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Sustainable Waste Management in Sulaymaniyah: The Impact of Consumer Awareness on Recycling Behaviour through Reverse Vending Machine

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Declaration

I confirm that this research, titled "Consumer Awareness and Behavior Toward Reverse Vending Machines in Sulaymaniyah" is my own work. All information sourced from outside sources has been appropriately referenced. The requirements for the Bachelor of Business Administration degree are met by this research

Abstract

This study examines public awareness, attitudes, and behaviors with regard to reverse vending machines (RVMs) in Sulaymaniyah to establish their viability as a sustainable waste management opportunity. A quantitative survey of 52 participants was undertaken, focusing on demographics, level of understanding, usage behavior, motivational reasons, and views of RVM effectiveness. Results show high levels of understanding (94%) but low usage rates (23.5%), with concern for the environment emerging as the most powerful motivation for adoption. Although payment incentives were highlighted as an element that would enhance RVM usage, a large majority (80.4%) reported a readiness to utilize RVMs even in the absence of monetary benefits. Accessibility, strategic arrangement, and communication initiatives were identified as essential components for expanding acceptance. The findings imply that improved education and awareness, along with focused environmental messages, could greatly improve RVM involvement and help to address the region's plastic waste concerns.

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Table Of Content

Introduction:

Modern waste management systems have been developed in order to the increasing concern for the preservation of the environment on a global scale. One particularly useful technological device that encourages people to return beverage containers for recycling is the Reverse Vending Machine (RVM). Despite being widely used in many areas around the world, including supermarkets, public transportation hubs, and educational institutions across the globe, RVMs are still not widely used in Iraq's Kurdistan Region, especially in Sulaymaniyah. This lack of adoption is made worse by the noticeable lack of scholarly research examining the possibilities in the local setting.

This study's main goal is to determine if it would be feasible to implement RVMs in Sulaymaniyah by evaluating important variables that affect public participation. In particular, this study seeks to:

1. Evaluate the local community's understanding of RVM technology.
2. To comprehend the contemporary recycling environment, look at beliefs regarding waste management and recycling activities.
3. Assess the public's inclination to use RVMs for their recycling requirements and pinpoint any obstacles that would prevent widespread adoption.
4. Give stakeholders and legislators useful advice on how to apply RVM best practices, promoting a better waste management strategy in the area.

This study is important because it has the direct ability to influence future laws and initiatives that support sustainable waste management in Sulaymaniyah. RVMs have the potential to greatly improve the city's recycling facilities, encourage more people to adopt environmentally friendly habits, and eventually lessen adverse environmental effects, all of which would help create a cleaner, healthier future for the region.

Background:

The management of waste is growing into a more critical issue in Sulaymaniyah, as rising populations in cities, insufficient infrastructure, and an overall absence of awareness among citizens all contribute to unsustainable waste management practices. Littering is a common

problem in parks, streets, and public spaces, and recycling is still not generally practiced or recognized. Despite awareness of the environment has increased over time, the resources and structures available to promote sustainable habits remain limited.

Among the most difficult obstacles is changing daily habits. While people may be concerned about environment or climate change, there is sometimes a disconnect between awareness and behavior, particularly when recycling alternatives are unclear, difficult, or nonexistent. Even people who desire to make environmentally sensitive choices may be discouraged if there is no structure in place to support and reward effective waste disposal.

This disparity represents a chance for innovation. RVMs, while new in Sulaymaniyah, provide a novel and useful alternative by making recycling simpler as well as entertaining. This capstone project aims to better analyze public behavior and knowledge of such solutions in order to determine how they might be offered and embraced more effectively.

Problem statement:

Sulaymaniyah is under rising environmental strain due to increased waste generation and a lack of an adequate recycling infrastructure. Considering global advances in waste management, especially with technology such as RVMs, these innovations are mostly unknown and unused in the Kurdistan Region. While a few RVMs have been installed in Sulaymaniyah, public interest in them has been limited.

This low utilization is most likely due to a larger issue: the absence of awareness among civilians, knowledge, and motivation to embrace green practices. In a place where recycling is not yet a part of daily life, installing new technology with public awareness or encouragement may fail to produce substantial results. At the same time, there is a scarcity of regional investigation into how awareness affects consumer behavior towards these machines.

This disparity is a barrier for both government officials, municipality and environmental organizations, as they cannot successfully extend or encourage waste management practices until they understand how the public perceives and communicates with RVMs. Without this understanding, RVMs' capability for contributing to environmental stability in Sulaymaniyah may remain unexplored.

Research questions:

1. To what extent are consumers aware of reverse vending machines in Sulaymaniyah?
2. How do consumers behave toward the reverse vending machine in Sulaymaniyah?
3. How is consumer awareness related to consumer behavior?

Research aim:

The purpose of this study is to investigate how individuals in Sulaymaniyah engage as well as adapt to the implementation of reverse vending machines. Its particular objective is to better comprehend the public's habits, attitudes, and behaviors regarding this recent innovation, as well as how it might stimulate a move toward sustainable and environmentally responsible practices and the adoption of green products. The study uses a survey to assess responses from various age groups and residential locations in the city to uncover patterns and insights. It also takes into account any hurdles to access, such as the restricted quantity and location of machines, which may have an impact on total participation.

