Mobile Phone Recycling and Stockpiling Behaviour in the UAE: A Gender and Age Study

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Abstract

The rapid growth in mobile phone usage has led to an increase in discarded devices. These mobile phones contain hazardous materials that can pollute the environment if not disposed of properly. Recycling mobile phones is a more sustainable option, but it requires user cooperation. This study investigates the factors influencing the intention of mobile phone users to recycle their devices. It focuses on potential demographic differences, particularly age and gender, in attitudes towards mobile phone recycling and stockpiling among men and women in the United Arab Emirates (UAE). Using a framework that extends the Theory of Planned Behaviour (TPB), this study incorporates new factors, such as data security and perceived benefits, along with additional factors from the Integrated Business Model (IBM). The study analyzed 601 self-administered online survey responses from UAE residents. Results showed that women were less concerned about data privacy (21%) than men (27%), and stored more devices (34.8%) than men (29.2%), especially when the number of stored devices was two. However, men outnumbered women when the number of stored devices was three or four, with ratios of 15.6% and 13.4% versus 10.4% and 6.8%, respectively. The findings of this study offer valuable insights for stakeholders in the mobile phone industry, underscoring the need to consider demographic differences in attitudes towards recycling and stockpiling when designing Reverse Supply Chain Management (RSCM) systems.

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1. Introduction

The rapid expansion of the global economy, reflected in the demographic impact, has led to the growing popularity of mobile phones. These devices have become the most widely used electronic devices in contemporary society, surpassing computers. This trend is attributed to the continuous advancements in mobile phone technology, spurred by the rapid growth of digital businesses and intense competition among smartphone manufacturers to release new models annually. As a result, the lifespan of mobile phones has shortened, leading to increased demand. However, the accumulation of unwanted mobile phones at homes or workplaces significantly contributes to the generation of electronic waste, posing environmental and health risks (Attia et al., 2021); Ben Yahya et al. (2023); (Ben Yahya et al., 2020; Coffey & Toland, 2019; Martinho et al., 2017; Yin et al., 2014). According to World Bank statistics, the United Arab Emirates (UAE) recorded the highest economic growth in the Middle East (ME) (Assaf et al., 2018), with a population of 9.89 million in 2020. The International Telecommunication Union (ITU) reported that the number of mobile phone subscriptions in the UAE was 186 per 100 people in 2020, with 18,374,332 mobile cellular subscribers. In 2020, the UAE ranked first in the ME region and third worldwide, following China and Hong Kong, in terms of mobile device penetration (ITU — The World Bank Group, 2020). Among countries worldwide, China has the most publications on electronic waste recycling, while the UAE has the least (Ben Yahya et al., 2021). Moreover, the UAE, with a gross domestic product (GDP) of US$358.87 billion in 2020 and a life expectancy at birth of 77.6 years (ITU — The World Bank Group, 2020), is considered a country with rapid economic growth in the ME (Assaf et al., 2018). Therefore, it is crucial to identify the factors influencing mobile phone users' behaviors towards participating in mobile phone recycling. This will enable companies operating in the UAE to develop an adaptable framework. Inefficient disposal of e-waste could lead to catastrophic environmental effects due to the release of harmful toxins. Many businesses are now employing reverse supply chain (RSC) as a primary method for collecting end-of-life (EOL) or end-of-use (EOU) items from environmentally conscious consumers through the four primary RSC processes: repair, reuse, remanufacturing, and recycling (Kianpour et al., 2017). This paper applies demographic analysis in a framework adopted by two studies (Ben Yahya et al., 2022, 2023). The framework, illustrated in Figure 1.1, will be used to analyze the collected data and measure if demographics affect mobile phone recycling behavior."

