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 Evagelos 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)

96   Awareness of consequence is one of the key constructs in Schwartz's (1977) NAM and

97   contributes significantly to the activation of personal norms towards behavior.

98   Consistent with Oke and Kruijsen (2016), the qualitative findings of this study showed

99   that awareness of behavior through specific information about the consequences of

100 waste and recycling influences employees' recycling behavior. The lack of awareness can

101 result in the denial of responsibility for waste generation and may inhibit recycling

102 (Bissing-Olson et al., 2016; Onwezen et al., 2013), especially at work where responsibility

103 can be transferred to employers (Paillé and Boiral, 2013). The propensity to engage in

104 recycling is high when employees know the implications of their waste generation and

105 recycling behavior. As a result,

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

107   **2.2**   Perception of Others (PO)

108 According to our model, the way employees perceive their colleagues' recycling behavior

109 influences recycling at work. As operationalized in this study, organizational context,

110 especially the social context of recycling, defines perception of others (PO) regarding

111 their recycling behavior. It accounts for the effects of recycling expectations and actions

112 of colleagues on recycling at work. The construct is analogous to Ajzen's (2002)

113 subjective norms that explain perceived normative pressure based on inferred behavior

114 and expectations of significant others. Consistent with earlier reviews (Miafodzyeva and

115 Brandt, 2013; Osbaldiston and Schott, 2012), the recent review (Knickmeyer, 2020) of

116 recycling behavior studies reported a significant effect of social factors on recycling at

117 home, especially when families and neighbors engage in recycling or support recycling

118 efforts. Also, studies have observed a positive effect of social norms on recycling behavior

119 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 discretional 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 Turker-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   **Insert Figure 3 Here**

361   According to the findings, recycling contexts are the important determinant of behavior.

362   We observed that employees are more inclined to recycle when adequate facilities, such

363   as bins, are installed to support recycling. For instance:

364   "*If I were in a different industry, I would have a different approach, I will like to*

365   *think I would still recycle, but I would only do it because the system is there*"

366   [Par_002]

367   "*So, I guess it kind of ties with the council given you specific bins to do this, and I*

368   *think you start to think more about it*" [Par_005].

369   As presented in Figure 3 and Table 3, situational attributes, such as scheme design and

370   its underpinning facilities, are different from one context to another, and construed as a

371   form of organizational support and the key determinants of recycling behavior. For

372   example, a participant argued that:

373   "*It can be frustrating with the workplace, I think there needs to be a shared approach*

374   *across businesses and households, I would love to see bins that are similar in households*

375   *are being used in businesses as well. So, households and businesses having more continuity*

376   *so it's easier for people to know*" [Par_009].

377   Consistent with the literature (Paillé and Boiral, 2013), employees perceive this support

378   as a form of organizational commitment to recycling and different from one organization

379   to another.

380   **Insert Table 3 Here**

381   While organizational commitment is context-specific, we further observed that

382   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 discretional 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 Kruijsen, 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

