace PBC (Conner and Sparks, 2005).

164 Based on the operational description of PBC (Ajzen, 2002), PC in this study (see Appendix
165 1) is different from PBC. According to the qualitative findings of this study, the construct
166 describes recycling opportunities, especially regarding accessibility and ease of recycling
167 at work. We observed from the qualitative findings that people have the liberty to set up

168 their recycling facilities at home based on their circumstances, such as accommodation
169 type and space. This possibility is lacking in organizational settings where facilities are
170 generally installed by organizations. Nevertheless, the level of organizational
171 support/commitment to recycling, such as providing appropriate receptacles,
172 contributes significantly to employees' self-efficacy, self-predisposition and perceptions
173 of control (Boiral et al., 2015). This contribution is context-specific and differs from one
174 organization to another, influencing employees' perception of personal control over
175 recycling in their organization. Therefore,

176 ***H4:** Perception of control (PC) directly affects recycling behavior at work (Recy_W).*

177 **2.5** Recycling at Home (RH)

178 Studies have shown that experience from past behavior contributes to attitudes, norms,
179 and future behavior (Ajzen, 2002; Osbaldiston and Schott, 2012); however, there is no
180 specific explanation of how people acquire recycling experience. The dominant school of
181 thought in the literature is based on habit formation and suggests that habitual behaviors
182 are repeated (Knickmeyer, 2020; Ofstad et al., 2017) within and across contexts. This
183 study adopts recycling at home to measure employees' past recycling behavior due to the
184 workplace context that this study investigates. While waste management policies are
185 different across municipalities and organizations (Soukiazis and Proença, 2020), the
186 qualitative findings of this study indicate the need for a correspondence across contexts
187 for recycling behavior to be consistent between home and work. Besides, there is a need
188 for the behavioral contexts to remain stable (Bratt et al., 2015; Ofstad et al., 2017), as any
189 structural and infrastructural changes within and across contexts could dissuade people
190 from recycling (Knickmeyer, 2020; Thomas and Sharp, 2013). If people
191 compartmentalize recycling behavior according to domain or context (Bratt et al., 2015),

192 the thesis of similarity between contexts for behavior to be consistent is plausible. The
193 extent to which recycling becomes normative at home (Thomas and Sharp, 2013) and its
194 harmonization with recycling at work (Oke, 2015) in terms of schemes, facilities, and
195 recyclables suggest that,

196 ***H5:** Recycling behavior at home has a significant positive effect on recycling at work.*

197 **2.6** Scheme Knowledge (SK)

198 Contrary to many studies (Osbaldiston and Schott, 2012; Yuriev et al., 2020), this study
199 operationalizes specific recycling knowledge instead of general environmental
200 knowledge. The decision results from the qualitative findings of this study, including
201 studies (such as Knickmeyer, 2020; Okonta and Mohlalifi, 2020) that reported positive
202 effects of scheme knowledge on recycling behavior. According to the qualitative findings
203 of this study, recycling scheme knowledge is context-specific due to differences in
204 recycling schemes and facilities. For example, we observed that some organizations have
205 two bins (e.g. mixed and general/residual waste) while others provide separate
206 receptacles for all recyclables with/out provisions for general waste and food waste. The
207 materials collected for recycling and available facilities are restrictive in many
208 organizations contrasting what employees know about recycling at home, affecting their
209 recycling knowledge and how they engage in recycling at work.

210 While different interventions (such as signage, prompt, and bulletin) inform employees'
211 knowledge and awareness about recycling, any adopted method should be explicit (Ng,
212 2020), particularly at work. This provision may require specific recycling information
213 encompassing declarative and procedural knowledge. As a result,

214 ***H6:** The effect of recycling scheme knowledge (SK) on recycling behavior at work is*
215 *significantly positive.*

216 **2.7** Group Harmony (GH)

217 Group harmony is another construct that emerged from the qualitative phase of this
218 study, although the construct has not been explicitly operationalized in pro-
219 environmental research. Based on this study, group harmony (GH) explains how
220 employees within the same organization collaborate towards corporate greening. While
221 the effect of social factors on recycling at home has been extensively examined
222 (Knickmeyer, 2020), there is no available research on the impact of social cohesion on
223 employees' recycling behavior at work. We argue that group harmony underpins Paillé
224 et al.'s (2016) eco-helping in the OCBE literature and construed in this study as a
225 collaborative relationship between colleagues to engage in recycling at work. However,
226 group harmony as operationalized in this study differs from Ajzen's (2002) subjective
227 norms, i.e. the perceived expectations of significant others, resulting in social pressure to
228 engage in recycling. Rather than perceived pressure from colleagues, group harmony
229 captures a positive and mutual relationship between colleagues to engage in recycling at
230 work through helping and guidance.

231 According to Boiral et al. (2015), eco-helping shows the willingness of employees to assist
232 colleagues in performing pro-environmental initiatives, such as recycling, at work. For
233 example, colleagues may assist co-workers in understanding what and where to recycle,
234 allowing organizations to divert quality recyclables from landfills. Considering that
235 recycling at work is perceived as an individualistic behavior according to the qualitative
236 findings of this study, we argued that the extent to which employees feel their workplace
237 is a collective community contributes to recycling at work. Therefore,

238 ***H7:** Group Harmony (GH) has a significant positive effect on recycling at work.*

239 **3.0. Methods**

240 This article is a part of an extensive study to investigate the determinants of pro-
241 environmental behaviors in organizational settings and how they differ from pro-
242 environmental behaviors at home (McDonald and Oke, 2018). The current study was
243 carried out in two stages to understand why employees engage in recycling in their
244 organization. Due to the scarcity of research efforts on recycling at work (McDonald and
245 Oke, 2018; Ng, 2020), the first phase of this study adopted an exploratory qualitative
246 design using semi-structured interviews. In the second phase, a structural equation
247 model was designed to test the relationship between the key themes that emerged from
248 the exploratory phase.

249 **3.1 Study 1: Qualitative Data Collection**

250 The qualitative phase was designed to gauge employees' perceptions using their
251 recycling account as they experience recycling at home and work. The goal is to identify
252 the determinants of recycling at work by understanding how people make sense of their
253 recycling behavior when at home and work. Rather than sampling householders, we
254 applied purposive sampling to recruit 15 key informants (employees) from 15 different
255 organizations in the UK based on their relevance in answering the research questions
256 (Carcary, 2009; Creswell, 2014). The number of participants (Table 1) in this study is
257 appropriate given that five to 25 participants are considered suitable for qualitative
258 research (Creswell, 2014).