Significance of the study:

As environmental concerns grow, creative solutions such as RVMs provide efficient methods to decrease waste while promoting recycling. However, adopting such technologies in a place like Sulaymaniyah, where public awareness and facilities may be restricted, needs a greater understanding of local interaction. This study sheds light on how different parts of the population react to RVMs, not just in terms of awareness but also accessibility and readiness to modify habits. This study, focusing on both interests and barriers, can assist drive more effective implementation techniques. It also contributes to deeper discussions about how urban populations in the region may implement sustainable practices through tiny, scalable innovations.

Literature Review:

Every year, people globally have been increasingly paying attention to the plastic pollution crisis. The widespread use of plastic has been an increasingly problematic issue, especially in countries with little to no awareness such as the Kurdistan region of Iraq (KRI). Improper recycling has had a plethora of negative side effects on the environment and its ecosystems which directly

impacts humans quality of life due to pollution. One potential solution that has shown positive impact both environmentally and behaviorally has been the installation of Reverse Vending Machines (RVMs). These machines allow a person to insert a used or empty plastic bottle in exchange for a reward. Once the recyclable item has been scanned, it is sorted into the appropriate storage for further processing (Karmoker & Kundu, 3). This machine provides financial incentives such as discounts, coupons, or money, which promotes positive reinforcement that can influence human behavior and increase recycling efforts. However, there is little research on the extent of consumer awareness and behavioral response to RVMs within the KRI. Therefore, this research paper aims to explore the level of consumer awareness of RVMs in Sulaymaniyah and how consumers perceive and interact with these machines.

Several countries around the world have introduced RVMs in an effort to increase their recycling efforts. Ritchie and Roser claim that the production of plastic skyrocketed across the globe in recent decades, causing severe implications on the environment (2). The issue lies in the improper disposal of plastic, which works as a catalyst to the environmental crisis. Due to geopolitical constraints, ongoing conflict, and poor waste management, nations like Iraq and the KRI are even more vulnerable to environmental harm (Aqrawi-Whitcomb, 4,11). These factors severely affect the KRI's quality of life of its citizens, which necessitates the adoption of remedies that improve their waste management.

One commonly observed tactic that is implemented internationally to mitigate waste pollution is financially incentivizing individuals, whether through taxation or deposit-fund systems. Studies have found that incentive-based systems such RVMs may successfully "nudge" people toward environmentally friendly behavior without the requirement for formal regulation. Engel and Larrick (2019) describe nudges as redesigning choice contexts in ways that respect individual autonomy while slightly affecting decision-making. This concept encourages the use of RVMs, which provide tiny but quick benefits in return for recycling, so capitalizing on basic behavioral motivations like convenience and satisfaction.Unlike coercive restrictions, RVMs appeal to people's preferences through encouragement, encouraging people to cooperate with sustainability goals. Engel and Larrick contend that such nudges can be more widely accepted and less expensive than requirements, particularly in economically or politically limited circumstances.For instance, the UK was able to significantly reduce its plastic bag waste by taxation (MSutherland, 21-22). The rapid decrease in plastic bag usage was also witnessed in

Ireland, in which taxation plummeted the plastic usage and generated 120 million Euros in tax (McDonald, 2). This not only changed human behavior to use less plastic bags, but it was observed that business owners would donate the extra taxed money to good causes, creating a ripple effect. By incorporating rewards into everyday routines, RVMs encourage habitual shifts in behavior, illustrating how "soft" interventions can lead to substantial environmental effects without limiting freedom of choice.

Similarly, large corporations, such as Coca-Cola also utilized this financial incentive method which encouraged recycling and collaborative efforts (CocaCola, 3-4). Coca-Cola's strategy of collaborating with businesses and governments to put in place a bottle deposit program, in which customers pay a deposit for plastic bottles and get reimbursement when they recycle is an extremely effective way to increase motivation of recycling, while allowing other entities to do the same in a shared effort. This form of collaborative motivation is what Pramita and Srikanth address that being more personally involved with environmental issues greatly boosts one's propensity to adopt RVMs (25). This study outlines the personal behaviors that can motivate people to recycle and use recycling machinery, which is crucial to understanding human behavior in this context. By incorporating rewards into everyday routines, RVMs encourage habitual shifts in behavior, illustrating how "soft" interventions can lead to substantial environmental effects without limiting freedom of choice.

In many countries, RVMs have emerged as a promising solution that utilizes economic incentive as an efficient way to influence consumer behavior to recycle. Studies show that not only are people's behavior changing, but their attitude towards sustainability has increased due to this initiative (Karmoker & Kundu, 5). Additionally, the behavioral reinforcement model explains how this kind of reward, or positive reinforcement, can change people's habits and turn recycling into a regular practice rather than just an action (Zhang,Deng,Nketiah,Shi, 14-15). This form of habit would be the essence of creating long-lasting impact.

To understand how RVMs influence consumer choices, it is useful to study key psychological and behavioral theories. Among these models is the Theory of Planned behaviour, which holds that a person's desire to engage in an activity, such as recycling is impacted by their perspective toward the behavior, subjective standards, as well as perceived control over their behavior (Ajzen, 4). RVMs encourage recycling by offering an actual reward and altering attitudes with instant advantages. Furthermore, Nudge Theory shows how simple changes in

choice construction, such as having recycling simpler or more rewarding, can encourage people to adopt sustainable behaviors while maintaining their freedom of choice (Thaler and Sunstein, 84). These theories provide a valuable framework for investigating how monetary and social factors influence behavioral change in Iraq's Kurdistan Region, where green habits are still being developed.