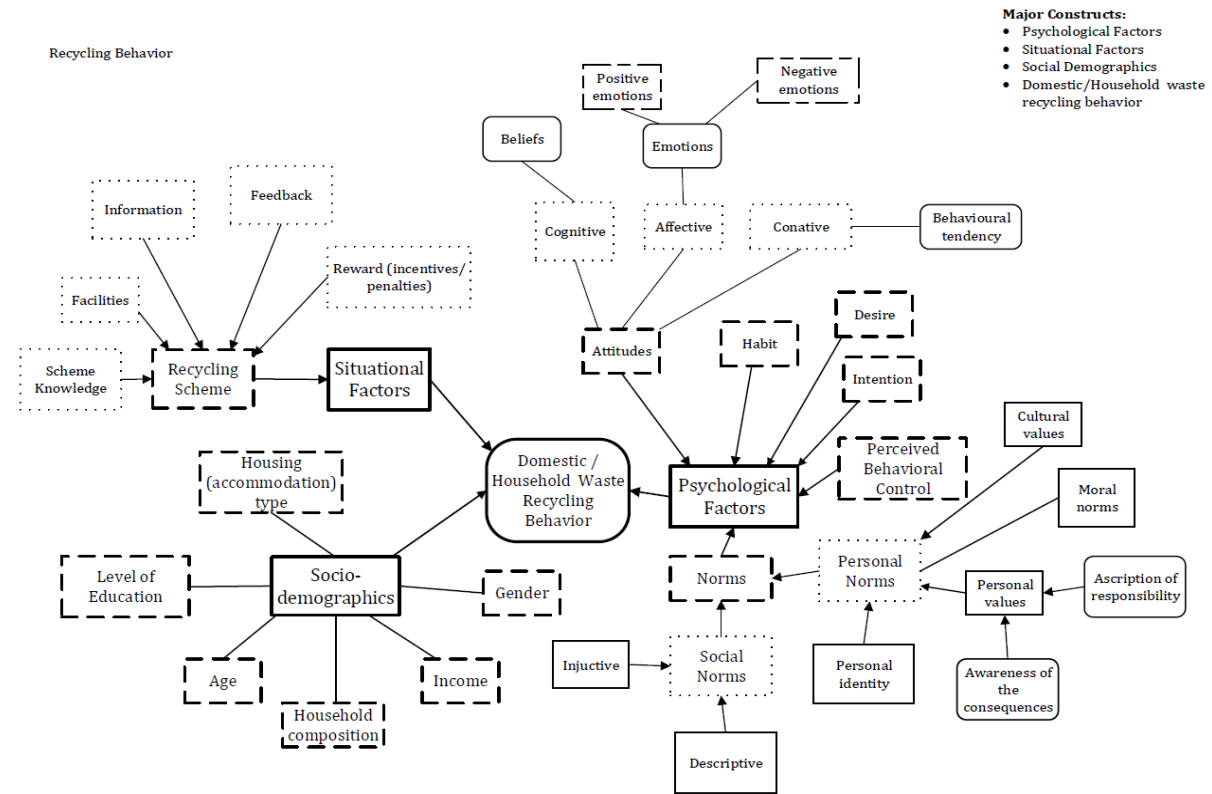730 redevelopment of industrial brownfields. Sustainability, 13(2), 977.

731

732
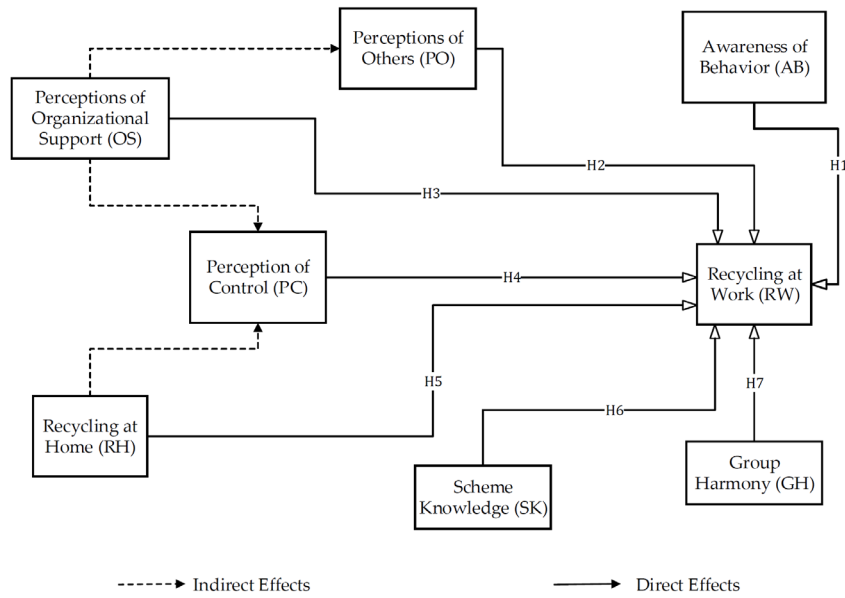
733 Fig. 1: Factors Influencing Household Recycling Behavior