259 **Insert Table 1 Here**

260 The lead investigator conducted all the interviews to maintain consistency, mainly in the
261 participants' office, between 2015 and 2016, which provided the opportunity to observe
262 waste management schemes and facilities in UK workplaces. Using face-to-face semi-
263 structured interviews, each session focused on the three broad thematic areas to set the

264 discussion context. These thematic areas were general recycling experience, recycling
265 behavior at home and work, and reasons for engaging in recycling whether at home or
266 work. Participants' responses were explored in-depth with different probes and prompt
267 during the interview process to have a holistic view of recycling behavior in both settings.
268 Each interview session lasted between 60 and 90 minutes and was recorded, transcribed,
269 and processed in real-time. Before the data analysis, transcripts were shared with
270 participants to ensure the data integrity and appropriateness (Carcary, 2009). This
271 approach generated quality data on recycling schemes, including a detailed account of
272 how and why employees engage in recycling.

273 **3.2 Study 2: Quantitative Data Collection**

274 To test the hypothesized relationships, questionnaire items (see supplementary table)
275 were developed based on this study's qualitative findings and refined using relevant
276 literature (such as Lee et al., 1995; Singelis, 1994; White et al., 2009). We examined each
277 construct using a 5-point rating scale (Oppenheim, 2000), ranging from "Strongly
278 Disagree" [5] to "Strongly Agree" [1]. Recycling behavior at work and recycling at home
279 were measured using key recyclables (Table 2) and assessed using a 5-point rating scale,
280 ranging from "Never [5] to Always" [1].

281 We conducted a pilot study using actual field conditions to clarify the language, layout,
282 coverage, questions' logic, and enhance the survey instrument's validity/reliability
283 (Byrne, 2016; Oppenheim, 2000). Respondents for the pilot study shared similar
284 characteristics with the target population to identify any form of ambiguities in the
285 survey instrument. The pilot study (N = 25) comprised 10 environmental/waste
286 management experts (who also participated in the qualitative phase) and 15 researchers.
287 We included the interview participants (N = 10) in the pilot to validate the contents of the

288 survey instruments based on the qualitative findings. The final questionnaire included 41
289 items (see supplementary table) that measured recycling behavior in both contexts and
290 other constructs in the hypothesized model.

291 **3.2.1 Quantitative Sampling**

292 The study sampled organizations in the UK rather than households to ensure that only
293 employees working in an office environment during data collection participated. The
294 approach allowed for the assessment of personal behavior instead of household recycling
295 behavior. Due to the UK Waste Regulations that require all businesses to collect their
296 recyclables separately, no strict criteria, such as organization size and sector, were
297 applied when selecting organizations.

298 We randomly selected organizations from the natural clusters of the UK countries using
299 the Financial Analysis Made Easy (FAME) and Kompass databases. We retrieved a total
300 of 14,420 organizations with contact details (email and/or telephone) from FAME and
301 Kompass databases. From the 14,420 identified organizations, we randomly selected
302 3,000 organizations using "Research Randomizer" (www.randomizer.org) to reduce the
303 sampling error. Considering that employees' contact details, especially their email
304 addresses, are not available/accessible to the public, we invited 3,000 randomly selected
305 organizations using their contact details. However, the invite was delivered to only 1,527
306 companies while the remaining organizations' email contacts were outdated or not in use.
307 Out of the 1,527 organizations, only 241 responded to the invite expressing their
308 willingness to distribute the online survey to their employees. The non-respondent
309 organizations were estimated to be 1,286 ($1527 - 241 = 1,286$) representing about 16%
310 of the invited organizations. Finally, we sent a personalized survey link through email to
311 each of the 241 organizations that responded to our invite. However, the final

312 questionnaire was administered online to 520 respondents, and 367 were returned from
313 43 organizations, resulting in a response rate of 71% above the minimum threshold of
314 64.8%, as observed by Barrios et al. (2011). The study's total sample size, N = 367, is
315 above the threshold recommended, N = 200, for an SEM analysis (Kline, 2015). We
316 adopted SEM due to its capability to account for measurement errors and unexplained
317 variances with the opportunity to test hypotheses simultaneously, including the ability to
318 fit the best model enhancing theory development.

319 **3.3 Data Analysis**

320 **3.3.1 Qualitative Data Analysis**

321 The interviews were transcribed and analyzed using thematic analysis. Rather than
322 identifying texts that portrayed similar meanings from participants' accounts through
323 coding and sorting (Ayres et al., 2003), each participant's experience was treated as a case
324 following Ayres et al. (2003) and Miles and Huberman (1994) data analysis techniques.
325 The process involved inductive de-contextualization and re-contextualization of the
326 participants' accounts by matching similar patterns, linking data to the research
327 questions, building explanation, and cross-case synthesis. The entire process was
328 facilitated by NVivo 10, a computer-aided qualitative data analysis software with-
329 documented audit trails to enhance the findings' validity (Carcary, 2009). The identified
330 themes and sub-themes were cross validated (or compared) and discussed by the
331 research team to achieve consensus.

332 **3.3.2 Quantitative Data Analysis**

333 The respondents' socio-demographic (Table 2) show that women (63%), men (34%), and
334 unspecified (3%) completed the online survey.

335 **Insert Table 2 Here**

336 We performed factor analysis with Principal Axis Factoring using "Oblimin with Kaiser
337 Normalization" rotation. Using a minimum eigenvalue of 1.0, we extracted 8 factors and
338 applied Cronbach's alpha to assess the constructs' internal reliability (Edwards and
339 Bagozzi, 2000; Kline, 2015). Also, we performed a confirmatory factor analysis (CFA) to
340 establish the reliability and validity of the model. Having established convergent and
341 discriminant validity, we assessed the hypothesized causal relationships in AMOS 24.0
342 using Maximum Likelihood Estimation (MLE) (Byrne, 2016). Consistent with Hu and
343 Bentler (1999), we applied goodness-of-fit (GFI), Comparative Fit Index (CFI), PCLOSE,
344 Minimum Discrepancy per Degrees of Freedom (CMIN/DF), Normed Fit Index (NFI), Root
345 Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square (SRMR),
346 and Tucker-Lewis Index (TLI) to assess the model fit. We examined the causal
347 relationship among the latent constructs in the hypothesized model, having confirmed
348 the SEM measurement model. The structural model was tested through SEM in AMOS to
349 determine the consistency of the hypothesized relationships with the data having
350 achieved the required minimum multivariate criteria (Byrne, 2016; Kline, 2015).

351 **4.0 Findings**

352 **4.1. Qualitative Findings**

353 The findings (Figure 3) highlight the complexity, subjectivity, and uniqueness of how
354 participants explained recycling and why employees engage in recycling when at home
355 and work. For instance, we observed from the data that recycling scheme determines
356 the infrastructure to support recycling, influencing what and how people recycle.