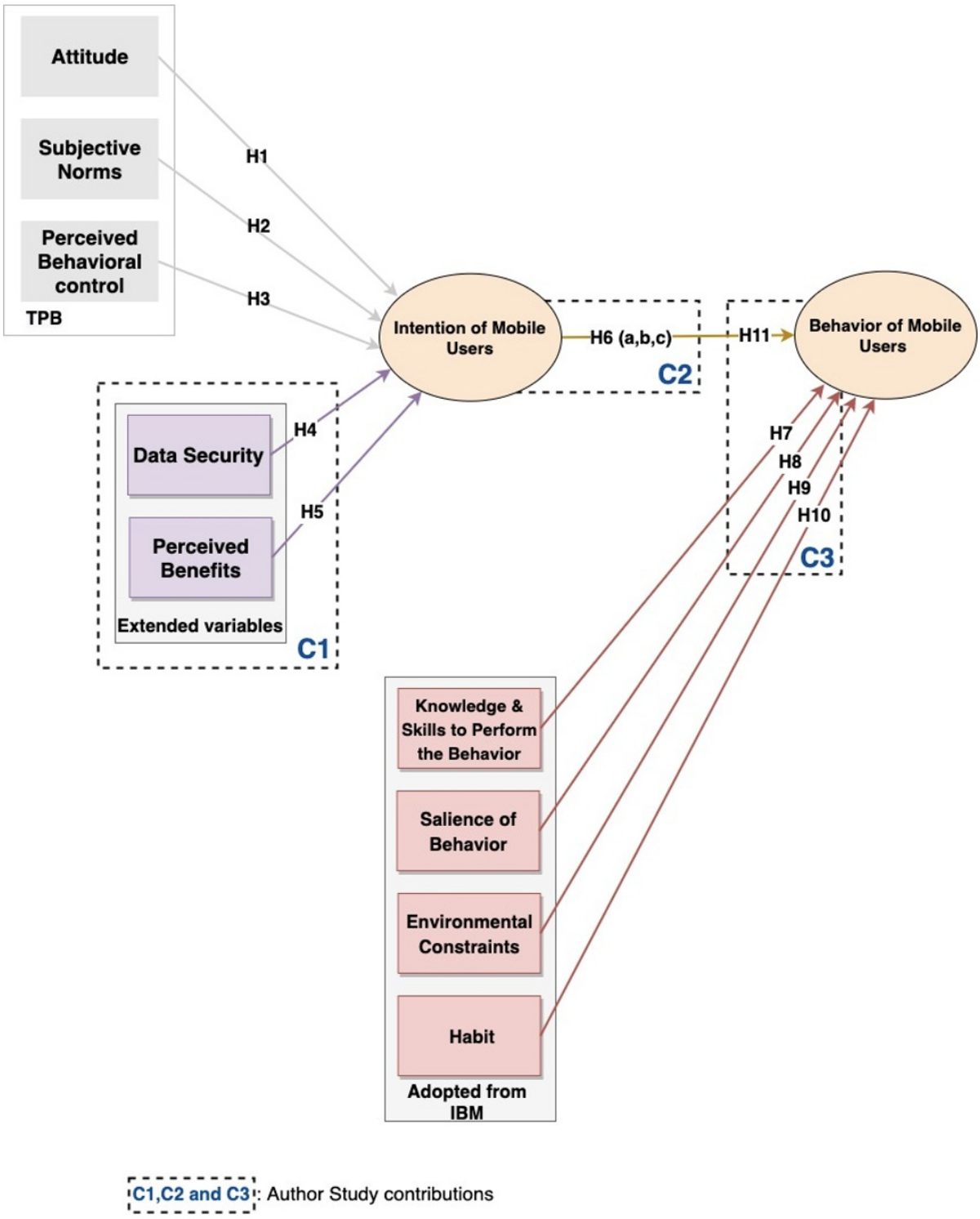

Figure 1. Conceptual model.

2. Research Data and Methodology

This paper employs a quantitative approach to research and utilizes a survey method as a research strategy. Data collection was carried out using a self-administered questionnaire based on a five-point Likert scale, employing a non-probability self-selection sampling technique (Ben Yahya et al., 2022; Saunders et al., 2019). The sample size was

determined using the Cochran (1977) formula (Tejada & Punzalan, 2012), which calculates the characteristics of the population with a 95% confidence level and a margin of error of plus or minus 4%. This resulted in the requirement of 601 questionnaires for the UAE population of 9.89 million (ITU — The World Bank Group, 2020). A self-administered questionnaire survey was distributed to respondents with the aim of collecting 601 completed responses. Furthermore, this sample size adheres to the ten times rule (Barclay et al., 1995; Hair Jr et al., 2021), which states that the sample size for the most complex partial least squares regression (PLS) model should be ten times the number of independent variables. The questionnaire examined in this paper includes open-ended questions with multiple options, focusing on answering queries related to the frequency and percentages of mobile phone treatment and stockpiling methods. Table 1 summarizes the questions and the options provided to the respondents, along with the presentation of the responses.

3. Data analysis and discussion

Data was collected on the treatment methods for mobile phones among users in the UAE. This included the number of devices stored in homes and offices, the typical methods of old phone disposal, and the most compelling reason against mobile phone recycling. As per Table 1, a majority of respondents (32.9%) retained their devices for three years. This was followed by 27% who kept their devices for four years and 22.3% who held onto their devices for two years. Approximately 45.9% replaced their old mobile phone if it was damaged, 24.6% did so to keep up with current technology, and 10.3% exchanged their mobile phone if the operating system was outdated. However, among those who selected other options, only three respondents stated they replaced their phone after the battery died. The majority of respondents (42.3%) were storing their end-of-life (EOL) or end-of-use (EOU) mobile phones in their homes or offices. This was followed by 28.8% who gave their EOL/EOU mobile phones to friends or family. One respondent noted that they dismantled their old phone before discarding it to ensure their data could not be recovered. About 43.6% of respondents stored one device at home, 30.9% stored two devices, and 12 respondents stored between five to ten devices at home. Finally, when asked why they refrained from participating in mobile phone recycling, 37.8% stated they would rather give their old phone to family or friends than recycle it for a low price. 30.4% stated they were unsure where to send the phone for recycling, and 24.1% cited concerns over privacy disclosure (data security/privacy reasons). 5.3% saw no benefit gained from recycling the old phone, 1.7% found recycling to be expensive, and only four respondents cited other possibilities; two did not recycle due to an emotional attachment to the old phone, one kept it as a backup, and the last respondent regularly recycled their old phones.