734

- - - - - ▶ Indirect Effects   ───────▶ Direct Effects

736   Fig. 2: Hypothesized Model of Recycling at Work

737

Table 1: Interview Participants Socio-demographics.			
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

738

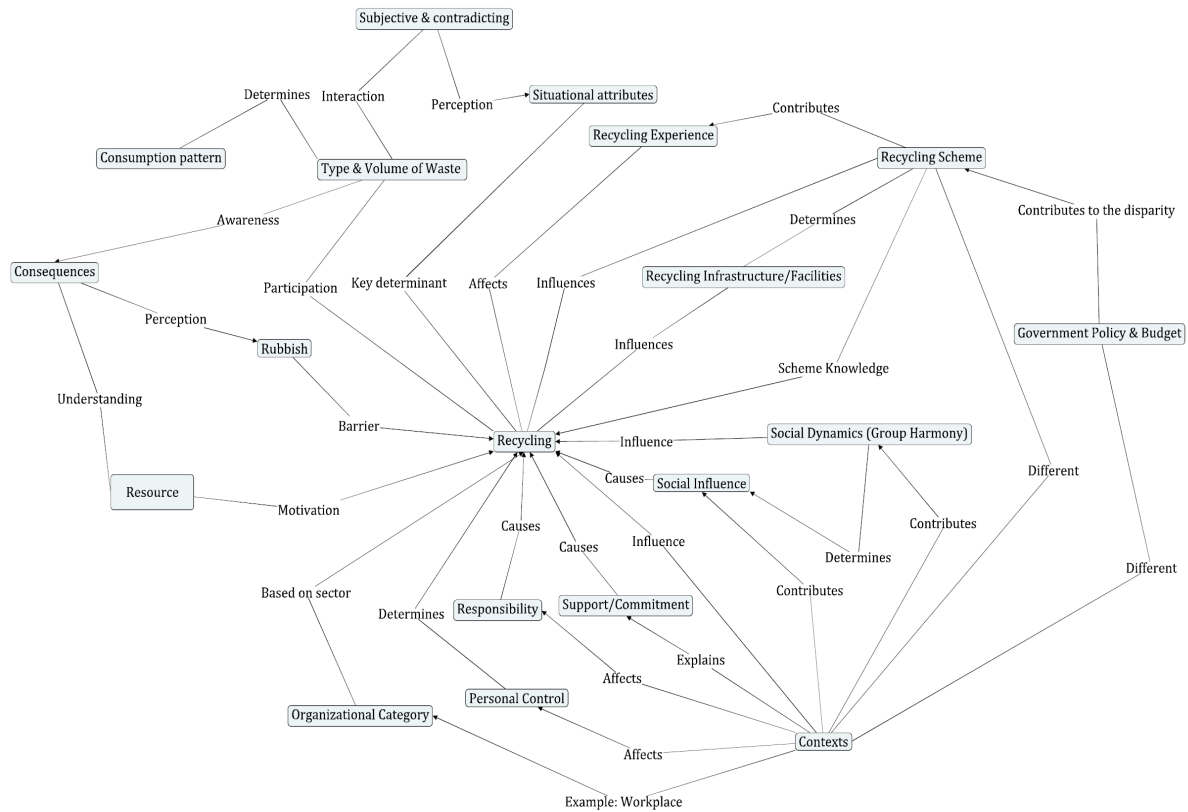| Table 2: Respondents Socio-demographics		Frequency	Percent
Gender	Male	126	34.3
	Female	230	62.7
	Prefer Not to Say	11	3.0
Age	Prefer Not Say	11	3.0
	16-25	25	6.8
	26-35	78	21.3
	36-45	98	26.7
	46-55	110	30.0
	56-65	40	10.9
	over 65	5	1.4
Qualification	None	1	0.3
	School (i.e. GCSE)	48	13.1
	College (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

