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Is This Right for You?: The Key Role of Shop Assistants in Promoting Energy-Efficient Household Appliances

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Abstract: In 2021, a significant update was made to the household appliance classification system in Europe with the introduction of a new energy-efficient label (EE). This update is a step towards achieving the Sustainable Development Goal 7 of the United Nations, which focuses on sustainable energy. The EE label is an effective tool for reducing overall energy consumption. However, its success relies on the awareness and decision making of consumers when making purchases. During the purchase phase, shop assistants have the potential to play a crucial role in promoting energy-efficient choices. Surprisingly, this aspect has been largely overlooked in previous research. In an attempt to fill this gap, we conducted an exploratory study employing a mixed-method approach, encompassing 22 in-depth interviews and questionnaires administered to shop assistants from various appliance stores. Our findings revealed that shop assistants face challenges in promoting energy-efficient choices, particularly after the introduction of the new EE label, due to a lack of training. This may result in incorrect advice that could impact consumer purchases and their daily energy consumption. Our study emphasises the need to support shop assistants in promoting energy-efficient purchases, to enhance their training, and to incorporate tools such as augmented reality to foster energy-efficient-orientated purchases.

Keywords: energy consumption; energy label; household appliance; energy-efficient; sustainability; sustainable development goals; shop assistants; consumers; training; AR

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1. Introduction

The market for household appliances has experienced a notable surge in growth in recent years, predominantly driven by significant technological advances that have resulted in substantial improvements in energy efficiency [1,2]. Interestingly, the upward trend in the market for household appliances is further reinforced by various government financial incentives aimed at promoting the adoption of highly energy-efficient appliances [3,4]. However, the effectiveness of these policies and the advancement in energy efficiency remain uncertain, as their success depends on various factors, such as consumer awareness and understanding of energy-efficient technologies [2,5]. Despite the implementation of numerous policies and programmes, the electricity consumption attributed to residential household appliances and lighting continues to exhibit an annual increase [6,7]. In fact, the residential sector in Europe consumes the largest share of energy, accounting for 26.3% of total European energy consumption [8].

Similarly, according to Istat [9], the official statistical institute in Italy, the household appliances sector in Italy witnessed significant growth in 2022, with a remarkable increase of 6.9% in sales compared to the previous year, 2021. Furthermore, in the same year, the Italian household sector consumed a significant amount of energy, reaching 67,052 terawatt hours, only 19,139 terawatt hours less than the energy consumption of the entire tertiary sector [10,11]. This observed increase in energy consumption can be partially explained by the

rebound effect, whereby improvements in energy efficiency led to increased consumption or increased use of appliances [12,13].

To achieve optimal energy savings, it is crucial to bring about a change in how people perceive, consume, and use energy, particularly concerning their household appliances. Interventions should address not only energy-saving behaviours but also the purchase phase, when users are about to make their decision. This was widely recognised by the European Commission, which implemented standardised energy labels to help consumers make energy-efficient decisions regarding the purchase of household appliances [14]. Recently, the energy label has been updated with the goal of conveying more standardised and comprehensive information about energy efficiency. However, despite the availability of this tool, consumers still struggle to interpret the information presented on energy labels, mainly due to the technical jargon used, which can be unfamiliar and complex for the average user [15–18].

In the context of promoting the sale of energy efficient appliances, the role of shop assistants is crucial, as they are often the primary experts that consumers encounter during the purchasing process, and they can help bridge the gap between technical energy-related information and consumer comprehension [15]. Still, the market for energy-efficient appliances continues to grow and shop assistants are faced with an increasing amount of information that they need to learn, stay up to date with, and convey to customers. This information overload poses a challenge for shop assistants, who may struggle to provide accurate and comprehensive guidance. In light of these assumptions, augmented reality (AR) emerges as a valuable technology to support shop assistants, enhancing their ability to effectively assist customers.

To date, very limited research has investigated the level of awareness and understanding of energy labels among shop assistants, as well as their ability to effectively promote energy-efficient household appliances [19]. Similarly, previous research did not explore shop assistants' attitudes toward AR technology employed as a support work tool. The present study addressed the research gaps outlined above. More specifically, our aim is to gather insights and perspectives by directly involving shop assistants with varying levels of experience, who work in household appliance stores of various sizes. Furthermore, despite the widespread adoption of augmented reality (AR) in the retail sector [20], the potential to leverage this technology to collect sustainability-related information, such as energy consumption, has been largely overlooked in previous research. We have employed a mixed-method approach that integrates the collection of qualitative and quantitative data. This involves conducting in-depth interviews to explore their experiences, knowledge, attitudes, and practices related to energy labels, in addition to administering questionnaires to assess their position on the implementation of AR in household appliance stores.

This research is exploratory in nature, as the limited literature on the field precludes the formulation of specific hypotheses. We sought to ascertain (1) the attitudes and knowledge of the shop assistants regarding energy-efficient household appliances, (2) the principal challenges they face, and (3) their views on the feasibility of employing augmented reality (AR) as a supportive tool in their work.

The article is structured as follows: in Section 2, we provide an overview of the current research on energy-efficient household appliances, with a particular focus on the introduction of the new energy label. We offer a description of the most common misconceptions consumers have regarding energy, followed by a discussion on the role shop assistants play in addressing consumers' needs, motivations, and preferences during the shopping phase. Section 3 describes the methods, procedures, and data collection employed in the study. Data analysis and results are presented in Section 4. Finally, in Section 5, we present the discussion, and in Section 6, we present the concluding remarks.

2. Related Work

The residential sector in Europe is a significant contributor to overall energy consumption, accounting for more than 25% of total energy usage. Within this sector, household

appliances play a fundamental role in energy consumption [8,21]. To address this growing trend, governments throughout the world promoted the adoption of effective sustainable energy practices, with particular emphasis on the use of highly energy-efficient household appliances [6]. These appliances are designed to optimise energy consumption, providing efficient services while minimising overall energy consumption to achieve optimal productivity [22]. In fact, the purchase phase of energy-efficient appliances is of significant importance in promoting energy-saving behaviours within households. However, while these appliances are specifically designed to optimise energy consumption, it is crucial to ensure that users understand their specific features and that they align with their needs and preferences [23]. Failure to consider this point may lead to unintended consequences, potentially resulting in increased energy consumption [24,25].