Table 1. Frequency and Percentages for Methods of Mobile Phone Treatment and Stocking

Mobile Phone Treatment Methods	Details	Number	% of Respondents
How long is the average service life of your mobile phone? **Mark only one**)	less than a year	30	5
	1 year	58	9.7
	2 years	134	22.3
	3 years	198	32.9
	4 years	167	27.8
	Other (More than 4 years)	14	2.3
What is usually the reason for replacing your mobile phone? (**Mark only one**)	Outdated style	55	9.2
	To keep up with the times (technology)	148	24.6
	Damage	276	45.9
	Fashion reasons (upgrade)	57	9.5
	Outdated OS	62	10.3
	Other:	3	0.5
How do you usually treat your old mobile phone? (**Mark only one**)	Store it at home	254	42.3
	Throw it away as ordinary garbage	19	3.2
	Give it to a friend or relative	173	28.8
	Resell it	69	11.5
	Recycle it through proper channels provided by the UAE government or organizations	85	14.1
	Other:	1	0.1
How many end-of-use or end-of-life mobile phones do you have stockpiled in your house/office? (**Mark only one**)	1	262	43.6
	2	186	30.9
	3	79	13.1
	4	62	10.3
	Others (More than 4)	12	2
Which statement, in your opinion, would most prevent you from participating in mobile phone recycling? (**Mark only one**)	I would rather give the phone to family or friends than recycle it at a low price	227	37.8
	I do not know where to send the phone for recycling	183	30.4
	I am afraid of disclosure of privacy (data security/privacy reasons)	145	24.1
	There is no benefit that I would gain from recycling my phone	32	5.3
	It is expensive to recycle my phone	10	1.7
	Other:	4	0.7

This paper seeks to investigate the behavior of mobile phone users towards recycling and storing their devices. The study aims to provide insights into users' perceptions of the importance of recycling and the methods they employ to store their devices. The study is based on feedback from a questionnaire distributed to a sample of mobile phone users. Figures 2 to 6 below compare the results obtained from the questionnaire, highlighting the emerging trends and patterns. By understanding the behavior of mobile phone users towards recycling and storing their devices, this paper can contribute to

developing effective strategies for promoting sustainable mobile phone recycling. The first question in the survey focuses on how long mobile phone users in the UAE keep their devices before recycling, reselling, or donating them. The results indicate that men are more likely to replace their mobile phones than women, with the average service life of a mobile phone for both genders being three years. The survey also found that mobile phone users aged 25-35, the typical employment age in the UAE, were more likely to replace their mobile phones than users who were older or younger. The complete results are illustrated in Table 2 and Figure 2.

Table 2. How long is the average service life of your mobile phone? (Gender and Age)

Question	Parameters	Female	Male	18 - 24	25 - 35	36 - 45	46 - 60	61 or older
How long is the average service life of your mobile phone?	less than a year	10	20	14	8	7	1	0
	1 year	24	34	19	24	13	2	0
	2 years	62	72	24	53	39	15	3
	3 years	97	101	44	79	52	22	1
	4 years	80	87	35	55	57	18	2
	6	6	4	1	5	3	1	0
	7	1	1	2	0	0	0	0
	8	0	1	1	0	0	0	0
	10	0	1	1	0	0	0	0