739

740

741   Fig. 3: Themes Depicting the Complexity of Recycling at Work

742

Table 3: Items Produced/Recycled and the associated Facilities				
Participants	**Items Recycled**		**Facilities**	
	Home	Work	Home	Work
001	Papers (including magazines & Newspapers).	Food waste; Papers, Cardboard; Plastics; Glass; Metals.	General waste (communal bin); No recycling facilities.	Bin for each recyclable; No food waste bin; Communication (Email; Posters).
002	Cans; Food waste; Glass bottles; Garden waste; Plastic bottle, Containers & Trays. Brown cards, Large & other household items.	Food waste; Coffee grounds; Tea bags; Paper towels; Pots & Trays; Containers, Papers (& cards); & cans,	Black bag (residual waste); Blue bin (for dry mixed recycling except glass); Box (for paper); Food waste caddy; Household items (use bring sites); Storage space.	Black bin bag (for general waste including coffee cups, coffee grounds, paper towels, film); food waste bin; dry mixed recycling bin (paper, cards, cans, tray, containers.
003	Packaging, Cardboard, Brown paper, Food waste; Glass; Plastics.	Food waste & Tea bag, paper; Milk (plastic) sachets & Coffee cups (general waste).	Food waste bin; Wheelie bin (commingle dry recyclables – plastics, cans, & glass); bin for cards & papers.	Segregation bins (confidential and non-confidential papers), Different bins for plastic; cans; food waste (main kitchen); a cardboard compactor, & we put things in clear bags.

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.

743

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 ≤ 0.05; ***p ≤ 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

Supplementary Table

Appendix 1: Questionnaire Items	Factor Loadings
Recycling at Work (Materials recycled at work)	
1. Paper	.74
2. Plastic	.91
3. Glass including jars	.60
4. Metals including cans	.75
5. Cardboard including packaging	.66
Recycling at Home (Materials recycled at home)	
6. Paper	.85
7. Plastic	.70
8. Glass including jars	.72
9. Metals including cans	.74
10. Cardboard including packaging	.78
11. *Food waste	.40
Perception of Control/responsibility	
12. To me personally, recycling at work is very important	.74
13. I make every effort to recycle at work	.74
14. I believe people at work should make every effort to recycle	.72
15. It is mostly up to me whether I recycle at work or not	.81
16. I have no control over whether I engage in recycling at work or not	.78
17. *I am not the type of person who is inclined to engage in recycling at work	.43
18. *It is my personal responsibility to recycle waste at work	.42
19. * I am the type of person who acts in an environmentally friendly way	.36
Perception of Organisational Support/Commitment	
20. The recycling facilities in my place of work are sufficient	.79
21. I have plenty of opportunities to recycle at work	.81
22. I am satisfied with the current recycling scheme at my workplace	.74
23. The arrangement of my workspace makes recycling easy for me	.73
Perceptions of others	
24. Most of my colleagues at work recycle	.87
25. Most of my colleagues at work expect me to recycle	.72
26. *When I see my colleagues recycling, I feel I should recycle as well	.46

27.	*Most of the people who are important to me would approve of workplace recycling	.44

Awareness of behavior

28.	I know that recycling at work helps preserve natural resources	.90
29.	I am aware that recycling at work reduces the amount of waste that goes into landfill	.83
30.	I am aware that recycling at work is good for the environment	.80
31.	Recycling seems like the right thing to do	.75

Group harmony

32.	I like being a participant in group activities	.55
33.	I am a person who considers friends and colleagues to be important	.66
34.	It is important for me to maintain harmony within my group	.71

Scheme knowledge

35.	I know the items that can be recycled at work	.61
36.	I know how to recycle at work	.77
37.	I understand well enough what is being said about recycling at work	.74
38.	I require more information on how to recycle at work	.85
39.	*I require more information on what (materials) to recycle at work	.41
40.	*I've no knowledge of my workplace's waste management strategies	.33

*Items dropped from the model