In the context of purchase decisions for energy-efficient household appliances, consumers can rely on two key resources: energy labels and shop assistants. Energy labels play a vital role as they are one of the primary tools that consumers can look at during the purchase phase [4,16]. It contains specific information regarding the energy consumption of the household appliance. These standardised data could be useful for comparing and making choices between the energy efficiency levels of various appliances. However, understanding the information reported on energy labels is a complex task that requires a careful deep analysis and comprehension, which can involve a significant cognitive effort from consumers [17]. This is exactly where shop assistants can play a crucial role: with their extensive knowledge and guidance on energy-related information, shop assistants can help consumers navigate the complexities of energy labels [19,26]. They can provide valuable insights and explanations that consumers often overlook or misunderstand, helping them make informed decisions based on their personal preferences [22].

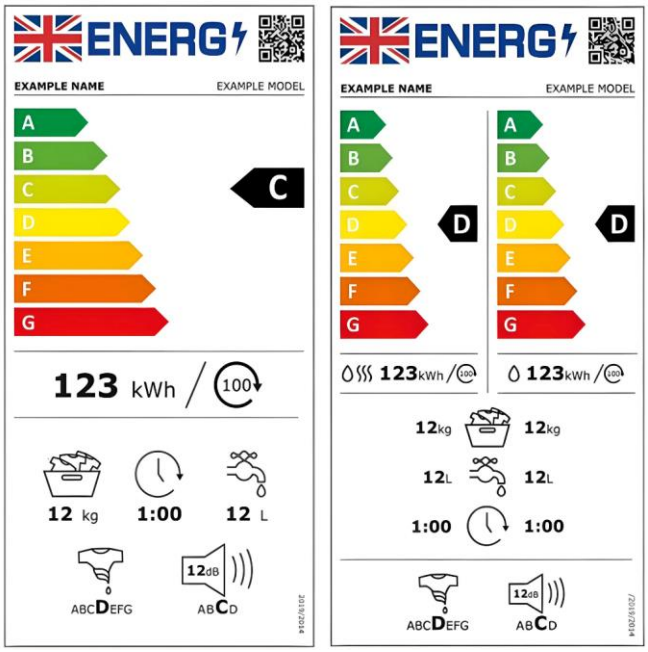
In the following section, we provide an overview of the new energy label, highlighting the improvements made in its design and layout, and exploring the existing body of research on consumers' knowledge and perceptions regarding this tool. Finally, we discuss the role of shop assistants in promoting energy-efficient household appliances, highlighting the potential of augmented reality (AR) as a tool to increase awareness of energy efficiency during the purchase phase.

2.1. The New Energy Label

Recognising the importance of energy labels in promoting energy efficiency and empowering consumers, the European Commission implemented a novel energy label for household appliances on 1 March 2021 [11] (Figure 1). The simplified design should improve clarity and ease of interpretation. Key information is strategically positioned at the top of the label, deploying a visual hierarchy to enable quick reference. The most notable change is the adoption of a new energy efficiency scale, ranging from A (most energy-efficient) to G (least efficient), replacing the obsolete A+++, A++, A+, A, B, C, D, and E classifications. Therefore, products previously labelled as A+++ have been reclassified as D or E, despite no discernible change in their energy consumption. This simple and standardised system should help consumers evaluate and compare the performance of appliances.

Beyond energy efficiency, the new label incorporates technical details. The label prominently displays the appliance's energy consumption in kilowatt hours (kWh). Energy efficiency standards are established based on precise metrics, such as energy consumption per 100 cycles (kWh/100) for washing machines or per year (kWh/year) for refrigerators. These metrics provide consumers with an approximate estimation of the device expected energy consumption. Supplementary icons at the bottom of the label highlight other crucial features, including water consumption, noise levels, and the size of the appliance. Another noteworthy improvement introduced by the new energy label is the inclusion of a QR code, which serves as a direct link to the European Product Registry for Energy Labelling (EPREL) database. Through this QR code, consumers gain access to comprehensive information about products that extends beyond what is displayed on the physical energy label. For

instance, while the energy label of a washing machine may provide information regarding energy consumption per 100 cycles in kilowatt hours (kWh), scanning the QR code uncovers additional specifications. Specifically, it reveals that these parameters consider various drum capacities (full, half-full, and quarter-full), with the consumption specifically calculated based on the Eco 40–60 cycle, as for other parameters, such as water consumption. The QR code also provides data on other aspects, including noise emissions, warranty details, spare parts availability, and product support. However, while this additional information undoubtedly accrues value for consumers, it also raises some concerns. Incorporating essential information, such as energy consumption and environmental impact, solely through a QR code, rather than presenting it explicitly on the physical label, can pose an additional challenge. Indeed, it is assumed that consumers are already aware that more detailed information is available through the QR code. Furthermore, it presumes that consumers are familiar with and comfortable using QR codes.



(**a**) (**b**)

Figure 1. Example of the new energy label for (**a**) washing machine and (**b**) washer–dryer. (**a**) The washing machine presents only the new label; (**b**) the washer–dryer presents a combination of two labels: on the right is the old label, and on the left is the new label.

Finally, this new energy label encompasses updated energy efficiency standards for various products, such as washing machines, dishwashers, refrigerators, televisions, lighting products, and room air conditioners, but not for others. In fact, on the market, the old energy label is also presented on some household appliances (e.g., ovens, dryers, and washer–dryers).

2.2. Consumers' Awareness of Energy Label

Different studies revealed that both the former and the current energy labels are inadequate to effectively capture consumers' attention toward electricity consumption. Eye-tracking data consistently reveal that consumers predominantly focus on the energy scale presented on the label, resulting in potential biases regarding the energy consumption of the appliances they intend to purchase [27,28]. These biases may arise from the fact that this kind of information, expressed in kilowatt hours (kWh/year), is more technical and difficult to interpret [17,22,28]. These studies are consistent with other research in the field of consumer behaviour and energy efficiency. Stadelmann [29] conducted a review highlighting the cognitive processes employed by consumers during the purchase phase

of household appliances. The author emphasises that users are required to analyse very specialised data and to navigate through the often-confusing information provided by the market on energy efficiency. Furthermore, the level of attention users devote to such information is also influenced by subjective factors, such as their level of literacy regarding energy-related information. Consequently, users may overlook or misinterpret energy consumption in certain cases, thereby potentially impacting their decision-making process and daily energy savings [26,30].