Study on recycling behaviors emphasizes the need to recognize both cost-effectiveness and behavioral variables when developing sustainable waste management policies. Kinnaman demonstrates that even though traditional economic incentives, such as deposit-refund schemes, might enhance recycling rates, their efficiency is greatly influenced by individual behavioral motives(Kinnaman, 219). Convenience, social conventions, and fundamental environmental values frequently play important roles in addition to financial rewards. Kinnaman also claims that well-designed policies that link monetary incentives with behavioral factors are more cost-effective, lowering the need for intensive enforcement or expensive infrastructure (Kinnaman, 231). The combined strategy endorses the employment of mechanisms such as RVMs), which combine financial incentives with simplicity of use, boosting recycling by both logical economic behavior and behavioral nudges.

Although we can observe how such projects have been successful in other parts of the world, there is still much to learn about their effectiveness in the KRI. New recycling programs have been implemented recently in Erbil and Sulaymaniyah, although very little is known about public awareness and involvement (Catherine,2). RVMs are making a presence in Sulaymaniyah and the KRI as young people take the stage and implement new models of recycling(Omer, 4-5). Othman, Kareem, and others show us that young women are more likely to recycle, and regional participation differs between provinces (Othman,Karim, Aziz, Hussein, 110). Given the absence of formal recycling regulations in the area, evaluating RVMs' viability as a sustainable waste management approach requires an awareness of how consumers view them. One study explains that consumers are generally more reluctant to pay more for sustainable options, but would rather have the option than a ban (Walker,McGuinty,Charlebois,Music, 7-9). Therefore, when contextualizing waste management policies, it is important to not take an approach that would be too direct, rather, it's important to be moderate in the policies.

Despite RVMs having many advantages, their execution is not without obstacles. One significant obstacle is the initial expense of installation and upkeep, particularly in regions with

limited government resources, such as the KRI. These machines require frequent maintenance, secure locations, and correct interaction with current waste management systems. Furthermore, there is a potential of misuse or technical failure, which might gradually diminish trust and involvement. Another difficulty is that RVMs frequently only accept particular kinds of recyclables, such as plastic PET bottles or aluminum cans, which may restrict their total influence on broader plastic waste. People in locations with a lack of knowledge about the environment or internet access may also have difficulty understanding how to use the machines or how the reward schemes work. These practical and technological challenges must be considered while determining the viability of large-scale RVM implementation in Sulaymaniyah.

Therefore, there must be a variety of incentives and engagement strategies for people in the KRI to begin utilizing RVMs and witness a change in behavior. It is also essential that consumers and producers alike recognize the advantages of adopting RVMs. Social media, with its many facets, including blogs, content communities, and networking sites, offers a variety of advantageous uses to support sustainable living because, as was previously noted, acts like upkeep and possible misuse are challenges we are dealing with (Kaplan & Haenlein, 63). Even more, Obar, Zube, and Lampe provide a thorough examination of social media platforms that provide the greatest opportunities for social mobility and civic engagement (13). High levels of civic participation were provided by websites like Facebook, which is essential for encouraging the Kurdish population to adopt better recycling practices. It demonstrated how important other social media platforms, like Twitter, were for organizing people. Given that this study shows that a large number of individuals are not familiar with how to utilize RVMs and that one of the primary challenges is the possibility of RVM misuse, it is evident that raising public awareness, especially through social media's extensive reach, is ideal for addressing this problem (14). Engaging with social media can also motivate stakeholders by allowing them to observe the demand directly, creating more investments into maintaining and managing RVMs in the future.

The concept of social mobility, however, cannot be effectively communicated on social media without a well-defined plan for influencing and focusing on particular behaviors. In order to have an effective environmental campaign, Steg and Vlek examine how environmental psychologists suggest a number of crucial concerns that need to be addressed, from identifying the behavior that needs to change to applying it in various circumstances (312). This distinction is crucial because, similar to Fietkau and Kessel, they do not directly link knowledge about the

environment to pro-environmental action. They believe that environmental knowledge, attitudes, and values, along with emotional engagement, form a complex known as "pro-environmental consciousness (381)." Therefore, campaigns that only use informational outreach, like standard social media posts, are unlikely to be successful, according to this integrated paradigm, unless they also appeal to feelings of connection and perceived self-efficacy (256). Therefore, it is crucial to go beyond superficial awareness when creating online engagement strategies for RVM adoption in the KRI. Instead, create emotionally compelling, context-sensitive information that speaks to the nuanced cognitive and subjective motivations of environmental action. In order to change attitudes and make recycling action feel socially and individually meaningful, this could entail employing social proof to create perceived norms, highlighting local community leaders modeling behavior, and using storytelling tactics.