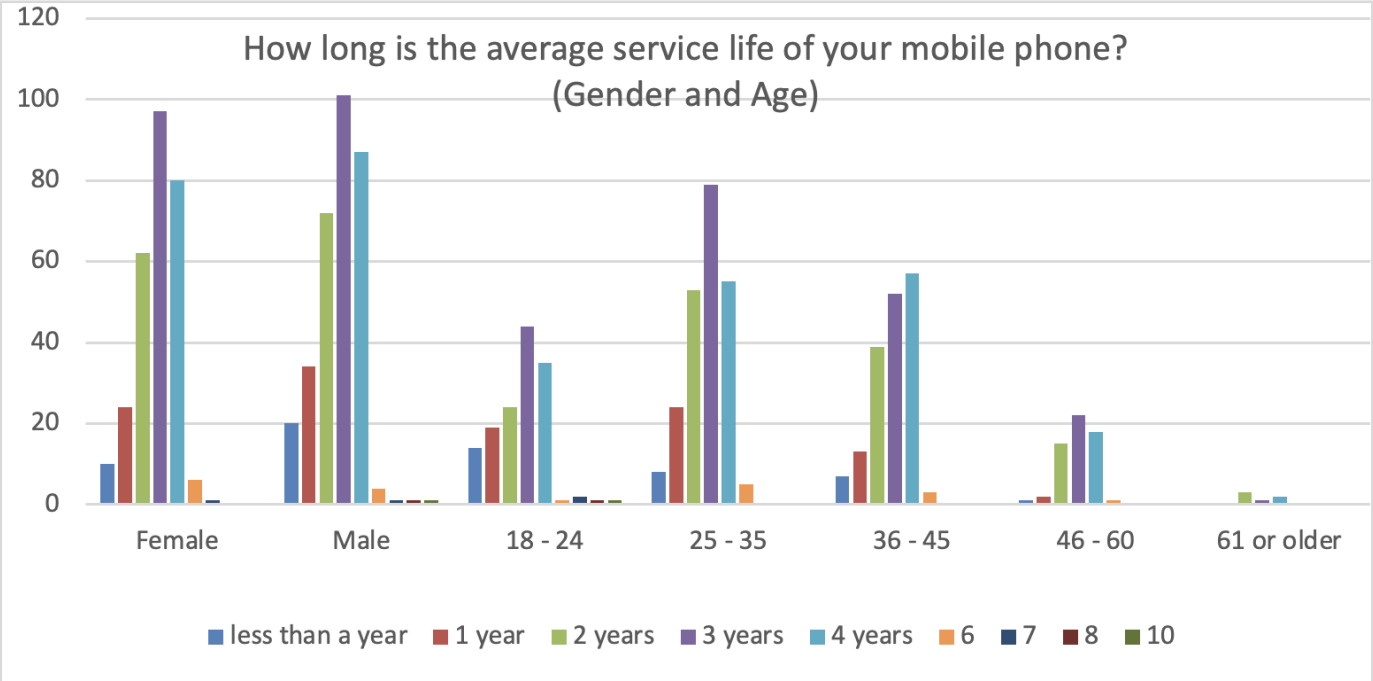

Figure 2. How long is the average service life of your mobile phone? (Gender and Age)

The second question in the survey asked respondents to identify the primary reason for replacing their mobile phones, as shown in Table 3 and Figure 3. The most prevalent reason for replacement was damage, with 53% of women and 40% of

men reporting that they had replaced their phones due to this issue. The second most common reason was to keep up with the latest technology, with 30% of men and 18.3% of women indicating that they had replaced their phones for this reason. The survey also found that mobile phone users aged 25-35 were more likely to replace their phones due to damage than users who are older or younger.

Individuals within the age range of 25-35 exhibit a similar pattern in terms of gender when it comes to replacing their mobile devices due to damage. Additionally, keeping up with technological advancements is a secondary consideration for this demographic.

Table 3. What is usually the reason for replacing your mobile phone?

Question	Parameters	Female	Male	18 - 24	25 - 35	36 - 45	46 - 60	61 or older
What is usually the reason for replacing your mobile phone?	Outdated style	24	31	18	16	16	4	1
	To keep up with the times (technology)	51	97	31	65	34	16	2
	Damage	149	127	56	102	88	29	1
	Fashion reasons (upgrade)	28	29	21	19	13	4	0
	Outdated OS	26	36	14	21	19	6	2