Addressing these issues is of utmost importance to make informed purchase decisions and also to promote energy-efficient practices in daily life [19,24,25].

2.3. Shops Assistants in Promoting Energy-Friendly Purchases

The literature consistently highlights the significance of the role played by shop assistants in enhancing consumers' shopping experience [31,32]. However, there is a notable lack of research investigating the role of shop assistants in promoting eco-friendly purchases. In terms of sustainability research, studies focused on shop assistants are relatively limited compared to the well-established research in marketing and consumer behaviour [22,33]. Furthermore, existing research primarily focuses on the fashion retail and organic food sectors [34,35]. Shop assistants play a crucial role in providing information, addressing inquiries, and making recommendations to customers, which can increase enthusiasm and the likelihood of making a purchase [36]. Their extensive knowledge about products and expertise in the field make them more reliable and helpful to customers, ultimately leading to higher levels of customer satisfaction and purchase intentions [37]. However, it is important to note that not all shop assistants possess the necessary knowledge or motivation to promote sustainable consumption. Consequently, there is a dearth of comprehensive research exploring the role of shop assistants and their training, particularly regarding energy efficiency [38]. Nevertheless, the importance for shop assistants to provide clear information to consumers is well known. Insufficient clarity or accessibility of information regarding sustainable products can result in negative perceptions of companies, retailers, or the products themselves [39]. In fact, when shop assistants lack knowledge about energy-efficient options, they inadvertently hinder the adoption of sustainable choices and may discourage consumers from making sustainable purchases [40,41]. Their inability to provide accurate information or to address customer queries effectively can lead to confusion and missed opportunities to promote energy-efficient alternatives. Furthermore, as highlighted above, the market for high-energy-efficient appliances is rapidly expanding, thereby posing challenges for shop assistants to keep up with the constant introduction of new models and advances in energy efficiency standards. These demands may pose a continuous cognitive effort from shop assistants, as they strive to stay up to date, comprehend, remember, and effectively convey to the end customer the key information that is crucial to their purchase process. To address these challenges and to enhance the role of shop assistants in promoting energy-efficient appliances, it is important to provide them with specialised tools and resources. Adopting new technologies, such as augmented reality (AR), can prove to be valuable in supporting shop assistants' efforts. These technologies can enable efficient management of the vast amount of product-related information that shop assistants need to recall while assisting customers. Additionally, utilising AR could enhance customers' understanding of the features and benefits of energy-efficient appliances, thereby fostering a greater appreciation for their potential energy savings.

2.4. Augmented Reality in the Retail Field

Augmented reality (AR) refers to a technological advancement that enriches the user's natural perception by overlaying virtual information onto the real world in real time [42]. AR technology has revolutionised the retail landscape, allowing customers to interact with products virtually [43] by simply pointing their smartphones or another device at them. This transformative approach effectively manages customer expectations and cultivates a sense of confidence in their purchasing decisions [14]. Consumers can explore interactive

and real-time information elements that enrich their understanding of product quality [44]. AR also simplifies the shopping experience by reducing the cognitive effort required to compare multiple products, a process that typically burdens memory and demands high attention, such as consulting external information sources (e.g., pamphlets or labels) [45–47]. In this sense, AR could contribute to a deeper understanding of the attributes and features of products, ultimately influencing their ability to make well-informed decisions [48,49]. The potential of AR is closely related to its ability to engage users, to improve decision-making processes, and to foster a more conscious and personalised approach to purchasing [43]. In general, researchers have highlighted that augmented reality has a significant influence on increasing customers' willingness to pay for a product [20,50,51].

To the best of the authors' knowledge, there is currently a gap in research regarding the acceptance of augmented reality (AR) technology among shop assistants in the retail field. However, given the characteristics mentioned above and its demonstrated benefits in other workplace settings [52], it has the potential to greatly assist these workers in their role to promote energy-efficient household appliances. AR has been proven to be effective in improving technical skills [53–55] and also offers the ability to facilitate knowledge management, which can mitigate knowledge loss [55]. Moreover, the implementation of AR can significantly improve technical training [56].

Although the application of AR in the context of sustainability and energy efficiency is relatively overlooked, its implementation holds great promise for both consumers and shop assistants in encouraging more energy-efficient choices.

3. The Present Study

This exploratory study took place in Italy, in the Umbria region, in January–February 2023.

3.1. Method and Materials

A mixed-method approach was employed, which involved the integration of both qualitative and quantitative data, to obtain a comprehensive understanding of the research problem. The adoption of mixed methods is consistent with established guidelines for the development of such studies [57]. By combining qualitative and quantitative data, researchers are able to triangulate insights from multiple sources and perspectives, leading to a more comprehensive and nuanced analysis [58]. Although mixed method approaches are increasingly utilised in various fields, they are still relatively underused in the realm of marketing research [59]. However, this methodology offers researchers the opportunity to develop a more comprehensive understanding of crucial marketing issues [60].

We conducted 22 semi-structured in-depth interviews with various Italian shop assistants who were specialised in household appliances. Interviews are widely recognised as one of the primary methods of collecting direct information from participants, particularly in organisational research [61]. To achieve a comprehensive range of perspectives, a target sample size of 9 to 17 interviews is generally considered optimal to obtain diverse insights and a comprehensive understanding of the topic under investigation [62]. Semi-structured interviews are a qualitative research technique that offers flexibility in the interview process. Before the interviews, the researcher prepared a set of open-ended questions which could be adjusted based on the interviewee's responses and areas of interest. This approach allowed for a comprehensive exploration of a wide range of topics in which participants were encouraged to provide detailed and personal perspectives, enabling the researcher to gain more nuanced insights.

Overall, the topics discussed during the interviews included (1) the training and tools provided by companies to shops assistants to promote energy-efficient appliances, with specific attention given to the new energy efficiency label; (2) their perceived and actual knowledge of the new energy efficiency label and their awareness regarding energy efficiency information; (3) main consumer attitudes, doubts, and uncertainties related to the adoption of energy-efficient household appliances; (4) the main issues that they have to

deal with during the purchase phase; (5) their insights and perspectives on AR effectiveness and relevance in enhancing awareness of energy efficiency during the purchase phase.