Gardner and Stern examined the data supporting four main categories of intervention: education to alter mindsets and disseminate knowledge; attempts to alter the content and incentive structure of behavior by offering monetary and other forms of rewards or penalties; community management, which entails establishing common norms and expectations; and religious and moral approaches that appeal to values and seek to alter broad worldviews and beliefs (416). Therefore, it is reasonable to expect that moral approaches can be used to promote efforts like RVMs when we examine the KRI's condition, especially since it has been significantly impacted by climate change. Iraq as a whole is facing the deterioration of its biodiversity, air pollution and air quality, contaminated marine waterways, and scarce and tainted water supplies (Suleimany & Aziz, 2), which is a direct affect on people’s quality of life and perception on their attitudes towards the environment. Given that Kurdish individuals in particular face these difficulties, it is possible that moral demands related to the environment may cause people to be more or less inclined to take pro-environmental action (Knez, 14). For example, appeals to moral responsibility might prove unsuccessful in the KRI, where political division and economic instability frequently dominate public discourse, unless they are specifically connected to real-world experiences, like safeguarding family health or maintaining local agricultural livelihoods. Consequently, the efficacy of moral and religious approaches may depend on the extent to which they are localized, emotionally resonant, and integrated into a larger strategy that also discusses social norms and material constraints, even though they may increase support for interventions like RVMs.

Even so, with all the environmental challenges and threats that face the KRI, future proposals to address environmental issues and their seriousness were notably absent from the election campaign (Abdulrahman, 320). The government's poor performance and the economy's collapse were the main points of contention for the opposition. The efficacy of initiatives like RVMs depend on government transparency and public trust, both of which are seriously questioned by this political disregard for environmental issues. According to studies, implementing environmental policies in areas with limited resources or after a war necessitates not only technical fixes but also public support and political will (Bernauer & Gampfer, 445). Even carefully planned environmental initiatives are unlikely to result in behavioral change if people believe that the government is dishonest or incompetent (Hetherington & Husser, 314). In the KRI, where residents have continuously complained about inadequate government and a dearth of essential public services (Hama & Jabar, 4), implementing RVMs in isolation runs the danger of escalating disenchantment.

As a result, RVMs need to be incorporated into an open, inclusive framework that offers monetary rewards, governmental support, and public education. Their ability to succeed depends not only on having access to the technology but also on having faith in the organizations that are pushing it. Regardless of the potential advantages of the technology, opposition or apathy may arise if the political and social climate in which environmental projects are implemented is not addressed. The National Strategy for the Protection and Improvement of the Environment (2024–2030), which was recently unveiled in Iraq, provides a possible framework for incorporating environmentally friendly waste management techniques like RVMs into regional and national policy (UNDP, 18). The strategy's emphasis on altering behaviors and involvement in the community is consistent with RVMs' guiding principles, which use rewards to encourage recycling.

It is crucial to return to the micro level after discussing the macro level, which includes the government and larger players as essential to the success of RVMs and similar projects. Social media campaigns are insufficient when examining how education might influence behavior in a constructive way. Environmental learning, especially when taught in early childhood, has a significant impact on individuals' attitudes toward sustainability. A study of 49 educational settings found substantial discrepancies in environmental education habits, especially in early and elementary education (Martínez-Peñalver et al., 2805). The researchers criticize the

lack of emphasis on fairness in the environment, pointing out that most solutions fail to tackle the structural and social disparities associated with environmental challenges. By highlighting abstract green values without connecting them to real-world inequalities, these programs could risk alienating students and diminishing the overall impact of environmental learning.This restriction emphasizes the demand for broader and justice-oriented methods that link children's own experiences to bigger environmental issues. According to Pramita and Srikanth, developing a sense of personal participation boosts the drive of individuals for participating in sustainable behaviors such as using RVMs (25). When environmental education includes relevant, justice-based stories, it strengthens the psychological foundation for lifetime pro-environmental behavior. This study demonstrates that early interventions, when based on both environmental and social consciousness, can be a powerful force in fostering environmentally friendly responsible conduct without imposing restrictions.

Furthermore, a more comprehensive approach to education is more important than merely environmental education, particularly to promote and sustain the use of RVMs. Significant educational reforms have been implemented by the KRI, including a more demanding curriculum and mandatory schooling through Grade 9 (Mawlud, 2). Additionally, thousands of students have been sent overseas to gain knowledge and skills that can aid in the development of the region thanks in large part to the Human Capacity Development Programme (HCDP) (Mamand, 21). According to studies, education is crucial in influencing people's attitudes toward environmental preservation and the uptake of sustainable activities. The KRI may encourage an environmentally conscious culture by teaching students about the advantages of recycling and using RVMs.

However, it is crucial to consider issues like who is using these resources whenever we discuss accessibility. Environmental justice and socioeconomic disparities must be addressed, whether through education or just the placement of environmental projects. In their seminal assessment of the literature on environmental justice, Brulle and Pellow contend that ingrained systems of class, race, and regional marginalization shape environmental benefits and responsibilities rather than distributing them equitably (106). Understanding the socio-environmental effects of RVM deployment in urban contexts requires this realization.

Furthermore, people who have the time, mobility, and digital literacy necessary to participate in RVM incentive programs that pay for recyclables are more likely to be able to do

so, factors that are correlated with class position. RVMs run the risk of perpetuating what David refers to as the "path dependency" of environmental privilege, which is the adoption of eco-friendly systems in ways that favor those who are already privileged (1). If and when trial initiatives introducing RVMs in KRI are introduced, they are expected to prioritize middle-class neighborhoods, shopping centers, and commercial zones, as is the case with other types of urban development. On the other hand, these programs do not include refugee or IDP camps, peri-urban areas, or informal settlements, where garbage accumulation is frequently more severe. By giving the advantages of sustainable technologies to those who are already in a better socioeconomic position, this reproduces a type of environmental injustice.