357 Compared to recycling at home (Figure 1) which is mostly assessed using socio-
358 psychology theories, such as TPB and NAM, figure 3 depicts how employees perceive
359 recycling and its determinants.

360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382

Insert Figure 3 Here

According to the findings, recycling contexts are the important determinant of behavior. We observed that employees are more inclined to recycle when adequate facilities, such as bins, are installed to support recycling. For instance:

"If I were in a different industry, I would have a different approach, I will like to think I would still recycle, but I would only do it because the system is there"

[Par_002]

"So, I guess it kind of ties with the council given you specific bins to do this, and I think you start to think more about it" [Par_005].

As presented in Figure 3 and Table 3, situational attributes, such as scheme design and its underpinning facilities, are different from one context to another, and construed as a form of organizational support and the key determinants of recycling behavior. For example, a participant argued that:

"It can be frustrating with the workplace, I think there needs to be a shared approach across businesses and households, I would love to see bins that are similar in households are being used in businesses as well. So, households and businesses having more continuity so it's easier for people to know" [Par_009].

Consistent with the literature (Paillé and Boiral, 2013), employees perceive this support as a form of organizational commitment to recycling and different from one organization to another.

Insert Table 3 Here

While organizational commitment is context-specific, we further observed that situational factors, particularly scheme design, recycling facilities, and waste generation

383 behavior, contribute to employees' sense of control and commitment including how they
384 ascribe recycling responsibility. Contrary to recycling at home where householders can
385 set-up recycling bins, our findings show that employees have no control over recycling
386 and its facilities at work. As a result, employees mainly ascribe recycling responsibility to
387 their organization due to the lack of control. For example,

388 *"I think when you're in the business it becomes less personal . . . when you're in the*
389 *workplace, then it's business' responsibility unless you're one of those 25% that are*
390 *committed, it could be a bit easy to almost say it's business not me and they haven't put the*
391 *bin where I need it. So, you do have less control over the system in business and may be as a*
392 *result you then have less ownership in terms of being willing to recycle"* [Par_015].

393 This finding is critical considering that studies have not sufficiently explored recycling
394 behavior regarding waste production (Soukiazis and Proença, 2020) and recycling
395 commitment outside the home settings. Besides, previous studies (see Miafodzyeva and
396 Brandt, 2013; Knickmeyer, 2020; Yuriev et al., 2020) have operationalized commitment,
397 perceived control, and responsibility together as separate constructs in a model. These
398 factors are psychological attributes of self (Figure 1) with the same motivational roots
399 and might result in multicollinearity issues when operationalized together in the same
400 model due to how people perceive them.

401 Based on the findings of this study, recycling in organizational settings may not
402 necessarily reflect employee's psychological, ethical and personality traits due to the
403 influence of external factors on recycling at work. Many of these external factors are
404 situational and outside the control of employees at work. For instance, we observed that
405 the provision of personal bins in offices was perceived as a barrier to waste segregation
406 in organizational settings despite employees' positive inclinations toward recycling. It

407 should be noted that recycling at work is discretionary and not explicitly part of employees'
408 formal role descriptions (Boiral et al., 2015). So rather than sorting waste as required by
409 UK waste regulations (Waste (Scotland) Regulations, 2012), employees commingle waste
410 due to the proximity of personal bins. This observation is consistent with many studies
411 (Li et al., 2020; Miafodzyeva and Brandt, 2013; Knickmeyer, 2020) that reported the
412 effects of convenience on household recycling behavior.

413 Although recycling is well-practiced at home (Ng, 2020; Thomas and Sharp, 2013), our
414 findings show that employees who recycle at home may not engage in recycling in
415 corporate settings due to the way contexts are perceived. According to the findings,
416 participants framed recycling with the use of "we" (at home) to "I" (at work), suggesting
417 different beliefs, especially about responsibility and commitment to recycling, across
418 contexts. The transition from "we" at home (such as "*We recycle glass . . .*") to the use of
419 "I" at work (for instance "*I have been putting plastic . . .*") [Par_011] is compelling and
420 influence how people engage in recycling. The social context of recycling shows that
421 recycling is perceived as a collective effort at home, whereas it is an individualistic
422 behavior at work. Our findings further show that green champions and the culture of
423 inclusiveness that underpins group harmony in many workplaces influence recycling in
424 organizational settings.

425 According to the participants, situational attributes at work are generally outside
426 employees' control but are major drivers for their recycling behavior. Considering the
427 difficulty in expressing their psychological traits, employees attribute their recycling
428 behavior to the effects of context and its features, such as recycling schemes, recycling
429 facilities, and the social dynamics of the waste generation context. According to Stern
430 (2000), people consider the consequences of their actions before performing the

431 behavior, suggesting that behavior is reasoned and deliberate. However, we observed
432 that employees recycle the same way based on their organization's recycling schemes
433 and facilities irrespective of their psychological and personality traits. Although
434 workplaces are not homogeneous groups, our findings indicate that socio-demographic
435 and psychological factors may not have the same effects on recycling at work compared
436 to home settings. By understanding how these factors (Figure 2) interact and influence
437 employees' recycling behavior, waste planners and managers could design a recycling
438 scheme that is convenient and attractive to employees with increasing recycling rates.

439 **4.2. Quantitative Findings**

440 **4.2.1. Measurement Model**

441 A series of measures were used in this study to establish validity and reliability (Hu and
442 Bentler, 1999; McDonald and Ho, 2002). As presented in Table 4, the Average Variance
443 Extracted (AVE) values were above the .5 minimum threshold with Composite Reliability
444 (CR) above 0.7 (Fornell and Larcker, 1981; Malhotra and Dash, 2011). Although the
445 obtained AVE (0.461) for Group Harmony (GH) was slightly lower than the .5 minimum
446 threshold, this is not considered a problem in this study considering that the construct's
447 composite reliability (CR) (0.718) is above the 0.7 threshold. The obtained AVE was
448 admissible for hypothesis testing, given that AVE is a conservative estimate and reliability
449 can be established using CR (*above 0.7*) alone (Fornell and Larcker, 1981; Malhotra and
450 Dash, 2011). Besides the strong convergent validity, we confirmed discriminant validity
451 using Fornell and Larcker's (1981) procedure with \sqrt{AVE} exceeding the squared
452 correlations (Table 4). Also, we controlled for social desirability bias by incorporating
453 socially desirable and negatively worded items in the survey. We later performed
454 Common Method Bias (CMB) based on Podsakoff et al.'s (2003) recommendation using a

455 common latent factor (CLF) approach. The obtained shared variance of all the model
456 items is not significantly different from zero indicating no CMB issue.