Shop assistants were also asked to complete an ad hoc questionnaire, which was meant to investigate their attitudes and concerns about the inclusion of this technology in their work, as well as the level of support provided by their respective companies in the adoption of new technologies. This questionnaire included 12 items, categorised into five dimensions: Personal Innovativeness in Information Technology (PIIT), Managerial Support (MSUP), Technology Anxiety (TA), Attitude towards Technology (ATT), and Perceived Complexity (PC). Participants responded using a 5-point Likert scale, with 1 indicating "strongly disagree" and 5 representing "strongly agree". The PIIT dimension (comprising three items) was adapted from the work of Elie-Dit-Cosaque and colleagues [63] and is conceptualised as an individual's personal propensity for innovation, characterised by their inclination to experiment with new information technologies [64]. MSUP, which consists of a single element, was also adapted [63], and is conceived as the support provided by upper and middle management to facilitate the effective implementation and adoption of information technology (IT). The TA construct, which features one item, was adapted from Spagnolli and colleagues [65] and defined as the sensation of anxiety experienced when using technology. Attitude towards Technology (ATT), which consists of five items, was also adapted [65] and pertains to an individual's overarching response to the employment of technology. Lastly, PC was made up of two elements, which refer to the extent to which a technology is perceived as relatively challenging to understand and use [66]. To ensure the clarity and relevance of the questionnaire, a small sample of experts first evaluated the questionnaire. Their feedback led to refinement of the questionnaire items and structure. The research team aimed to make the questionnaire short and concise to prevent fatigue in the respondents.

3.2. Recruitment

Before conducting this exploratory study, suitable stores were identified through a comprehensive web-based search. This research was carried out using relevant keywords such as "household appliance seller", "household appliance store", and "household appliance retail". These identified stores were contacted to assess their eligibility and willingness to participate in the research; the inclusion criterion was to sell household appliances. Upon contacting the stores (N = 26), it was found that eight of them were repair and maintenance services and were excluded from the final sample. Additionally, two stores expressed their reluctance to participate in the study. Ultimately, 16 of the stores met the inclusion criteria and agreed to involve their shop assistants, who specialised in the sale of household appliances, in the investigation. We adopted convenience sampling, recruiting participants who met specific inclusion criteria related to the shop of household appliances in the city. This recruitment method is frequently used in social sciences to ensure that participants have the necessary knowledge, experience, or characteristics relevant to the research topic [67].

3.3. Procedure

The University Ethics Committee approved the study. All participants received an informed consent form and voluntarily agreed to participate, demonstrating their understanding of the research objectives. The interviews were conducted face to face at each store and recorded audio to facilitate subsequent analysis. On average, the interviews lasted approximately 43 min. After the interviews, participants were introduced to the concept of augmented reality. The researcher provided all the shop assistants with the same description and information about AR. Once the participants indicated that they understood the technology, a mock-up was presented to them to further facilitate their understanding on how AR could be applied in the household appliances stores. This visual representation served as a probe, helping participants to envision how AR could be used in stores and to provide feedback or insights. Finally, they were asked to fill out a questionnaire, which was designed to gather their thoughts and opinions on the potential application of AR technology in their work environment.

3.4. Participants

A total of 22 shop assistants (10 female) participated in this study. The average age of the participants was 43.30 years (*SD* = 12.349). Their average years of educational attainment were 12.87 (*SD* = 2.616). Regarding work experience, on average, they worked 18.65 years (*SD* = 11.464) in the field of selling household appliances.

3.4.1. Characteristics of the Shop Involved

Seven shop assistants were from family-run stores (FSs). Such stores are small-scale enterprises, typically owned and operated by family members. They often foster close ties with the local community and its residents. Eight shop assistants were from hypermarkets (HMs). These are expansive retail hubs that amalgamate characteristics of supermarkets and department stores. They stock a diverse array of products, including household appliances. Finally, seven shop assistants represented electronic chain stores (CSs). As the name implies, these stores focus on retailing electronic goods and their related accessories.

4. Analysis and Results

Semi-structured interviews were recorded, transcribed, and evaluated following thematic analysis [68,69]. This allowed us to reveal participants' experiences and viewpoints and provided a rich and nuanced knowledge of the research subject. Open-coding identified categories and then grouped them into themes. Two independent judges, experts in workplace research and qualitative data analysis, were instructed to examine the transcripts and to look for emerging codes to be grouped into categories. The analysis resulted in six themes: (1) stores and their characteristics, (2) training practices for shop assistants, (3) shop assistants' actual knowledge of the energy labels, (4) consumers issues with the new energy label, (5) the fear of planned obsolescence, and finally (6) the introduction of AR in the stores.

Data collected using the questionnaires were analysed with IBM's SPSS (Version 25).

4.1. Interviews

Type of stores and their main characteristics: For a clearer analysis, we categorised our sample based on the specific retail establishments where the shop assistants were employed. This stratification was designed to pinpoint variations and insights stemming from the unique characteristics of each store type as described in Section 3.4.1.

Despite differences in the type of store, ensuring customer satisfaction, building trust, and cultivating long-term relationships between customers and shop assistants is a common goal reported by all respondents (CS = 7; HM = 3; FS = 7). This point was especially relevant in family-run stores, as they typically cater to senior customers who rely on one-on-one interaction with shop assistants. This allows a sense of familiarity and trust to develop over time, which can be viewed as a competitive advantage over larger chain stores that may lack personalised customer interactions. On the other hand, large chain stores (n = 7) and hypermarkets (n = 3) attract more adults and young adults, and as suggested by three HM shop assistants, customers often arrive already informed by the flyers about what they would like to buy and to save time. Due to this, they make quick decisions and may not engage in lengthy discussions, making it difficult to provide detailed explanations and information during the purchase process. Furthermore, shop assistants in CSs (7) and HMs (4) may find it challenging to provide extensive guidance to each customer, even though their attention can be divided between multiple tasks, for example, consumer inquiries, online purchases, household appliance returns, reordering, and other similar issues that require their immediate attention. The informants reported that price is the most important factor for all customers (N = 22), and many of them, especially the youngest, visit physical stores but make purchases online due to lower prices. However, the participants noticed that when purchasing online, consumers may lack the information necessary to become aware of energy consumption, leading to improper use and later disposal of appliances (CS = 3; FS = 4; HM = 1). In general, stores that also feature an online

shop reported frequent returns of appliances bought online because they do not align with actual customer needs (CS = 5, HM = 2). This process of buying and returning to the store contributes to the environmental impact due to multiple instances of transportation. In this regard, all shop assistants emphasise the importance of their expertise in guiding customers towards products that can effectively meet their needs.