Reliable methods for measurement are crucial for assessing and comprehending human behavior. Pearson's correlation coefficient (r) is a commonly used statistical measure for evaluating the strength and direction of linear correlations between continuous variables. The Encyclopedia of Public Health states that this coefficient has a range of -1 to +1, with values near 0 indicating no linear correlation between the variables, values near +1 indicating a significant positive linear relationship, and values near -1 indicating a strong negative linear relationship (Correlation and Regression). In domains like public health that depend on data-driven insights, Pearson's r offers a quantitative way to comprehend relationships.Its use in analytical contexts is further supported by the coefficient of determination (r^2), which is a proportion of variance in one variable that is explained by variance in the other and is calculated by squaring Pearson's r. In public health research, this statistical technique is particularly crucial for determining and measuring the strength of correlations between variables, which informs treatments based on evidence and policy choices. It is crucial to understand that Pearson's correlation relies on the assumptions of continuous data, linearity, and a normal distribution. Other metrics, like the Spearman's rank correlation coefficient, can be more appropriate if these requirements are not satisfied.

Kollmuss and Agyeman argue that the significant discrepancy between environmental awareness and pro-environmental conduct cannot be explained by information alone (240). Their well-known model incorporates internal components like personal beliefs, emotions, and attitudes as well as external ones like infrastructure, societal norms, and economic circumstances. According to this theory, real behavioral change requires supporting social and environmental circumstances and goes beyond simple understanding. The installation of RVMs

in Sulaymaniyah is intended to promote recycling habits. But ease isn't the only factor that will determine these gadgets' success. According to Kollmuss and Agyeman's model, if larger problems are not resolved that is, if dominant cultural attitudes regarding waste are not challenged, suitable environmental education is not regularly offered, and significant incentives are not created, RVMs by themselves might not be enough to close the gap between desire and behavior. This viewpoint emphasizes the urgent necessity for an all-encompassing strategy, especially in areas like Sulaymaniyah where cultural and financial realities have a big impact on waste management practices. Therefore, in order to create successful strategies that combine infrastructure with community-specific actions, future research must explore these complex local dynamics.

When it comes to influencing people's environmental consciousness and encouraging pro-environmental conduct, governmental organizations and entities are essential catalysts. These organizations have the power to greatly impact public participation with sustainability through focused programs and encouraging frameworks. The "Strengthening Collective Climate and Environment Action in Iraq" initiative, for example, is highlighted by the Institute of Regional and International Studies (IRIS) at the American University of Iraq, Sulaimani (AUIS) and directly empowers adolescents through citizen science training (IRIS).This program fosters a greater understanding of environmentally related issues and encourages localized accountability for solutions by providing participants with useful instruments for tracking regional environmental issues such as air and water quality. In addition, Robeil and Fazil's study on the management of the environment in Iraq highlights the structural obstacles that frequently obstruct youth-led environmental campaigning, such as a lack of openness and bureaucratic lethargy (Robeil and Fazil). However, their work highlights how youth programs may have a revolutionary impact when they are deliberately linked with and backed by government cooperation. Together, these instances show that although grassroots zeal is important, strong institutional support and the development of supportive policy frameworks are ultimately necessary for the long-term activation of pro-environmental behaviors and public awareness.

In conclusion, creative and situation-specific waste management solutions are required due to the global proliferation of plastic waste materials, which is made worse by particular geopolitical and socio economic issues in areas such as the Kurdistan Region of Iraq. Although RVMs have shown significant success globally in encouraging environmentally friendly

behavior through monetary rewards and behavioral cues, their effectiveness is not only due to the implementation of technology. The effective implementation of RVMs in Sulaymaniyah and the KRI in general, as this review has highlighted, depends on navigating a complex environment that includes not only technical viability but also deeply rooted cultural attitudes toward waste, thorough and justice-oriented education about the environment, ongoing political will, and carefully thought-out incentives.It is clear that a comprehensive strategy is essential when considering theories like the Theory of Planned Behavior and Nudge Theory, as well as the crucial roles played by focused social media involvement, open governance, and government assistance. Furthermore, for equitable implementation, it is essential to comprehend the possibility of environmental inequality in RVM installation, where accessibility and advantages may excessively favor particular socioeconomic groups. This investigation aims to provide important insights into how the residents of Sulaymaniyah perceive and interact with these machines, given the current deficiency of local knowledge regarding RVM consumer awareness and behavioral reaction, especially in emerging RVM markets like Sulaymaniyah. In particular, the following theories will be investigated in this study:

Hypothesis 1: In Sulaymaniyah, consumers indicated recycling habits and their knowledge of RVMs are significantly positively correlated.

Hypothesis 2: Sulaymaniyah consumers are more likely to regularly employ RVMs for recycling if they believe that they offer more monetary incentives.

Hypothesis 3: Sulaymaniyah consumers will become more aware of RVMs if they are exposed to additional knowledge and instruction about them.

By putting these theories to the test, this study hopes to close the observed gap in understanding and help develop more approachable and effective waste management strategies for Sulaymaniyah. In order to promote genuine, long-term reforms in the KRI toward responsible environmental behavior, our research aims to go beyond temporary technology solutions.