457 **Insert Table 4 Here**

458 The model fit was assessed using CFA, although the initial indices were below the
459 minimum acceptable thresholds. The model was improved by removing items with factor
460 loadings below .5 (Bagozzi et al., 1991) based on the modification indices (Byrne, 2016;
461 Chou and Bentler, 2002). The obtained statistics show that all the constructs in the
462 improved model were unidimensional (*CMIN/DF*, 1.72; *SRMR*, 0.0508; *CFI*, 0.95; *GFI*, .89;
463 *AGFI*, 0.86; *PCLOSE*, 0.96; and *RMSEA*, 0.04) and admissible for hypothesis testing.

464 **4.2.2 Hypothesis Testing (Structural Model)**

465 The structural model was examined using the recommended fit indices with *CMIN/DF*,
466 1.72; *SRMR*, 0.0505; *GFI*, 0.88; *AGFI*, 0.86; *CFI*, 0.95; *PCLOSE*, 0.97; and *RMSEA*, 0.06 (Hu and
467 Bentler, 1999; McDonald and Ho, 2002).

468 The estimated structural model paths (Table 5) depict the hypothesized antecedents of
469 recycling at work with other key relationships.

470 **Insert Table 5 Here**

471 As presented in Table 5, H2, H3, H4, H5, and H7 were all supported. The results confirmed
472 that perception of others, organizational support, perception of control, group harmony,
473 and recycling experience (recycling at home) are direct antecedents of recycling at work.
474 The results further establish that the social context of recycling and recycling experience
475 affect employees' recycling behavior in organizational settings. The significant negative
476 influence of group harmony on recycling at work supported the study's qualitative

477 findings that observed recycling at work as an individualistic behavior compared to home
478 settings where people perceive recycling as a collective behavior.

479 While this study focuses on the direct antecedents of recycling at work, we further probed
480 the model to examine factors that may indirectly affect employees' recycling. As a result,
481 the mechanisms through which Organizational Support and Recycling Home (recycling
482 experience) affect recycling behavior at work were examined. By constructing a
483 mediating model, the indirect effects of "Organizational Support" on recycling at work
484 through "Perceptions of Control" and "Perception of Others" were analyzed.

485 According to the obtained estimates (Table 5), the three interaction models are
486 statistically significant. Consistent with the qualitative findings, the quantitative results
487 confirm that organizational support is central to employees' participation in recycling at
488 the corporate level. Organizational support affects recycling behavior directly,
489 contributes to employees' sense of personal control over recycling, and enhances
490 employees' knowledge of recycling schemes. Similarly, employees with a strong feeling
491 of control are more likely to translate their recycling at home to recycling behavior at
492 work irrespective of their predisposition or psychological traits.

493 **5.0 Discussion**

494 This study aimed to investigate how organizations can enhance recycling behavior using
495 a sequential exploratory mixed methods design. Semi-structured interviews were
496 conducted in the first instance to explore how employees perceive and construct their
497 recycling behavior. The qualitative findings were used to design the hypothesized model
498 and explained using relevant theories and studies. Eight factors were extracted using
499 Exploratory Factor Analysis (EFA) with Principal Axis Factoring using "Oblimin with

500 Kaiser Normalization" rotation. The confirmatory factor analysis in SEM showed a good
501 fit.

502 According to the quantitative results, perception of others, organizational support,
503 perception of control, group harmony, and recycling at home are statistically significant
504 and are antecedents of recycling behavior at work. The social context of recycling, and
505 organizational factors are important when improving recycling at work. These factors,
506 such as organizational support, perception of others, perception of control, group
507 harmony, are context-specific and differ from one organization to another. Consistent
508 with the literature (Largo-Wight et al., 2013; Smith and O'Sullivan, 2012), this study
509 shows that the employees' perception of their organization's support contributes to their
510 self-efficacy and control over recycling. Organizations can reduce the burdens of
511 recycling on their employees by providing adequate facilities and increase awareness
512 about the scheme. The provision of adequate facilities is a form of organizational
513 commitment to the idea of recycling, and this commitment is organizational-specific but
514 supports employees' recycling behavior. While recycling schemes and facilities should be
515 consistent across organizations due to the legal requirements underpinning recycling in
516 the UK, our study shows that many organizations focus only on recyclables, such as paper,
517 that affect their bottom line. Besides, organizations may fail to implement the regulations
518 if they perceive that separate waste collection is not the best practice.

519 The lack of consistency in recycling schemes from home to work and from one
520 organization to another affects how employees engage with recycling across contexts
521 suggesting the need to enforce and harmonize recycling schemes. While recycling is
522 considered a norm in UK homes (Thomas and Sharp, 2013), the positive effect of recycling
523 experience (i.e. recycling at home) on recycling behavior at work is not due to habit. For

524 recycling to be habitual, recycling schemes should be similar across contexts such that
525 people are not relying on cognition when engaging in recycling.

526 The indirect effect of recycling at home on recycling behavior at work through the
527 perception of control suggests that situational factors may attenuate how recycling
528 experience from home translates to corporate settings. The social context of recycling,
529 especially with "green champions" and "group harmony", contributes significantly to
530 recycling in organizational settings. Therefore, the way employees perceive their
531 colleagues' recycling behavior influences their recycling behavior.

532 While psychological and personal traits affect pro-environmental behaviors (Fielding et
533 al., 2016; Yuriev et al., 2020), our study suggests that the intersection between personal-
534 psychological characteristics and situational factors shapes employees' recycling
535 behavior. This interaction requires further investigation in organizational settings,
536 especially in other behavioral domains, such as energy and water use.

537 While this study contributes significantly to theory and practice, it has some limitations
538 that future studies should address. Future studies should consider actual recycling
539 behavior using experimental design instead of self-reported measures. Future studies
540 should also consider the consumption pattern of employees and its implications on their
541 recycling behavior in that many employees spend more time at work than other
542 behavioral contexts. For instance, those who do not use plastics at work may respond that
543 they are not recycling plastics, affecting the measures and interpretation of recycling
544 behavior.

545 **6.0 Conclusion**

546 This study provides valuable insights on recycling behavior, especially in organizational
547 settings, given the dearth of empirical research in this realm. The approach adopted in

548 this study reveals the importance of contextual factors, particularly organizational
549 commitment, for recycling to be effective in corporate settings.

550 The triangulation strategy (cross-validation) adopted in this study using the qualitative
551 phase to explain the quantitative findings increases the strength of inferences and
552 conclusions of this study. It further reveals that many constructs share the same
553 motivational roots and are empirically incongruent when operationalized in the same
554 study. For instance, this study observed that personal norms, values, personal
555 commitment, and personal control are similar constructs that may lack discriminant
556 validity if conceptualized independently in a study. This study also suggests that scheme
557 knowledge and awareness of behavior should be operationalized as part of "perception
558 of control" such that perception of control is used as a second-order construct.