Energy efficiency training practices: The main focus of this theme was to investigate the characteristics of the training programmes (e.g., frequency) provided to shop assistants to keep them updated on the energy efficiency of household appliances. Indeed, it is noteworthy that shop assistants were often encouraged to promote and sell the newest models of appliances, which not only possess greater energy efficiency but also come with higher price tags, reflecting commercial priorities. However, not all stores offered regular training programmes focused specifically on the energy efficiency of household appliances. Among small retailers (n = 7) and hypermarkets (n = 8), updates were generally limited to significant technological advancements, such as the introduction of new appliances with completely new features. This kind of information was sent by email once or twice a year. On the other hand, shop assistants employed in larger electronic chains reported a greater dedication to their training (n = 7). These stores would regularly invite shop assistants to structured training courses every 2–3 months. The aim was to understand the key features and benefits of the appliances they promoted, enabling them to communicate this information effectively to customers. However, it should be noted that, in general, none of the shop assistants (N = 22) received detailed information on the energy performance of household appliances, regardless of the variation in the level of training provided. They were only trained to report if it is more, or less, energy-efficient than other models on the market.

We specifically enquired about the new energy label to understand if and how they were trained about it. The new label was introduced into the retail market during the COVID-19 pandemic, particularly at the beginning of the so-called third wave. This period was characterised by a significant increase in COVID-19 cases, largely attributed to the spread of virus variants. To contain the spread of the virus, the Italian government implemented stricter measures to maintain social distancing, and due to this, all respondents received energy label information only via email. When asked whether they found such information appropriate and complete, some of the respondents (CS = 7; FS = 3; HM = 2) stated that the reorganised energy classes were straightforward and easy to understand for them. However, a few participants (HM = 2; CS = 1) mentioned that initially they found the information on the new energy labels to be somewhat unclear, but none of them searched for additional information.

Actual knowledge of energy efficiency: In an effort to explore the actual knowledge of shop assistants about the new energy label, we asked them to explain the label of a washing machine to the researcher. The choice of a washing machine was deliberate, given its prevalence as a commonly sold household appliance in Italy and since its energy label contains a wealth of information. Regarding the QR code, none of the shop assistants had attempted to scan it before, so they were uncertain about its specific purpose. When it came to explaining the energy efficiency class, all shop assistants were able to do so effortlessly. Furthermore, they accurately conveyed the relationship between the current energy classes and those depicted on the previous energy label. In terms of the kWh parameter, only a few shop assistants (CS = 5; HM = 1) provided a clear and detailed explanation of the energy consumption of the washing machine. They accurately reported that that piece of information was based on an average of 100 cycles, specifically referencing the Eco programme being set at 60°. In terms of the technical parameters presented at the bottom of the energy labels, all respondents were able to describe them easily. However, even in this case, only three shop assistants (from CSs) explained that these parameters were also based on the average of 100 cycles (Eco programme 60°). When we asked them whether consumers generally enquired about the meaning of the Eco programmes, on which these eco-labels are based, they replied negatively; instead, the consumers expressed a preference

for quick wash cycles because they believe that they are energy-saving. Furthermore, shop assistants (CS = 7; FS = 3; HM = 2) reported facing challenges in explaining to consumers how the Eco cycle works in an energy-efficient way compared to quick washing.

Consumers' main issues towards the energy label: This topic pertains to the issues that, according to our respondents, consumers have in understanding the new energy label and their awareness of its relevance for making informed purchasing decisions. To clarify the differences between old and new energy labels for consumers, all participants (N = 22) promptly displayed the brochures they use with customers. Generally speaking, the respondents admitted that customers have limited knowledge of the new appliance labelling systems, but they rely on them to understand the energy efficiency of products and to estimate future energy costs. In addition, they stressed that they had the impression that the introduction of the new energy label in the European Union has increased the time customers spend examining information on energy efficiency and comparing products (CS = 4; FS = 4; HM = 3). Twenty-two months after the introduction of the new regulation, all respondents reported that customers seemed confused due to (1) misconceptions regarding the energy label, (2) struggles with understanding some technical features such as the kWh parameter, and (3) a lack of uniformity in labelling among different household appliances.

(1) Misconceptions regarding the energy label

Shop assistants (HM = 3; CS = 7; FS = 3) have observed a bias among customers towards the highest energy efficiency classes when considering household appliances. Consumers are used to associating the highest energy efficiency with the A+ or higher ratings, as presented in the previous energy label system. Therefore, customers may mistakenly view new energy classes, such as B or C, as less efficient, while these new classes still indicate reduced energy consumption. Another misconception related to energy classes (HM = 2; CS = 4) is the willingness of some customers to purchase the highest-rated product available, even if it does not fully align with their specific needs. For example, they may choose an excessively large model classified as an "A" but end up under utilising its capacity, thereby reducing its actual efficiency.

(2) Struggles with understanding the information about kWh

Global events, such as the increase in energy prices, have had a profound impact on the market, and as a consequence, shop assistants have observed increasingly more attention paid to energy consumption in the decision-making process (HM = 4; CS = 5; FS = 3). Customers try to calculate future cost savings but do not always seem to be able to interpret kWh-related information correctly (N = 22). In addition, things have become more complex due to the lack of a standardised indicator of household electricity consumption (CS = 4; FS = 7). As a result, understanding the energy efficiency standard has become a mental effort for both customers and shop assistants, as they strive to help customers comprehend and compare energy consumption effectively (CS = 5).