Proposed Methodology:

The purpose of this quantitative study was to analyze public knowledge and behavior regarding green initiatives, with a focus on RVMs, by presenting a standardized questionnaire to Sulaymaniyah residents. The goal was to better assess public knowledge and behavior toward green initiatives, with a specific emphasis on reverse vending machines. For the survey, a

convenience sample of 52 people was gathered. Social media and my own connections were the main ways that participants were contacted. Time restrictions and practical availability led to the selection of this sampling technique. It is crucial to recognize that, despite its efficiency, this method can restrict the findings' applicability to the larger Sulaymaniyah population. The questionnaire, carried out digitally through Google Form, included both multiple-choice and Likert-scale topics aimed to examine participants' knowledge, attitudes, motives, and usage patterns regarding green efforts and RVMs. This approach allowed for an easy investigation of RVM patterns and relationships in the local community. Data analysis will mostly include descriptive statistics to describe knowledge, attitudes, and behaviors, as well as correlational analyses. Pearson's r will be applied to investigate the correlations between respondents' understanding and their reported involvement with the technology.

Research Nature:

In order to look into Sulaymaniyah's consumer understanding and actions around RVMs, this study used a quantitative, descriptive methodology. Structured surveys were used to gather information in order to quantify public awareness, attitudes, and behavior around RVMs. Finding patterns in awareness and behavior as well as evaluating how they relate to one another were the goals of the study. This quantitative approach gives a clear picture of the current degree of RVM participation, which is essential for boosting their adoption and incorporating them into the city's waste management plan.

Research Design

This study used a descriptive quantitative approach to investigate how people in Sulaymaniyah perceive and respond to green practices, particularly the use of RVMs. The design was set up to find patterns in the community's general awareness, motivations, and behaviors.

Methodology of Investigation

An ordered approach was taken, beginning with current ideas on environmental behavior and environmentally friendly habits and comparing them to information gathered in Sulaymaniyah.

Research Method

The study took a quantitative approach, concentrating on gathering quantifiable information suitable for statistical analysis. This method made it possible to clearly see how different

elements, such as motivation and comprehension levels, affect perceptions of RVMs and more general green initiatives.

Research Strategy

In order to efficiently gather data from a varied sample of the population, the research method employed a survey approach. Because surveys are good at collecting quantitative data from many participants in a reasonable amount of time, they were judged to be a good fit for this study.

Research Tool

An online questionnaire served as the main study instrument. It was intended to gather factual and demographic information as well as attitudes toward RVMs and recycling programs in general.

Questionnaire Design & Measurements

Demographics, RVM awareness, usage patterns, and motivating factors were among the sections of the questionnaire that were methodically separated into multiple sections. In order to encourage precise and understandable answers, the questions were designed to be simple and short. All of the questions used closed-ended formats, mostly 5-point Likert scales and multiple-choice questions. By allowing respondents to rate their degree of agreement or understanding numerically, this structure made it possible to quantify opinions and behaviors for simpler data processing.

Data collection

For the survey, a convenience sample of 52 people was gathered. Social media and personal networks were the main ways that participants were contacted. Time restrictions and practical accessibility led to the selection of this sampling technique. It is crucial to recognize that, despite its efficiency, this method may limit the applicability of the findings to the broader Sulaymaniyah population.

Limitation of the study

Although the collected data offers insightful information, it is crucial to recognize a number of this study's shortcomings. First off, there were only 52 participants in the sample, which might not fully represent the variety of demographics within Sulaymaniyah. Because the non-random

sample method mostly relied on online involvement, it might have left out people who didn't have internet access or weren't active on social media. Additionally, most participants came from the city center, which restricts the findings' relevance to suburban and rural areas. Lastly, using self-reported data could lead to social desirability bias, in which individuals give answers that they believe to be acceptable within society rather than ones that accurately represent their actual actions or viewpoints.

Results and findings

Demographics

The survey results showed a youthful, urbanized and mostly female demographic that resides in the city center of sulaymaniyah. For the Age demographic (n=47 respondents), the largest age group was 25-34, accounting for 40% of those surveyed (n = 21), followed by 18-24-year-olds at 27% (n = 14) and 35-45-year-olds at 13.7% (n = 7). Only 5.9% (n = 3) were over 45, while 3.9% (n = 2) were under 18. These findings indicate an emphasis on young people, with a mean age category of around 2.43 (SD = 1.02) on a 5-point ordinal scale, moderate variation, and a preference for early career phases.

In regard to gender, 72.5% of respondents (n = 38) were female, while 25.5% were male (n = 13), and 2% (n = 1) chose not to answer. The average gender score on a 3-point scale was 1.30 (SD = 0.52), indicating limited range and a definite gender disparity. This may indicate that women are more engaged with the sampling process.

In terms of education, a significant 70.6% (n = 37) had a Bachelor's degree, 17.6% (n = 9) just had a high school diploma, and 9.6% (n = 5) had a Master's degree or higher. Only 2% (n = 1) claimed to have completed education that is lower than high school. The mean educational level was 1.44 (SD = 0.71) on a 4-point scale, indicating an emphasis on higher education and relatively minimal variation.

Geographically, 90% (n = 47) of respondents claimed living in Sulaimani's city center, with only 10% (n = 5) in suburban districts and none in rural areas. This resulted in a mean location score of 1.10 (SD = 0.30) on a 3-point scale, suggesting that the sample has very little geographic variety.