559 While this study has shown that recycling experience, especially from home, is a
560 determinant of recycling at work, this study argues that recycling schemes and facilities
561 at home and work should be similar for people to maintain consistency. Correspondence
562 across contexts will prevent environmental pollution while reducing the operational and
563 overhead costs by resolving the logistical issues associated with waste collection. It is
564 counterproductive for waste planners and policymakers to assume that people will
565 maintain consistent recycling behavior across contexts without harmonizing recycling
566 schemes and facilities.

567 For recycling schemes to be effective at work, organizations must demonstrate their
568 commitment and show responsibility for waste by providing facilities and support their
569 employees' recycling behavior. Organizations can improve the social context of recycling
570 through their commitment by installing correct facilities, thus shifting the recycling
571 responsibility from organizations to their employees.

572 In conclusion, this study provides an opportunity for waste planners and managers to
573 design interventions specific to recycling, especially in organizational settings, given that
574 pro-environmental behaviors are motivated differently (Bratt et al., 2015; Ones and
575 Dilchert, 2012).

576 **Funding:** This research did not receive any specific grant from funding agencies in the
577 public, commercial, or not-for-profit sectors.

578 **References**

579 Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the
580 theory of planned behavior. *J. Appl. Soc. Psychol.*, 32(4), 665-683.

581 Alzaidi, S.M. and Iyanna, S. (2021), "Developing a conceptual model for voluntary pro-
582 environmental behavior of employees", *Soc. Responsib. J.*, Vol. ahead-of-print No. ahead-
583 of-print. <https://doi.org/10.1108/SRJ-11-2020-0477>.

584 Ayres, L., Kavanaugh, K. and Knafl, K. A. (2003). Within-case and across-case approaches
585 to qualitative data analysis. *Qual. Health Res.*, 13(6), 871-883.

586 Bagozzi, R. P., Yi, Y. and Phillips, L. W. (1991). Assessing construct validity in
587 organizational research. *Admin. Sci. Quart.*, 421-458.

588 Bandura, A. (2012). On the functional properties of perceived self-efficacy revisited. *J.*
589 *Manage.*, 38(1), 9-44.

590 Barrios, M., Villarroya, A., Borrego, Á. and Ollé, C. (2011). Response rates and data quality
591 in web and mail surveys administered to PhD holders. *Soc. Sci. Comput. Rev.*, 29(2), 208-
592 220.

- 593 Bissing-Olson, M. J., Fielding, K. S. and Iyer, A. (2016). Experiences of pride, not guilt,
594 predict pro-environmental behavior when pro-environmental descriptive norms are
595 more positive. *J. Environ. Psychol.*, 45, 145-153.
- 596 Blok, V., Wesselink, R., Studynka, O. and Kemp, R. (2015). Encouraging sustainability in
597 the workplace: a survey on the pro-environmental behaviour of university employees. *J.*
598 *Clean. Prod.*, 106, 55-67.
- 599 Boiral, O., Talbot, D. and Paillé, P. (2015). Leading by example: A model of organizational
600 citizenship behavior for the environment. *Bus. Strateg. Environ.*, 24(6), 532-550.
- 601 Botetzagias, I., Dima, A. and Malesios, C. (2015). Extending the theory of planned behavior
602 in the context of recycling: The role of moral norms and of demographic predictors.
603 *Resour. Conserv. Recycl.*, 95, 58-67.
- 604 Bratt, C., Stern, P. C., Matthies, E. and Nenseth, V. (2015). Home, car use, and vacation: The
605 structure of environmentally significant individual behavior. *Environ. Behav.*, 47(4), 436-
606 473.
- 607 Byrne, B. M. (2016). *Structural equation modeling with AMOS: Basic concepts, applications,*
608 *and programming*, 3rd edition. Routledge, Taylor and Francis Group.
- 609 Carcary, M. (2009). The Research Audit Trial--Enhancing Trustworthiness in Qualitative
610 Inquiry. *Electron J. Bus. Res. Methods*, 7(1).
- 611 Chao, C. M., Yu, T. K. and Yu, T. Y. (2021). Understanding the factors influencing recycling
612 behavior in college students: the role of interpersonal altruism and environmental
613 concern. *Int. J. Sustain. High. Educ.*, Vol. ahead-of-print No. ahead-of-print.
614 <https://doi.org/10.1108/IJSHE-07-2020-0232>.
- 615 Chou, C. P. and Bentler, P. M. (2002). Model modification in structural equation modeling

- 616 by imposing constraints. *Comput. Stat. Data An.*, 41(2), 271-287.
- 617 Conner, M. and Sparks, P. (2005). Theory of planned behaviour and health behaviour. In
618 M. Conner, & P. Norman (Eds.), *Predicting health behaviour* (2nd ed., pp. 170–222).
619 Berkshire, England: Open University Press.
- 620 Coşkun, A. and Özbük, R. M. Y. (2020). What influences consumer food waste behavior in
621 restaurants? An application of the extended theory of planned behavior. *Waste Manage*,
622 117, 170-178.
- 623 Creswell, J. W. (2014). *A concise introduction to mixed methods research*. Sage
624 Publications.
- 625 Edwards, J. R. and Bagozzi, R. P. (2000). On the nature and direction of relationships
626 between constructs and measures. *Psychol. Methods*, 5(2), 155.
- 627 Escario, J. J., Rodriguez-Sanchez, C. and Casaló, L. V. (2020). The influence of
628 environmental attitudes and perceived effectiveness on recycling, reducing, and reusing
629 packaging materials in Spain. *Waste Manage*, 113, 251-260.
- 630 Fielding, K. S., van Kasteren, Y., Louis, W., McKenna, B., Russell, S. and Spinks, A. (2016).
631 Using individual householder survey responses to predict household environmental
632 outcomes: The cases of recycling and water conservation. *Resour. Conserv. Recycl.*, 106,
633 90-97.
- 634 Fornell, C. and Larcker, D. F. (1981). "Evaluating structural equation models with
635 unobservable variables and measurement error". *J. Marketing Res.*, 18(1), 39–50.
- 636 Francoeur, V., Paillé, P., Yuriev, A. and Boiral, O. (2019). The measurement of green
637 workplace behaviors: A systematic review. *Organ. Environ.*, 1-25.
- 638 Hu, L. and Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure

- 639 analysis: Conventional criteria versus new alternatives. *Struct. Equ. Modeling*, 6(1), 1-55.
- 640 Kline, R. B. (2015). *Principles and practice of structural equation modeling*. Guilford
641 Publications.
- 642 Knickmeyer, D. (2020). Social factors influencing household waste separation: A
643 literature review on good practices to improve the recycling performance of urban areas.
644 *J. Clean. Prod.*, 245, 118605.
- 645 Largo-Wight, E., Bian, H. and Lange, L. (2012). An empirical test of an expanded version
646 of the theory of planned behavior in predicting recycling behavior on campus. *Am. J.*
647 *Health Educ.*, 43(2), 66-73.
- 648 Largo-Wight, E., Johnston, D. D. and Wight, J. (2013). The efficacy of a theory-based,
649 participatory recycling intervention on a college campus. *J. Environ. Health*, 76(4), 26-31.
- 650 Lee, Y., De Young, R. and Marans, R. W. (1995). Factors influencing individual recycling
651 behavior in office settings A study of office workers in Taiwan. *Environ. Behav.*, 27(3),
652 380-403.
- 653 Li, C., Zhang, Y., Nouvellet, P., Okoro, J. O., Xiao, W. and Harder, M. K. (2020). Distance is a
654 barrier to recycling—or is it? Surprises from a clean test. *Waste Manage.*, 108, 183-
655 188. Malhotra N. K. and Dash S. (2011). *Marketing Research an Applied Orientation*.
656 Pearson Publishing.
- 657 McDonald, R. P. and Ho, M. R. (2002). Principles and practice in reporting structural
658 equation analyses. *Psychol. Methods*, 7(1), 64-82.
- 659 McDonald, S. and Oke, A. (2018). Recycling at home and work: An exploratory
660 comparison. *Soc. Bus.*, 8(2), 145-165. Mesmer-Magnus, J. R., Viswesvaran, C. and Wiernik,

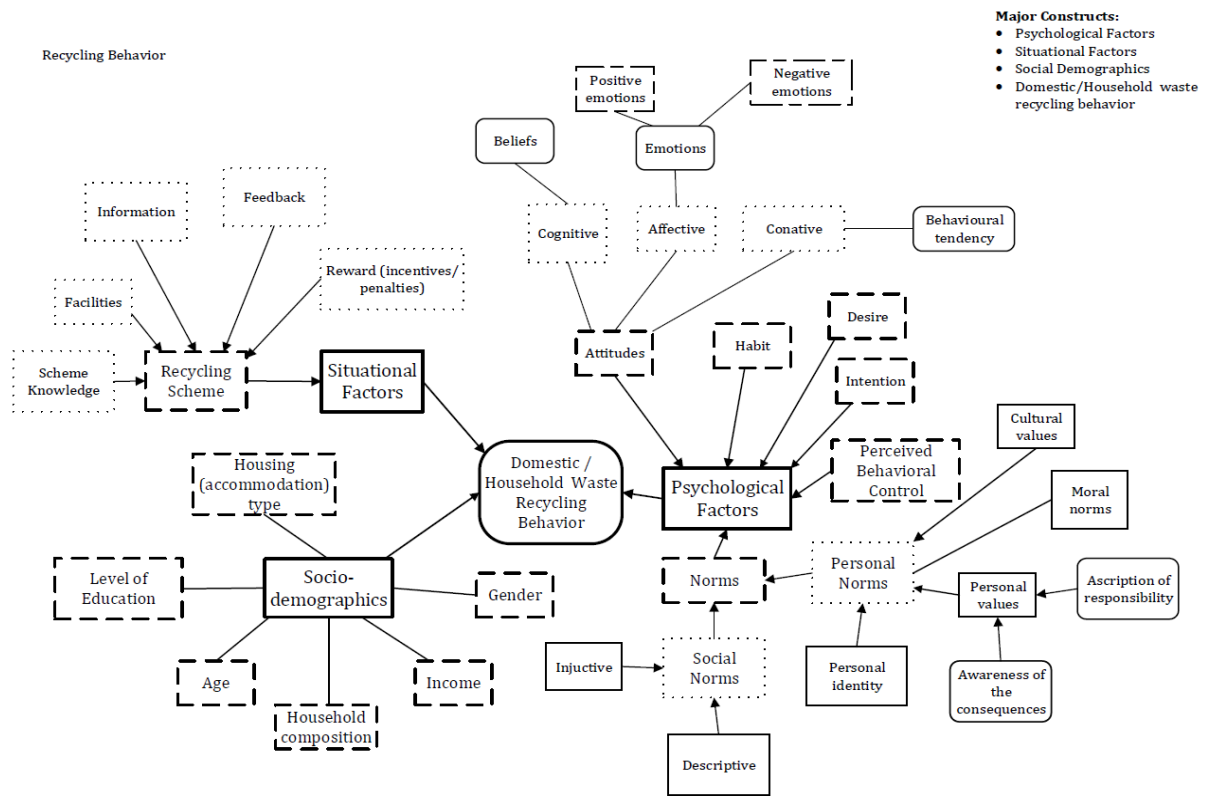
- 661 B. M. (2013). Book Highlight—The role of commitment in bridging the gap between
662 organizational and environmental sustainability. *Glob. Bus. Organ. Excell.*, 32(5), 86-104.
- 663 Miafodzyeva, S. and Brandt, N. (2013). Recycling behaviour among householders:
664 Synthesizing determinants via a meta-analysis. *Waste Biomass Valori.*, 4(2), 221-235.
- 665 Miles, M. B. and Huberman, A. M. (1994). *Qualitative data analysis: An expanded*
666 *sourcebook*. Sage Publications.
- 667 Ng, S. L. (2020). Knowledge–intention–behavior associations and spillovers of domestic
668 and workplace recycling. *Soc. Sci J.*, 1-20.
- 669 Ofstad, S. P., Tobolova, M., Nayum, A. and Klöckner, C. A. (2017). Understanding the
670 Mechanisms behind Changing People's Recycling Behavior at Work by Applying a
671 Comprehensive Action Determination Model. *Sustainability*, 9(2), 204.
- 672 Oke, A. (2015). Workplace waste recycling behaviour: A meta-analytical review.
673 *Sustainability*, 7(6), 7175-7194.
- 674 Oke, A. and Kruijssen, J. (2016). The importance of specific recycling information in
675 designing a waste management scheme. *Recycling*, 1(2), 271-285.
- 676 Ones, D.S. and Dilchert, S. (2012). Environmental sustainability at work: A call to action.
677 *Ind. Organ. Psychol.*, 5(4), 444-466.
- 678 Onwezen, M. C., Antonides, G. and Bartels, J. (2013). The Norm Activation Model: An
679 exploration of the functions of anticipated pride and guilt in proenvironmental
680 behaviour. *J. Econ. Psychol.*, 39, 141-153.
- 681 Oppenheim, A. N. (2000). *Questionnaire design, interviewing and attitude measurement*.
682 Bloomsbury Publishing.