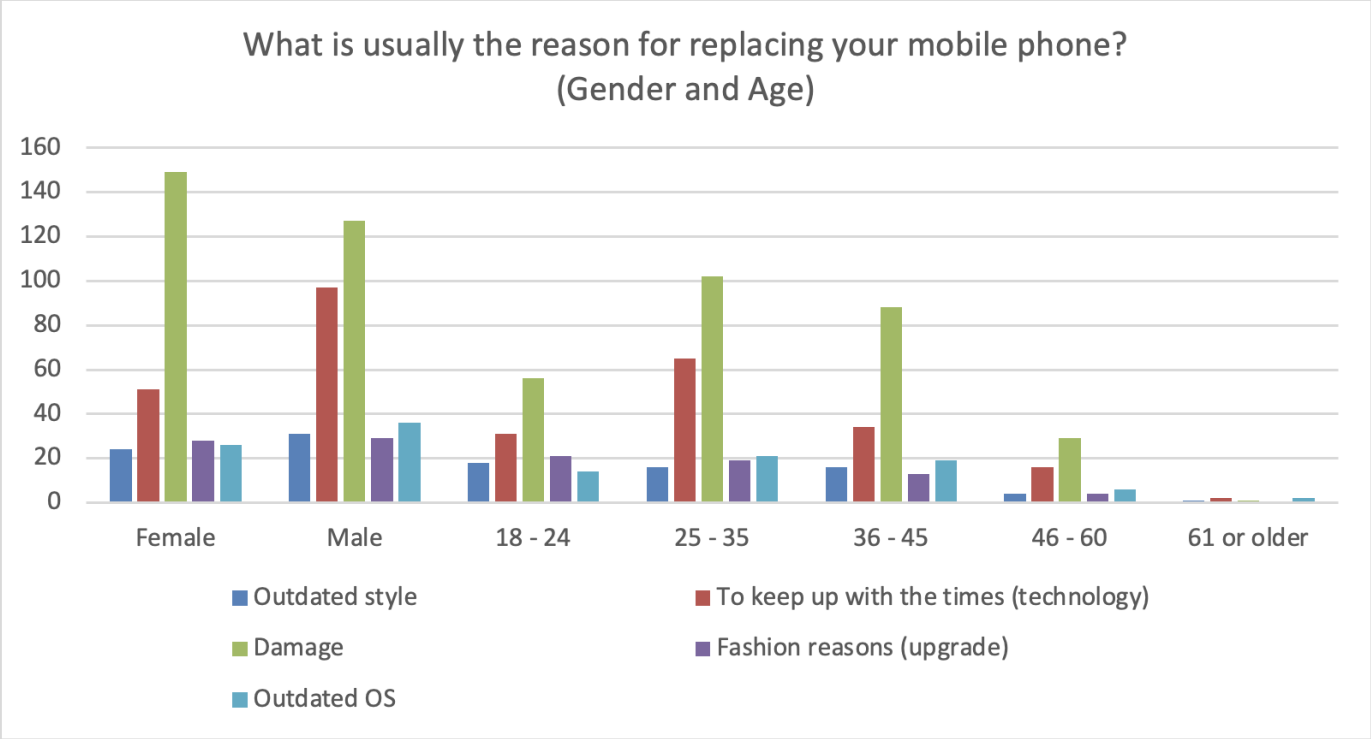

Figure 3. What is usually the reason for replacing your mobile phone? (Gender and Age)

The most notable finding from the survey pertains to how mobile phone users dispose of their end-of-life (EOL) devices. As shown in Table 4 and Figure 4, most respondents (42.3%) stored their EOL devices in their homes or offices, while 28.8% gave them to friends or family. Men were more likely to hoard their EOL devices than women, whereas women

were more likely to give their EOL devices to friends or family.

The demographic group consisting of individuals between the ages of 25 and 35 tends to either retain their EOL device within their household or provide it to an acquaintance or family member as a secondary alternative. The distribution of percentages for both options is equivalent.

Table 4. How do you usually treat your old mobile phone?

Question	Parameters	Female	Male	18 - 24	25 - 35	36 - 45	46 - 60	61 or older
How do you usually treat your old mobile phone	Store it at home	122	132	54	82	86	30	2
	Throw it away as ordinary garbage	5	14	6	5	6	2	0
	Give it to a friend or relative	88	85	34	81	38	16	4
	Resell it	31	38	16	28	22	3	0
	Recycle it through proper channels provided by the UAE government or organizations	34	51	31	28	18	8	0