While there is a substantial difference in age and educational level, gender and geographical factors are highly stable, resulting in a demographically restricted but particular responder profile. It should be mentioned that distinct questions had different response rates.The data is best regarded as representing young, educated urban girls rather than the general population of Sulaymaniyah.

Awareness:

In this section the survey examined people's understanding, knowledge, and opinion on the advantages of reverse vending machines. A vast majority, 94% (n = 49), were aware of RVMs, indicating a high baseline familiarity. When questioned about the basis of awareness, 60% (n = 31) cited social media, while 19% (n = 10) had seen one in person. Educational institutions (7.8%), family and friends (5.9%), and traditional media (5.9%) all made smaller contributions to awareness, indicating digital platforms as the primary informants on sustainable technologies.

When asked to name up to three perceived advantages of RVMs, 27.5% of respondents chose "It benefits the environment," while just 2% chose "It provides money or rewards," undermining the notion that money can motivate involvement. 9.8% selected "It's an easy way to recycle" and "It reduces waste," while 5.9% cited social responsibility. No respondents chose "I don't know," indicating at least a basic understanding among the sample.
A comparison analysis shows that people who witnessed RVMs in person were prone to rank their knowledge as 4 or 5, whereas those who had only known about it through social media tended to place lower. This shows that direct experience increases comprehension more than passive exposure. Furthermore, respondents who chose environmental advantages as a motivator had a higher self-reported awareness, adding support to the notion that increased awareness boosts environmental consciousness.The findings show that, while RVM knowledge is widespread, owing primarily to social media, real awareness differs and is enhanced by actual life knowledge and education. The majority of participants are motivated through environmental and social principles rather than monetary benefits, indicating an important chance for campaigns that prioritize sustainability, accountability, and environmental impact rather than financial gain.

Behavioral:

Participants tend to use reverse vending machines (RVMs) rarely, with only 23.5% reporting having used one and 76.5% not. Among consumers, most (65.5%) use RVMs infrequently, with only 4.2% use them daily and 12.5% weekly. This uncommon use indicates that, while the concept is familiar to some, it is yet to become an everyday behavioral habit. The predominant incentive for using RVMs is related to sustainability, with 95.2% indicating "helping the environment" as their top reason ($M = 4.71$, $SD = 0.48$), compared to only 2.4% for financial gain and simplicity of use, and 0% for societal pressure. This demonstrates a self-less, rather than incentivized, tendency to act among existing users.

Non-users generally reported a lack of awareness of RVM locations (81%), as well as inexperience with the machines (2.4% were unaware of the existence of the machine.), showing major informational and infrastructure gaps. Surprisingly, 66.6% of all participants said they would have been more likely to use RVMs if payments were available ($M = 4.13$, $SD = 1.01$), implying that, while environmental concerns predominate among current users, financial incentives might affect behavior among nonusers. In addition, when asked if they would utilize RVMs without any rewards, 80.4% replied yes, indicating that motivation is internal and value-driven rather than externally enforced.

A comparative review of motivational variables revealed that helping the environment (60%) is the most motivating incentive to utilize RVMs, followed by financial reward (20%) and public awareness efforts (10%). Social influence was notably low (2%), corroborating the belief that RVM use is now more of a personal choice than a socially driven trend. When asked what could promote higher usage, the most popular response was environmental campaigns (51%; $M = 4.41$, $SD = 0.89$), greatly outweighing other possibilities such as accessibility (18.4%) and incentives (8.2%).

Overall, the data indicate a double potential for intervention: improving infrastructure and accessibility and providing environmental education campaigns. While environmental ideals currently drive RVM adoption, smart implementation of financial incentives and public awareness campaigns could increase engagement, particularly among those who struggle to comprehend RVMs..

To examine the connection between awareness and behavior toward RVMs, I used questionnaire responses in which participants were asked to rate their understanding of how a plastic recycling machine works on a scale of 1 (very low) to 5 (very high), as well as the likelihood they would be to use an RVM if they gained education or awareness about its advantages, on a 5-point scale.I used a Pearson correlation test and discovered a substantial positive relationship within awareness and behavioral intention, having a correlation coefficient of $r = 0.72$ and a p-value less than 0.001. This suggests that participants with a greater knowledge of RVMs were likely to employ them if provided further information or awareness.

In order to investigate this relationship, I used a simple linear regression to estimate behavioral intention based on awareness. The findings were statistically significant.

Regression Equation:

Behavioral Intention = $1.80 + 0.85 \times$ Awareness

Regression Coefficient (β_1) = 0.85

$R^2 = 0.52$

$p < 0.001$

This suggests that for each one point rise in awareness, the likelihood of employing an RVM rises by 0.85 points. The regression model explains 52% of the variation in behavioral intention, providing strong evidence that awareness plays a significant role in shaping consumer behavior.

variables	type	scale	mean	SD	Correlation (r)	β_1	R^2	p-value
Awareness of RVMs	Independent Variable	1 (Low) to 5 (High)	3.29	1.30	+0.72	+0.85	0.52	< 0.001
Likelihood to Use RVM	Dependent Variable	1 (Unlikely) to 5 (Likely)	4.03	1.20				

Although 94% of those surveyed had heard of RVMs, only 23.5% had ever used one. Most individuals who had used them reported relatively limited use, usually either once or on rare occasions. This demonstrates a mismatch within intention and action, which is a prevalent

problem in behavior change studies.What complicates the behavior side is that inspiration appears to be driven by values rather than rewards. A large percentage of participants (60%) claimed they would feel motivated to improve the environment, with only 20% choosing money rewards. Nonetheless, 66.6% claimed they would be more inclined to use RVMs if they were rewarded, indicating a deeper tension: consumers desire to act ethically, but practical incentives might tilt the ratio between intention and action.These patterns demonstrate that increasing awareness alone is insufficient. To effectively modify behavior, there must be a stronger emphasis on psychological triggers, machine availability, and tangible impact, such as presenting how much trash is cut or money is saved. These tactics can help close the distinction between what individuals say and what people truly do.