- 683 Osbaldiston, R. and Schott, J.P. (2012). Environmental sustainability and behavioral
684 science: Meta-analysis of proenvironmental behavior experiments. *Environ. Behav.*,
685 44(2), 257-299.
- 686 Paillé, P. and Boiral, O. (2013). Pro-environmental behavior at work: Construct validity
687 and determinants. *J. Environ. Psychol*, 36, 118-128.
- 688 Paillé, P., Mejía-Morelos, J. H., Marché-Paillé, A., Chen, C. C. and Chen, Y. (2016). Corporate
689 greening, exchange process among co-workers, and ethics of care: An empirical study on
690 the determinants of pro-environmental behaviors at coworkers-level. *J. Bus. Ethics*,
691 136(3), 655-673.
- 692 Park, J. and Ha, S. (2014). Understanding consumer recycling behavior: Combining the
693 theory of planned behavior and the norm activation model. *Fam. Consum. Sci.*, 42(3), 278-
694 291.
- 695 Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y. and Podsakoff, N. P. (2003). Common method
696 biases in behavioral research: a critical review of the literature and recommended
697 remedies. *J. Appl. Psychol.*, 88(5), 879-903.
- 698 Schwartz, S. H. (1977). Normative influences on Altruism¹. *Adv. Exp. Soc. Psychol.*, 10,
699 221-279.
- 700 Singelis, T. M. (1994). The measurement of independent and interdependent self-
701 construals. *Pers. Soc. Psychol. B.*, 20(5), 580-591.
- 702 Smith, A. M. and O'Sullivan, T. (2012). Environmentally responsible behaviour in the
703 workplace: An internal social marketing approach. *J. Marketing Manage.*, 28(3-4), 469-
704 493.

- 705 Soukiazis, E. and Proença, S. (2020). The determinants of waste generation and recycling
706 performance across the Portuguese municipalities–A simultaneous equation approach.
707 *Waste Manage.*, 114, 321-330.
- 708 Stern, P. C. (2000). New environmental theories: toward a coherent theory of
709 environmentally significant behavior. *J. Soc. Issues*, 56(3), 407-424.
- 710 Thomas, C. and Sharp, V. (2013). Understanding the normalization of recycling behaviour
711 and its implications for other pro-environmental behaviours: A review of social norms
712 and recycling. *Resour. Conserv. Recycl.*, 79, 11-20.
- 713 Tudor, T. L., Barr, S. W. and Gilg, A. W. (2008). A novel conceptual framework for
714 examining environmental behavior in large organizations A case study of the Cornwall
715 national health service (NHS) in the United Kingdom. *Environ. Behav.*, 40(3), 426-450.
- 716 Van der Werff, E., Steg, L. and Keizer, K. (2013). It is a moral issue: The relationship
717 between environmental self-identity, obligation-based intrinsic motivation and pro-
718 environmental behaviour. *Global Environ. Chang.*, 23(5), 1258-1265.
- 719 Wan, C., Shen, G. Q. and Choi, S. (2021). The place-based approach to recycling intention:
720 Integrating place attachment into the extended theory of planned behavior. *Resour.*
721 *Conserv. Recycl.*, 169, 105549.
- 722 White, K. M., Smith, J. R., Terry, D. J., Greenslade, J. H. and McKimmie, B. M. (2009). Social
723 influence in the theory of planned behaviour: The role of descriptive, injunctive, and in-
724 group norms. *Brit. J. Soc. Psychol.*, 48(1), 135-158.
- 725 Yuriev, A., Dahmen, M., Paillé, P., Boiral, O. and Guillaumie, L. (2020). Pro-environmental
726 behaviors through the lens of the theory of planned behavior: A scoping review. *Resour.*
727 *Conserv. Recycl.*, 155, 104660.

728 Zhang, G., Zhang, Y., Tian, W., Li, H., Guo, P. and Ye, F. (2021). Bridging the intention-
 729 behavior gap: Effect of altruistic motives on developers' action towards green
 730 redevelopment of industrial brownfields. Sustainability, 13(2), 977.

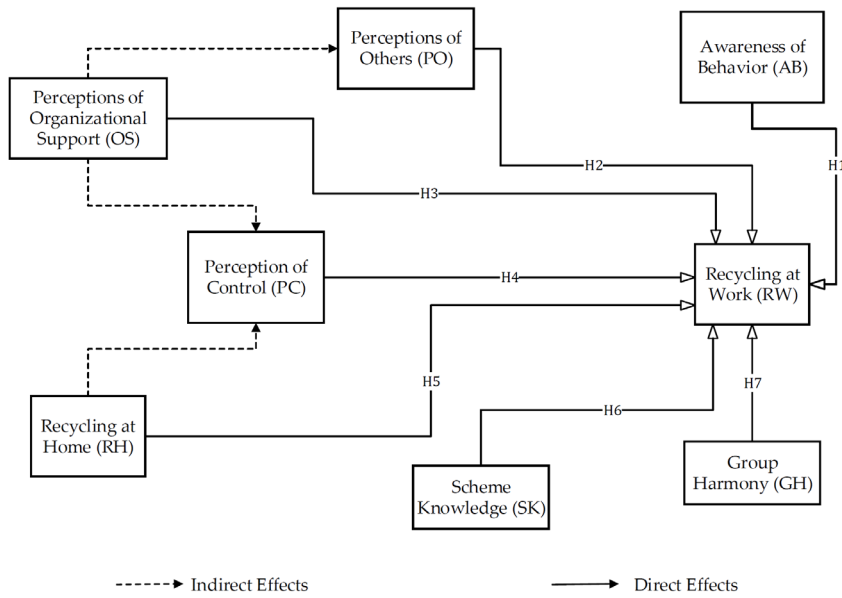
731



732

733 Fig. 1: Factors Influencing Household Recycling Behavior

734



735

736 Fig. 2: Hypothesized Model of Recycling at Work

737

Participants	Job Function	Years of Experience	Gender
001	Facility Management	15+	Male
002	Environmental Management	15+	Male
003	Facility Management	20+	Male
004	Environmental Consulting	10+	Female
005	Operations Director	20+	Male
006	Technical Sales (Waste)	15+	Male
007	Waste Management Officer	30+	Male
008	Facility Management	3+	Female
009	Environmental Specialist	5+	Female
010	Operations Management	10+	Male
011	Environmental Analyst	5+	Female
012	Waste Management Officer	20+	Male
013	Business Development Manager - Waste Management	10+	Male
014	Environmental Consulting	20+	Male
015	Technical Sales (Waste)	10+	Male