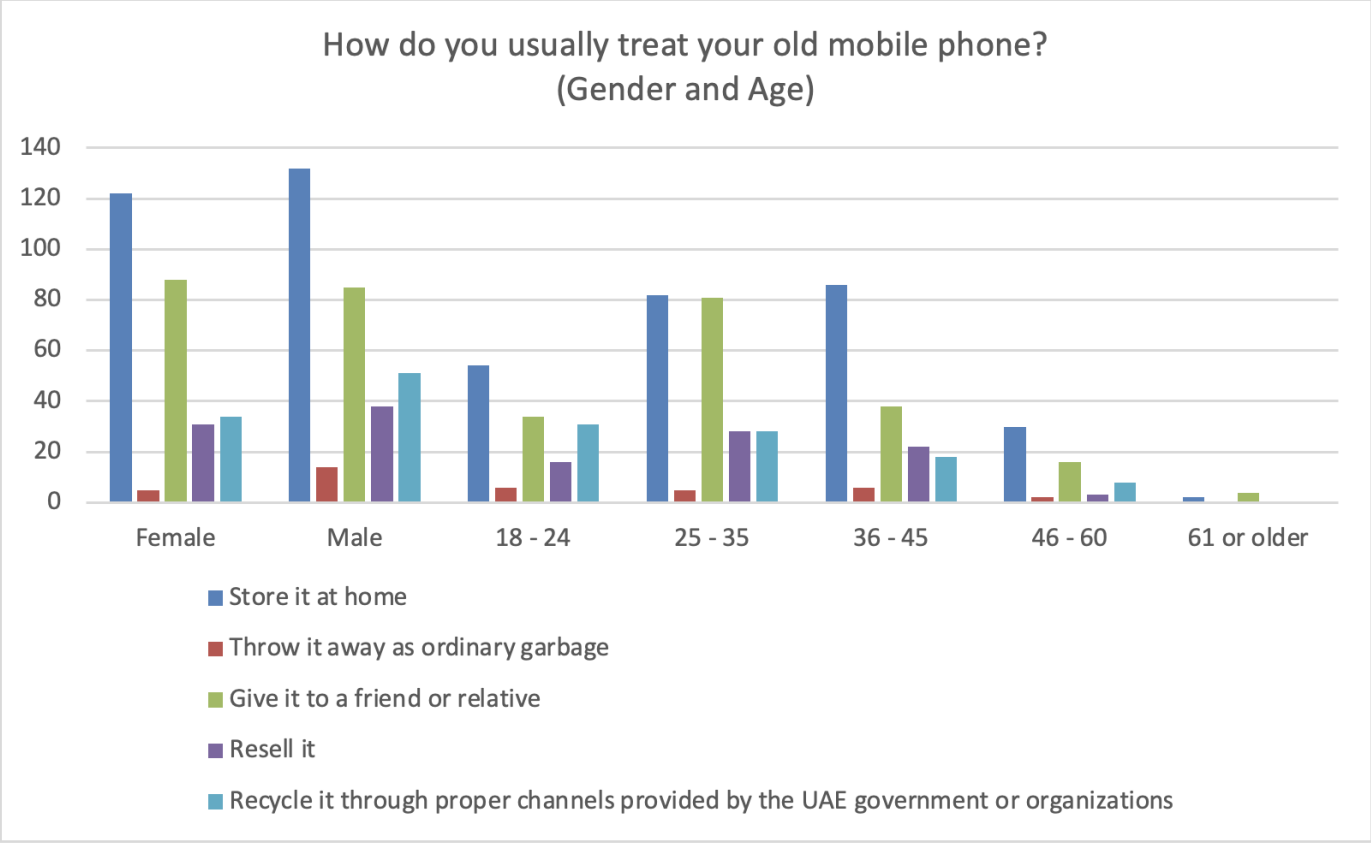

Figure 4. How do you usually treat your old mobile phone? (Gender and Age)

In response to the survey question investigating the number of mobile devices UAE users keep at their homes or offices, the results indicated that approximately 43.6% of respondents store one device at home, 30.9% store two devices, and 12 respondents store between five to ten devices at home. The results also revealed that women (34.8%) store more devices than men (29.2%), particularly when the number of stored mobile phones is two. However, when the number of stored

devices was three or four, men outnumbered women, with 15.6% and 13.4% versus 10.4% and 6.8%, respectively. These results are summarized in Table 5 and Figure 5.

Table 5. How many end-of-use or end-of-life mobile phones do you have stockpiled in your house/office?

Question	Parameters	Female	Male	18 - 24	25 - 35	36 - 45	46 - 60	61 or older
How many end-of-use or end-of-life mobile phones do you have stockpiled in your house/office?	1 device	130	132	73	114	60	14	1
	2 devices	97	89	43	65	59	16	3
	3 devices	29	50	14	27	22	14	2
	4 devices	19	43	10	16	25	11	0
	5 devices	0	1	0	0	1	0	0