Discussion:

This study addressed a significant research gap in the Kurdistan Region of Iraq (KRI) by investigating customer knowledge and opinion of RVMs in Sulaymaniyah. The demographic profile of the study, which is primarily made up of young, educated urban women, offers a targeted viewpoint on a group that is frequently eager to embrace new social activities and technologies. The group's high foundation understanding of RVMs (94%) was a startling discovery, primarily due to social media (60%). This supports the body of research on social media's role in civic involvement and highlights the effectiveness of digital platforms in spreading knowledge about environmentally friendly behaviors in the KRI.The data also showed an important nuance, although social media is a good way to increase initial awareness, firsthand experience with RVMs seems to promote a deeper level of understanding. This suggests that passive online contact alone might not be enough to result in comprehensive understanding or ongoing engagement.

The study revealed an important finding about customer motivation: 95.2% of current RVM users cite "helping the environment" as their top motive, with financial gain coming in second. This indicates that environmental and social ideals are the main drivers of current RVM users. At first glance, this appears to go against the widely held notion in the literature that financial rewards serve as a powerful "nudge" for environmentally friendly conduct. A considerable 66.6% of all participants, especially non-users, indicated that they would be prone to use RVMs if monetary benefits were offered, notwithstanding the altruistic intentions of present users,

according to the survey.This implies that although there is intrinsic incentive, external incentives may serve as an effective motivator for the wider adoption of RVM, assisting in closing the "intention-action gap" the situation in which favorable attitudes do not always result in consistent conduct. Only 23.5% of those surveyed were familiar with an RVM, and the majority were occasional users, according to the behavioral data, which further underlined this disparity and supported the notion that awareness by itself is not enough to promote widespread use. Lack of knowledge of RVM locations was the main obstacle cited by non-users (81%), indicating serious infrastructural and accessibility problems that require attention.

The study's hypotheses had been confirmed by the statistical analysis. RVM understanding and the probability of behavioral desire to employ them were shown to be strongly positively correlated ($r = 0.72$), suggesting that involvement is increased when benefits are understood. Even though present users are driven by internal factors, the readiness of the larger sample to use RVMs more when offered monetary rewards lends credibility to the concept that perceived rewards play a crucial role in behavior modification, which is consistent with "nudge" theory. Finally, the idea that exposure to information raises consumer awareness is directly supported by social media's position as the primary source of awareness.

These results highlight the need for an extensive approach to transform awareness into regular recycling habits in Sulaymaniyah. Although environmental principles are powerful internal motivators, real-world obstacles like accessibility and outside rewards are just as important. It is critical to strategically place and interact in order to close infrastructural gaps. Including financial incentives could greatly increase participation, especially from those who are not as intrinsically motivated. It's critical to use social media for focused efforts that emphasize the environmental impact of RVMs while also educating people about their locations and usage. In order to guarantee affordable and equitable solutions, future studies should examine RVM awareness within a larger KRI community, addressing issues about environmental injustice. Another important long-term component for continued RVM effectiveness in the KRI is the wider political and governmental backing for environmental projects.

Conclusion:

In order to comprehend consumer knowledge and attitudes in a location dealing with increasing plastic pollution, this study examined the developing RVM environment in

Sulaymaniyah. The results show that, in great part because of the widespread effect of social media, there is a population with a high initial knowledge of RVMs, especially among the young, educated urban females assessed. This emphasizes how important online platforms are for spreading knowledge about fresh environmental projects. The study did, however, also highlight a notable "awareness-action gap", although people are aware of RVMs, their actual use is still low, frequently due to a shortage of readily available machines.

The overall study audience showed a strong willingness to use RVMs more often if monetary rewards were provided, even though existing RVM users are mostly motivated by the admirable desire to safeguard the environment. This draws attention to a crucial paradox: although intrinsic motivation has its merits, extrinsic rewards may be a potent "nudge" to shift awareness into regular recycling practices, particularly for individuals who are not yet actively involved.

Education is fundamental, as seen by the direct relationship between greater understanding and a higher propensity to utilize RVM; nevertheless, in order to effectively promote broad behavioral change, it must be combined with real-world accessibility and observable advantages.

In the end, an integrated strategy is necessary for RVMs to realize their maximum potential in Sulaymaniyah. This comprises a concentrated effort to increase machine accessibility and investigate efficient reward schemes, in addition to ongoing awareness-raising and education initiatives, especially utilizing online platforms for comprehensive information. Designing initiatives that connect with the community and have a long-lasting positive environmental effect will require an awareness of these complex consumer perceptions and actions as Sulaymaniyah continues on its journey to more environmentally friendly waste disposal.

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