Table 2: Respondents Socio-demographics		Frequency	Percent
Gender	Male	126	34.3
	Female	230	62.7
	Prefer Not to Say	11	3.0
Age	Prefer Not to Say	11	3.0
	16-25	25	6.8
	26-35	78	21.3
	36-45	98	26.7
	46-55	110	30.0
	56-65	40	10.9
	over 65	5	1.4
Qualification	None	1	0.3
	School (i.e. GCSE)	48	13.1
	College (i.e. HNC / HND / NVQ)	53	14.4
	University Higher Education	265	72.2
Employment status	Employed, full-time	315	85.8
	Employed, part-time	47	12.8
	Self-employed	4	1.1
	Working as a volunteer	1	0.3
Organisation category	Public	203	55.3
	Private	164	44.7
Industry	Administrative & Support Services	20	5.0
	Agriculture, Forestry & Fishing	7	2.0
	Community, Social and Personal services	15	4.0
	Digital, Creative & Information Services	19	5.0
	Education	56	15.0
	Energy (including Oil & Gas)	54	15.0
	Financial & Business Services	21	6.0
	Food, Beverages & Tobacco	18	5.0
	Health & Social Care	12	3.0
	ICT & Precision Instruments	13	4.0
	Public Admin & Defence	24	6.0
	Research & Development	69	19.0
	Engineering & Utilities	39	11.0

004	Paper (including newspaper, magazine); Packaging (cardboard, cereal boxes, & drink cartons); Plastic bottles; Cans (including aerosols); Foil trays; Food waste; Garden waste; Glass; Tins.	Paper (envelopes, letters); Plastic bottle; Tea bags.	General waste bin; Food waste container (on street); Recycling sites (for glass, paper, cardboard, tins, cans, glass, tetra packs; & plastic bottle).	Paper bins; General waste bin; & Mixed recycling bin.
005	Paper; Plastic bottles; Cardboard; Tins; Glass bottles; & Garden waste.	Compostable food containers; Food leftovers; Paper; Paper towels, Tea bags.	Two streams: A general bin (for bottles, glass; & plastic); Another bin (for Paper & cardboard); then food waste bin.	General waste bins; different bins each (for cans, food & biodegradable, Glass, & Plastics); & box (for papers). Bins for batteries.
006	Cans; Cardboard; Clothes; Paper (including junk mails); Plastics; Garden waste & Household items.	Papers (mostly confidential); Ink cartridges.	Different bins each for cardboard; paper; shredded paper, plastic & glass bottles; tin cans.	Bins for paper; box for inks & cartridges; bins for tins, cans, plastics, & films no general waste bin.
007	Cardboard; Paper (including newspapers); Cans; Glass; Garden waste; & Plastic.	Paper (including newspapers); Glass; & Plastics.	Two bins - a brown one & a black one, & small bin for cans; glass; plastic & hessian bag for paper only.	Four bins – one for glass & bottles; one for cardboard; & two for rubbish (general waste); & two for cardboard. No bin for food waste.
008	General waste; Food waste; Paper; Plastics; Cardboard; Cans.	Paper cup; Pieces of paper; Plastic lid. Food waste goes into the general bin.	Paper bin & Normal (general) bin; Food bin; & Designated area (communal) for different materials.	Three designated recycling bins (one for cans, plastic, & glass; one for general & one for paper. No food waste bin.
009	Food; Packaging; Glass; Plastics; Paper; Yoghurt pots; Tetra packs; Tea bags.	Packaging; Paper; Yoghurt pots (Mixed recycling bin); Food waste.	Composter; Mixed recycling (wheelie bin); Food caddy.	Food caddy; Paper bin; mixed recycling bin; & general (residual) waste bin.
010	Metals (Tins); Paper; Cardboard; Glass; Food waste.	Batteries; Cardboard Paper; Plastics.	A box/bin for each item.	Different bins for different items; No food bin.
011	Cardboard; Plastics; Glass; Metals (Cans).	Plastics; Papers; Coffee cups.	General waste bin; No recycling bins & no food waste bin.	General waste bin (including coffee cups); separate bins for papers, plastics, & cans. Food waste bin in the kitchen area.
012	Cardboard; Food; Glass; Garden waste; Paper (including magazines); Plastics; & Tins.	Paper, Plastic; Cans.	General waste; Separate bins for paper & food; bins for cans, plastics, & glass.	Separate bins for different items.
013	Food; Glass; Plastics; Cans.	Food; Paper; Plastic.	Food waste bin & General waste bin.	Separate bin for each item.
014	Food; Paper, Packaging; Glass; Plastics; Cans.	Food; Paper; Plastic.	Mixed recycling bin	Separate bin for paper; Mixed (commingle) bin
015	Food; Paper (including newspaper), Glass; Plastics; Large goods; Tins.	Food; Paper; Paper towels.	Mixed	Paper bins; General waste bin; No food waste bin.

744

Table 4: Reliability and Validity Tests

		α	CR	AVE	MSV	MaxR (H)	PC	GH	PO	OC	SK	AB	RH	RW
1.	PC	.88	0.872	0.577	0.555	0.876	0.759							
2.	GH	.70	0.718	0.461	0.323	0.735	0.536***	0.679						
3.	PO	.76	0.771	0.630	0.509	0.802	0.263***	0.419***	0.794					
4.	OC	.91	0.906	0.708	0.553	0.910	0.242***	0.206**	0.714***	0.841				
5.	SK	.81	0.831	0.555	0.553	0.852	0.444***	0.382***	0.528***	0.743***	0.745			
6.	AB	.89	0.891	0.673	0.555	0.894	0.745***	0.568***	0.172**	0.131*	0.399***	0.820		
7.	RH	.79	0.859	0.512	0.142	0.885	0.376***	0.155*	0.119†	0.017	0.094	0.242***	0.715	
8.	RW	.84	0.856	0.547	0.407	0.898	0.391***	0.212**	0.624***	0.638***	0.518***	0.223***	0.370***	0.740

Significance of Correlations: † $p < 0.100$; * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$

745

746

Table 5: Regression Weights of the hypothesized model (Direct effects)

	Coefficients (β)	t-value	Hypothesis confirmed
RW<---AB	-.03	-.29	No
RW<---PO	.24	3.42***	Yes
RW<---OS	.21	3.00***	Yes
RW<---PC	.25	2.15*	Yes
RW<---RH	.26	4.83***	Yes
RW<---SK	.02	.21	No
RW<---GH	-.16	-1.95*	Yes
Indirect [Estimate (p value)]			
OC→PC→RW		0.22***	
OC→PO →RW		0.22***	
RH→PC→RW		0.05*	

* $p \leq 0.05$; *** $p \leq 0.001$ (two-tailed); **RW**, recycling at work; **RH**, recycling at home; **PC**, perception of control (responsibility); **OS**, perception of organizational support (commitment); **PO**, perception of others; **AB**, awareness of consequences of behavior, **GH**, group harmony; **SK**, scheme knowledge

747