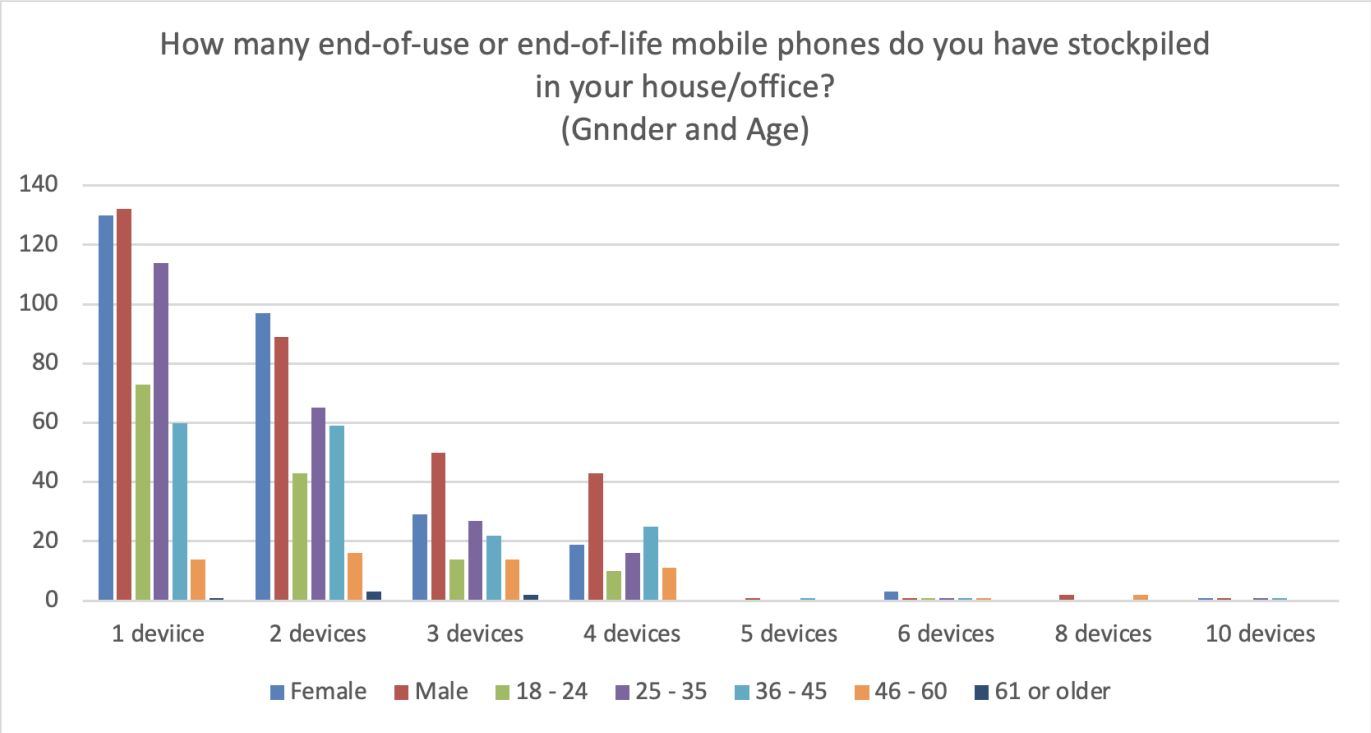

Figure 5. How many end-of-use or end-of-life mobile phones do you have stockpiled in your house/office? (Gender and Age)

To provide additional context about storage and data privacy concerns, Table 6 and Figure 6 show that women were less concerned about data privacy than men (21% vs. 27%). Furthermore, women stored more devices (34.8%) than men (29.2%). Surprisingly, as shown in Table 6, 27% of males selected data security as the primary reason preventing them from participating in mobile phone recycling, compared to only 21.2% of females. This is notable, especially considering that the UAE is a conservative country where the female population is generally more concerned about data privacy compared to their male counterparts. Table 5 also shows that women stored more devices (34.8%) than men (29.2%), particularly when the number of stored devices was two. A 2019 study conducted by Nowakowski (2019) revealed that women are less likely than men to keep e-waste at home, although this study was conducted in Poland, not in the Gulf region.

Moreover, Table 6 and Figure 6 show that the majority of people, both female and male, aged between 25-35, are more inclined to give their old device to a family member or friend rather than recycle it. This tendency may be related to the short life cycle of mobile phones, which is around two to three years (Shi et al., 2017; Yin et al., 2014). This short life cycle often prevents mobile phone users from returning their end-of-life (EOL) or end-of-use (EOU) mobile phones for recycling or refurbishing without a compelling reason, such as environmental conservation, health preservation, or financial return. This is why most respondents (41.7%) would rather give their old phones to family members or friends than recycle the device at a low price.

Table 6. Which statement, in your opinion, would most prevent you from participating in mobile phone recycling?

Question	Parameters	Female	Male	18 - 24	25 - 35	36 - 45	46 - 60	61 or older
Which statement, in your opinion, would most prevent you from participating in mobile phone recycling?	I would rather give the phone to family or friends than to recycle it at a low price	116	111	46	95	63	20	3
	I do not know where to send the phone for recycling	90	93	47	75	42	17	2
	I am afraid of disclosure of privacy (data security/privacy reasons)	59	86	32	46	48	18	1
	There is no benefit that I would gain from recycling my phone	10	22	8	6	15	3	0
	It is expensive to recycle my phone	3	7	8	0	1	1	0