(3) A lack of uniformity in labelling

During the purchasing phase, customers struggled with inconsistent energy labelling practices in various types of household appliances, as reported by CSs (7) and FSs (3). The adoption of the new energy label has not been uniformly implemented in all household appliances. In some cases, appliances that still display the old label are placed alongside those with the new label, leading to increased confusion among customers. A notable example of this inconsistency is seen in washer–dryers, where a single appliance may have two completely different energy labels, one for the washing machine and another for the dryer, as reported by three CS participants.

Fear of planned obsolescence: This topic reports the concern or apprehension that consumers may have regarding the manufacturing of new household appliances. During the past year, shop assistants observed an increase in interest in household appliances due to technological advancements (CS = 5; HM = 3; FS = 4). However, customers often opt for inexpensive appliances that lack key features, are inefficient in energy, and are prone

to failures. According to shop assistants (CS = 5; HM = 7; FS = 3), it is also common for individuals to buy new appliances instead of having the old ones repaired, as the repair would cost more. This further confirms that customers have the impression of household appliances being short-lived. Shop assistants (CS = 5; HM = 7; FS = 3) encouraged customers to understand that the cheapest option often consumes more energy and is not the most cost-effective option in the long run. In this context, most of the respondents identified improper use and care as a significant cause of damage to household appliances (CS = 6; FS = 7). They stressed the importance of routine maintenance and offered advice to customers on proper appliance care. Neglecting maintenance tasks, such as cleaning filters or fixing broken seals, can strain appliances, increase energy usage, and lead to more frequent breakdowns. Despite this, due to the time constraints faced by the shop assistants in CSs (7) and HMs (4), they reported that they may not always be able to provide detailed information on all aspects of appliance use and maintenance. However, these misconceptions and misuses can contribute to waste and undermine the potential benefits of energy-efficient technology.

AR Mock-Up

During the final phase of our study, the researcher provided the shop assistants with a brief explanation of augmented reality (AR) and displayed a non-interactive mock-up. This mock-up illustrated the potential implementation of AR technology in household appliance stores, as shown in Figure 2. The first objective of the AR mock-up was to improve consumers' awareness of energy efficiency by providing information that would be tailored to their individual consumption patterns. Furthermore, the AR tool would offer accurate comparisons with other appliances in the same category, helping consumers make well-informed decisions. The explanation that they were offered was that this technology could be used by both the consumers and them.

(**a**) (**b**)

Figure 2. Static AR mock-up. (**a**) The users scan the QR code to have real-time energy information based on their habit consumption; (**b**) comparison of energy consumption between two household appliances. Also, a suggestion on what household appliance could be more suitable for consumers, considering their average energy consumption.

AR in household appliance stores: All respondents acknowledged the potential benefits of implementing augmented reality (AR) technology in household appliance stores. In light of the importance of understanding potential cost savings for consumers, some shop assistants proposed that the AR could include information about the energy cost, potentially expressed in monetary terms and calculated based on average electricity prices, or customised to the consumer's bills (HM = 2; CS = 7; FS = 5). All shop assistants saw this tool as a useful for integrating their knowledge, as they emphasised that even if these AR devices were available to consumers, their expertise in the field would still be essential, as they could provide personalised and tailored suggestions. Furthermore, respondents

(CS = 7; HM = 4) expected that the use of AR technology would encourage consumers to pay more attention to the energy consumption of the household appliances they are interested in. The same respondents also expressed that they did not see this technology as a threat to their work but rather as a tool that could alleviate the laborious and potentially error-prone task of calculating energy costs. They have shown enthusiasm for including AR because they believed that it could be a valuable support not only for customers but also for themselves, allowing them to access accurate and up-to-date information to quickly answer customer questions and to provide improved service. Despite this, not all shop assistants believed it would be acceptable in their own stores due to the consumer's preferences, especially the respondents of the FSs. Four of them were doubtful due to the cost of this technology. All respondents who worked in FSs did not consider this technology suitable for them because their customer base was predominantly made by older adults, who may not be inclined to use such technology. In addition, they reported that due to the one-to-one interaction that characterises their shopping experience, their role is crucial and they do not see this technology as useful in their store. As a result, they suggested that AR implementation would be more suitable for larger chain stores or other types of stores. Some hypermarket shop assistants (n = 2) expressed reservations, thinking that their customers primarily seek price convenience and are not likely to have much time to spend in the store, making them less prone to compromise, even by using AR.

4.2. Questionnaire

After performing a Shapiro–Wilk test to assess the normality of the data (all the *p* values were >0.01), a Wilcoxon one-sample test was performed, applying Bonferroni correction, to investigate the attitudes of the respondents about the implementation of AR in their retail sector. In particular, we compared the scores that the participants assigned to each dimension of the questionnaire with the median value of the scale (*Mdn* = 3), indicating a neutral attitude, as reported in Table 1.

Table 1. Values of one-sample Wilcoxon tests comparing score with median (*Mdn* = 3); means, standard deviations, and medians.

Dimension	V	p (BH)	M	*SD*	*Mdn*
PIIT	238	<0.01	4.11	0.9	4.33
TA *	166	<0.01	3.74	1.45	4
ATT	197	<0.01	3.43	0.58	3.6
PC *	155	<0.01	4.5	1.04	4.5
MSUP	92	0.89	3.22	1.44	3

* Reversed item.

The results of the statistical analysis particularly evidenced shop assistants' willingness to experiment with new technologies, showcasing their propensity for innovation. This is further underpinned by a low level of Technology Anxiety, suggesting that respondents are comfortable with the adoption of augmented reality (AR) technology in household appliance stores. They display a positive attitude towards the use of AR in this context and do not perceive it as overly complex, which bodes well for its integration in the retail environment. However, the analysis indicates moderate Managerial Support for new technologies, highlighting a potential area for improvement to fully capitalise on the benefits of AR in enhancing the retail experience.

These findings shed light on the multifaceted nature of individuals' perceptions and attitudes toward AR technology, highlighting both their innovative inclination and the anxieties and complexities associated with its use in household appliances stores.

5. Discussion

In recent times, consumers have shown an escalating interest in energy-efficient household appliances, influenced by technological advancements, changing lifestyles,

and global events like the Ukrainian War and the COVID-19 pandemic that impacted energy prices [1,3,4,70]. Consistently, a 2022 survey found that 70% of Italian respondents expressed intentions to reduce energy use and to invest in energy-efficient appliances [71].