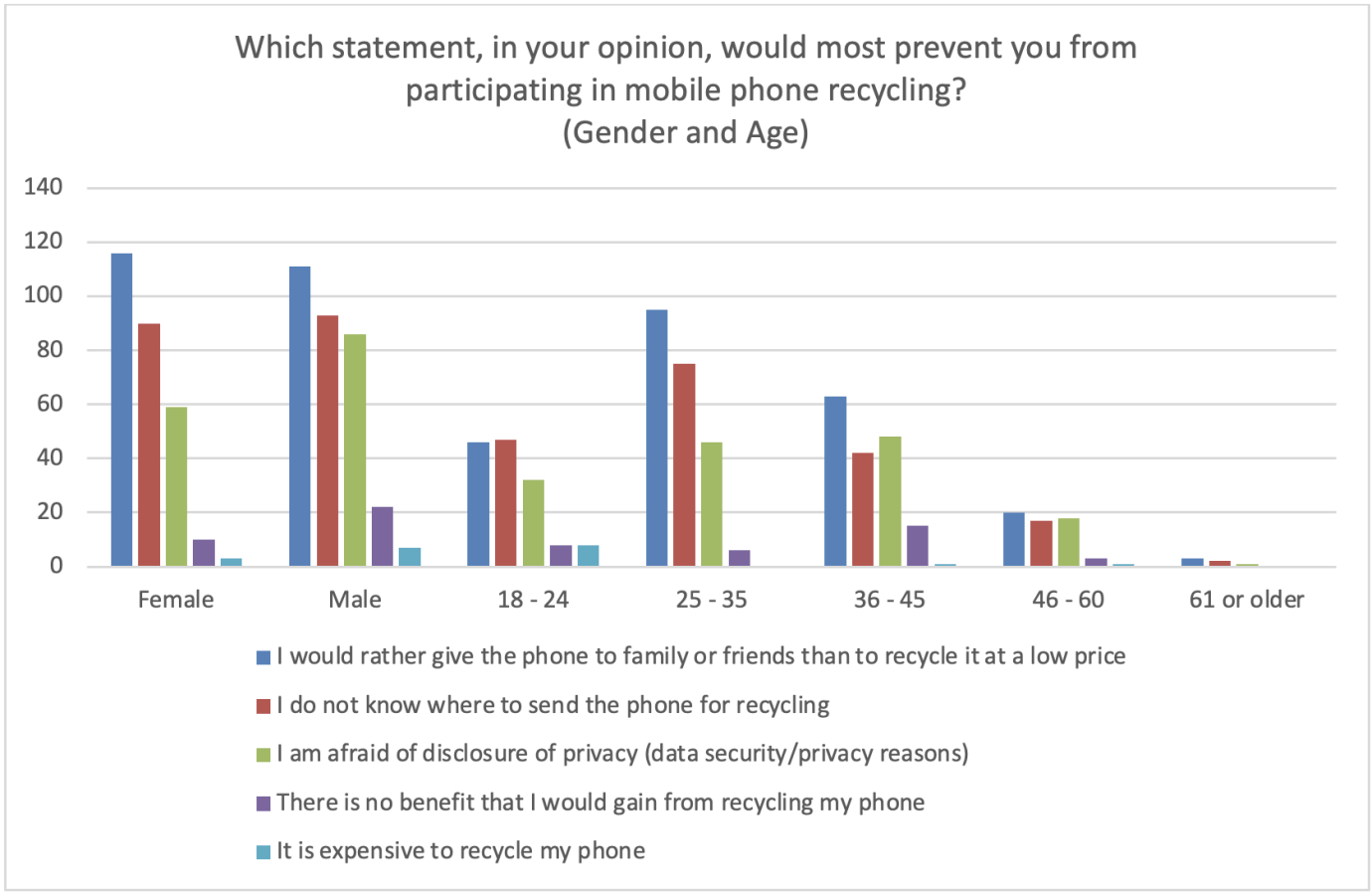

Figure 6. Which statement, in your opinion, would most prevent you from participating in mobile phone recycling? (Gender and Age)

7. Conclusion

In conclusion, this study illuminates the factors that influence the intention of mobile phone users to recycle their devices, with a focus on demographic differences in attitudes towards mobile phone recycling and stockpiling among men and women in the United Arab Emirates (UAE). The rapid use of mobile phones has led to an increase in discarded devices, which poses environmental and health risks due to hazardous materials. Recycling mobile phones presents a more sustainable option, but it necessitates user cooperation.

The study's results indicate that there are significant demographic differences in attitudes and behaviors related to mobile phone recycling and stockpiling. Women exhibited less concern about data privacy and were more likely to store multiple devices, particularly when the number of stored devices was two. Conversely, men outnumbered women when it came to storing three or four devices. These findings underscore the importance of considering demographic factors, such as age and gender, when designing reverse supply chain management systems for mobile phone recycling.

The insights offered by this study have practical implications for stakeholders in the mobile phone industry, including manufacturers, policymakers, and environmental organizations. Understanding the factors that influence users' recycling intentions can aid in the development of targeted strategies to promote sustainable mobile phone recycling practices. By addressing concerns related to data security, privacy, and perceived benefits, stakeholders can encourage greater participation in recycling efforts and reduce the accumulation of electronic waste.

Overall, this research contributes to existing knowledge by exploring the demographic differences in attitudes towards mobile phone recycling and stockpiling in the UAE. It underscores the need for tailored reverse supply chain management system approaches to effectively engage mobile phone users in recycling activities. By adopting sustainable practices and promoting responsible disposal of mobile devices, the UAE can mitigate the environmental and health risks associated with e-waste, thereby contributing to a more sustainable future.

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