On a global level, the shift towards such appliances yields multiple advantages: reduced energy costs, lowered household expenses, and alignment with sustainable development goals [72]. Many governments worldwide, recognising these benefits, have implemented economic incentives to promote the purchase of energy-efficient household appliances. The aim was to mitigate the impact of energy consumption, providing sustainable alternatives to citizens [2,5]. Additionally, the European Commission in 2021 introduced a new energy label with the aim of improving consumer awareness and understanding of energy-related information [14]. Despite the fact that these initiatives are crucial, it is vital to recognise that they often overlook the importance of considering social and psychological aspects in a more comprehensive and contextual manner [5,73]. In fact, these are traditional top-down approaches that focus on cost–benefit analyses and normative perspectives, barely considering social norms, values, and practices that actually shape consumer behaviours and decisions [6,23,74]. Taking a human-centric approach in the development of such interventions and strategies could help promote the effective purchase of high-energy-efficient household appliances and reduce energy consumption [5,73,74]. Experts, such as shop assistants in the field of household appliances, have a wealth of knowledge and expertise in effectively communicating and engaging the consumer [31,32,36]. They interact directly with customers on a regular basis and have a deep understanding of their preferences and needs [19]. In addition, they are aware of the potential problems that customers may face when considering the diverse energy-efficient options, but research in the field of energy has overlooked the importance of their role so far [33,34].

To enlighten the pivotal role played by shop assistants in promoting high-energy-efficiency information, we conducted 22 interviews in different household appliance stores. Our research focused on understanding the factors and the barriers that shop assistants encounter when promoting high-energy-efficient household appliances. We explored the needs and assessed the attitudes of shop assistants towards energy information and their actual knowledge of the new energy label, providing valuable information on the dynamics of these stores and their customers. We also found that different types of stores, including family-run stores, hypermarkets, and electronic chain stores, operate within distinct contexts, each with its own set of opportunities and challenges. However, their common objectives are to achieve customer satisfaction, build trust, and cultivate long-term relationships with customers. As the marketing literature shows, this goal is commonly pursued by providing customers with a tailored purchase experience [75], which, moreover, attempts to maximise the benefits of high-energy household appliances. Without shop-assistants personalised advice, which considers consumer needs, habits, and lifestyles, the chances of making informed purchases in-stores would be missed [76]. An example of this was highlighted when discussing the experience of online shopping. In fact, as shop assistants report, the absence of personalised guidance is likely to result in suboptimal choices that may not fully capitalise on the potential energy savings and environmental benefits of energy-efficient appliances.

Respondents also highlighted the challenges they typically face. They clearly revealed that the new energy label, introduced with the intention of providing clarity, may not have achieved its intended purpose [24]. In line with the findings regarding the former energy label, consumers still struggle to interpret and understand the information presented on both the new and the old energy labels, leading to misconceptions regarding the energy efficiency of household appliances [29]. It is essential for shop assistants to address these misconceptions and to guide customers towards appropriate choices. However, it emerged that information related to energy consumption displayed on the label can be dense in concepts that are complex to process not only for consumers but also for shop assistants. Shop assistants themselves lack detailed information on energy efficiency, which hinders

their ability to provide accurate guidance. In fact, the availability of comprehensive training programmes addressed to shop assistants to update their knowledge of the new energy label and, in particular, on energy efficiency, is generally scarce. Moreover, they have to retain an increasing amount of information due to the continuous innovation of appliances. This poses a significant challenge, as shop assistants need to stay up to date with the latest features, energy efficiency ratings, and other relevant information to provide accurate information to customers. It should be noted that when shop assistants lack adequate knowledge about energy-efficient options, they unintentionally hinder the adoption of sustainable choices, potentially discouraging consumers from making environmentally friendly purchases [40,41].

Indeed, the recognition of shop assistants' expertise and their essential role in promoting high-energy-efficiency household appliances is a crucial element in achieving sustainability goals. These professionals, through their direct contact with consumers and their practical knowledge of the products, are exceptionally well placed to influence consumer choices and to promote virtuous behaviours. Their interactions with customers are opportunities to inspire more environmentally conscious decisions. While their value cannot be overstated, their expertise has to be complemented with the necessary resources, such as augmented reality. AR technology can transform the abstract concepts of energy efficiency into tangible, understandable experiences, making the benefits of such appliances more relatable and convincing to the average consumer. In this context, the implementation of augmented reality (AR) technology in household appliance stores can have distinct applications for both customers and shop assistants.

On the customer side, AR has the potential to be an effective tool in engaging customers and fostering a more conscious and personalised approach to purchasing [43]. This can lead to more aware and informed purchasing decisions, as customers could be better able to understand how a product would fit into their lives.

On the shop assistants' side, AR can be a valuable tool in supporting and enhancing their work. Indeed, there is a growing body of literature indicating that AR is successfully used in various professional contexts to support work tasks and the development of new skills, e.g., in manufacturing [76,77]. For example, AR can aid in inventory management, provide real-time information about products, assist in visualising appliance features and functionalities, and offer training and troubleshooting guides. This use of AR can lead to more efficient and informed customer service [45–47].

Respondents welcomed this hypothesis with enthusiasm, reporting that AR could provide standardised and precise energy-related information to customers, as well as more digestible information, such as potential cost savings. AR technology was perceived as a powerful tool to improve consumer awareness of energy efficiency by providing tailored information based on individual consumption patterns and facilitating informed decision making through accurate comparisons between appliances in the same category [45,48]. In addition, AR can relieve the burden on shop assistants by removing them from the task of remembering complex energy-related information [48]. In this way, they can have more time to focus on the interactions with customers, such as offering guidance on better management of household appliances. Although all shop assistants expressed enthusiasm for the implementation of AR in household appliance stores and a high level of acceptance toward this technology, it is important to recognise that the final adoption of AR may vary between different types of stores and customer demographics. Specifically, shop assistants who run family stores or work in hypermarkets raised concerns about the preferences of their predominantly elderly customer base. Therefore, when implementing AR in household appliance stores, careful consideration should be given to the specific context and target audience. It is crucial to understand the characteristics and needs of the customer base in order to tailor the AR experience accordingly.

Coherently studying the factors that influence consumer purchasing decisions is crucial for promoting energy-efficient household appliances. This includes understanding consumer motivations, their awareness of energy efficiency, the impact of marketing

strategies, and their effectiveness in developing strategies that align with both consumer preferences and environmental goals as explored in previous studies [78–80].

Contribution to the Energy Efficiency Saving Field

This study delves into the promotion of energy-saving technologies, specifically household appliances, among Italian consumers, focusing on the critical role of sales assistants. It uncovers a significant gap in previous research in the field that rarely considered the role of sales assistants in promoting energy-saving practices [22,33].

It proposes that recognising the benefits of training shop assistants in promoting energy-saving behaviour regarding household appliances is crucial in shaping consumer attitudes. This study examines the new energy label literacy of shop assistants, revealing that they often lack adequate training and knowledge about energy-efficient technology and EU standards. Moreover, it broadens the scope of this field by providing new empirical insights on the factors that influence consumers' purchase intentions for energy-efficient household appliances.

Concurrently, the research evaluates the potential of augmented reality (AR) technology as a tool to fill this gap and to support sales assistants and consumers to reach Sustainable Development Goal 7. Augmented reality (AR) is increasingly recognised as a critical technological innovation, influencing a multitude of sectors. The versatility is evident in its ability to improve work quality for various types of workers across numerous industries. AR-based assistance systems are gaining attention in companies, with the main goals being to minimise errors, to optimise speed, and to improve efficiency and quality [81–84]. In the construction industry, AR can be used for predictive maintenance, facility management, and future refurbishment. This optimisation leads to a decrease in unnecessary energy consumption and simultaneously boosts productivity levels. Such advances indicate that AR is not just a tool for technological enhancement but also a tool to promote more sustainable and energy-efficient practices [83]. AR can aid in inventory management, provide real-time information about products, assist in visualising appliance features and functionalities, and offer training and troubleshooting guides. Furthermore, AR can be used to increase consumers' energy literacy and awareness, as shown by studies conducted with children and their families; to improve energy-saving behaviours; and to promote sustainable consumption [85,86].

The transition of the application of AR and this benefit into the sale phase of household appliances could further amplify these good energy practices overall for society. In retail settings, AR could reduce carbon footprints, enrich the consumer experience [87,88], and improve energy efficiency. Moreover, the adoption of AR tools in the retail field could help shop assistants vividly demonstrate how energy-efficient appliances operate and their long-term advantages, such as cost savings and reduced environmental impacts. This interactive approach surpasses traditional sales techniques, helping customers make well-informed decisions.

The recommendation for governments, stakeholders, and manufacturers to invest in both the training of shop assistants and the implementation of AR technology in household appliance stores represents an innovative strategy to promote a greener, more energy-efficient, world. Companies that focus on technological innovation in energy-saving products can gain more market share while improving customer satisfaction [44]. Therefore, the promotion of energy-efficient appliances not only serves the immediate financial interests of consumers but also contributes to the broader sustainability goals and the growth of the energy-efficient product market.

The integration of consumer engagement, knowledgeable shop assistants, and supportive technology such as AR creates a more informed and active community focused on energy efficiency. Shop assistants play a vital role in direct consumer interactions, offering essential guidance and promoting sustainable behaviours. Meanwhile, AR technology serves to effectively clarify misconceptions about energy labels, potentially disrupting

the cycle of energy waste that impacts both consumer expenses and broader sustainability goals.

6. Conclusions

This research enhances our understanding of the dynamics in purchasing energy-efficient household appliances, highlighting the crucial roles of both micro-level actors (consumers and shop assistants) and macro-level policies. As the market increasingly gravitates towards appliances with higher energy efficiency, the role of shop assistants in guiding these purchases becomes more pivotal. Effective marketing strategies recognise the importance of clearly conveying product features to consumers.

This involves shop assistants possessing not only thorough knowledge of the product's unique features and benefits but also an ability to effectively communicate this information. When consumers are actively engaged and well informed about the benefits and functionalities of high-energy-efficient appliances during the purchase process, they are more likely to opt for these over less efficient alternatives. Such informed purchases not only contribute to energy conservation and sustainability goals but also extend to consumers' daily appliance use, fostering more energy-efficient practices. These practices could include using appliances at optimal times, maintaining them properly for efficiency, and being mindful of unnecessary usage. Ultimately, these behaviours could lead to reduced energy bills for consumers, a decrease in overall energy demand, and a contribution to environmental sustainability through lowered carbon emissions from energy production.

Limitations and Future Research

This exploratory study is grounded in specific contexts, perspectives, and experiences. Future research should expand to different regions and cultures, with a particular emphasis on metropolitan cities, where unique energy challenges and diverse consumer needs and preferences present distinct scenarios for shop assistants to navigate. This broader scope could provide more comprehensive insights into the global applicability of these strategies.

This study, while focusing on the shop assistants' role in the promotion of energy efficient household appliances, paves the way for future research in the field. Future studies could explore whether consumers' intentions to purchase energy-efficient appliances, possibly influenced by assistants, translate into actual behaviour. Such an analysis could provide deeper insights into the transformation of consumers' intentions into actions after shop assistants' advice. An observation in the field during a real purchase phase should be made to deeply capture the nuances of these interactions. These data can inform the development of more effective sales and marketing strategies, ensuring communication is tailored to meet diverse needs and preferences while promoting good energy practices.

Moreover, in an effort to boost the promotion of energy-efficient appliances, it is essential to understand how to implement comprehensive training programmes for shop assistants. Identifying the most effective training to enhance their expertise in energy efficiency, including their knowledge of energy labels, seems critical to inform customers about how these appliances align with EU standards and to contribute to wider sustainability goals.

Finally, the advancement of augmented reality (AR) to enhance energy awareness necessitates practical, real-world evaluations. These assessments are crucial in uncovering the real-life challenges and opportunities that accompany the application of AR technology. Future studies are encouraged to explore AR tools, evaluating their effectiveness in deepening shop assistants' and customers' understanding of energy efficiency and in meeting EU standards and sustainability objectives, thereby contributing to wider energy conservation efforts.

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