Beyond convenience, toward technology: a qualitative study on consumer behavior emerging trends in vending machines

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Abstract

This study investigates the evolving consumer behavior within the vending machine industry, emphasizing the role of emerging technologies and gamification in shaping customer experiences. Through qualitative analysis of 20 in-depth interviews with vending machine users aged 20-50, key themes were identified: consumer habits and purchasing experiences, the integration of advanced technologies, and gamification strategies. Findings suggest a shift from traditional, impulse-driven purchases to more immersive and planned interactions facilitated by personalization, fresh and locally sourced products, and innovative technologies such as augmented reality. Gamification emerged as a promising avenue for fostering consumer engagement and loyalty, particularly through point-collection systems and sustainable choices. This research highlights the potential for vending machines to transition into dynamic retail spaces that align with modern consumer expectations, offering actionable insights for managers aiming to innovate in this sector.

Keywords: *vending machines, consumer behavior, gamification, technology integration, retail innovation*

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Introduction

A vending machine (VM) is a customer service machine that operates without human intervention. It provides different consumer products, from food to jewelry, after the vendee inserts currency or credit into the machine using extremely simple steps (Pradeepa et al., 2013). The first example of a kind of vending machine may be retrievable in 215 BC at a temple in Egypt. This machine could dispense holy water in exchange for coins (Higuchi, 2007). As the technological revolution proceeded, the VM became smart, which means machines able to connect to the internet, implemented with a touchscreen, able to send voice messages and show video and written messages. Customers can also buy products using their digital payment wallet with the help of a mobile application (Alam et al., 2021). The rising demand for drinks, food, and on-the-go snacks due to the changing lifestyle of urban populations is a key factor in the growth of the vending machines (VMs) market, all around the world. The smart VM market in the U.S. is estimated at US $2.1 billion in the year 2020. Furthermore, China, the world's second-largest economy, is forecast to reach a projected market size of US$2.7 billion by 2027 (Research and Markets, 2022). Europe counts 4.45 million VMs and Italy is the leading market with 826,000 machines installed (Sgambato, 2023). In addition, In Italy, 2021 has been a turning year for the vending industry. The revenue of the vending market was €1.435 Billion with a growth of +12,11%. The value of consumption has increased with a growth rate of 10.47% and the number of VMs is now about 2% more compared to 2020. Italians generate a turnover of 3 billion euros with an amount of consumption per year of 11 billion including coffee and hot drinks (Confida, 2022). The present research aims to contribute to filling this gap by conducting 20 in-depth interviews with Italian VM users. Results show different aspects that affect consumers' decision processes in the new technological environment.

1. Theoretical Framework

Although historically speaking, the evolution of vending channels started in ancient times with the first coin-operated dispenser of holy water (Segrave, 2015), it is only recently that vending channels have started to regain popularity in the business landscape as retail providers of customer convenience (Bolton, 2019). Moreover, innovations in the VM sector are spreading a lot in Italy (Ganz, 2023; Bertoletti, 2019). Then, the new generation of vending machines, when implemented with artificial intelligence (AI) and machine learning software, offer functionality such as face and voice recognition. By adding these features to the machines, it is possible to get information in real-time about consumer behavior, and preferences, improving the customer experience (Allegrino, et al., 2019; Stoyanov, 2021). Furthermore, looking at previous literature on VMs, we found that most studies explored the factors encouraging consumers to make healthier choices (Whatnall et al., 2020; Hua & Ickovics, 2016) and the efficacy of nutritional interventions in eliciting behavior change (Grech & Allman-Farinelli, 2015; Matthews & Horacek, 2015). However, recent reviews highlight the need for a deeper understanding of many aspects concerning consumer behavior in the vending sector (Stoyanov, 2021). The present research aims at exploring the demand side. Specifically, to investigate how VM users' experiences have been considered after introducing new technologies and implementing digital systems. Hence, we defined the following RQ: How have new technologies changed the customer journeys of VM users and how can VM users' experience be improved in the new digital context?

2. Methodology

This study used a qualitative method to understand vending users' behavior, expectations, and experiences. Data were collected through semi-structured in-depth interviews by developing an extensive interview guide based on a literature review. Although it provided

some structure for the interviews, participants could share other issues and ideas that were not included in the interview questions (Gioia, 2021). The interviews were conducted with open-ended questions regarding overall experience. After discussing their experiences, and what they liked and disliked, we asked for information about the pros/cons of using VM and prompted them to share their thoughts about implementing technologies in vending and what they would do to improve their experience. Examples of the themes and questions addressed are presented below (Table 1).

Themes	Questions
Purchase Habits	How often do you buy products from vending machines?
	"What are the places where you buy most frequently? Have you ever purchased from vending machines in the city?"
	When do you usually purchase?
	When do you choose to buy from vending machines?
	What do you usually buy?
	Have you ever bought products that you could only find in vending machines?
	Can you tell me about one of your purchase experiences?
Decision-Making	"When buying from vending machines, do you usually decide on the spot, or have you ever gone directly to a vending machine already knowing what to purchase?"
	Are there any factors that influence your choice?
	"If some products were marked with a banner like 'on sale,' 'product of the month,' or 'consumer-recommended,' similar to supermarkets, what impact would that have on your choice?"
	If the nutritional values, like calories and sugar content, were displayed?
Facilitators	"Are there elements that make you choose or prefer vending machines? Do you think the purchase experience is intuitive?"
Barriers	"Even if you purchase, are there factors that 'limit' your use or reduce its frequency? e.g., product assortment, cost, vending machine location... (should examples be clarified or reduced?)"
	What could be done to improve the purchase experience?
Product Perception	Do you think the product assortment inside vending machines has changed?
	Are there products you perceive as healthier? Could you give me an example?
	Are there any products you'd like to be able to purchase from vending machines? (food)
OOS (Out of Stock)	Have you ever found that a product you were looking for was unavailable?
	What did you do?
Smart Vending Machin	"Smart vending machines are machines with touch screens that can send messages (both promotional and advertising...). Have you ever used them?"
	If you've never used them, do you think they could be an alternative? Do you prefer traditional ones?
Technologies	Do you use vending machine apps? e.g., for electronic payments, promotions, etc.
	"Smart vending machines can send messages when you're in front of them. What do you think about the idea of receiving promotional messages? What if they varied based on recognizing your mood?"
	How do you think technologies could change vending machines?
Mobile App	What if messages were sent to promote products?
	What if they reminded you to maintain a healthy lifestyle?
Sustainability	What do you think about sustainable packaging in vending machines? Would you notice or would it influence your choices?
	How important is packaging for you when choosing a product in a vending machine?
	Are you interested in finding organic products in vending machines? Why or why not?
	How much more would you be willing to pay for an organic product in a vending machine?
	Have you ever purchased a fair-trade product from a vending machine? If yes, what motivated you?
	How would a greater availability of fair-trade products in vending machines influence your purchasing habits?
Gamification	Could a promotion motivate you to try a new or different product than usual?
	Would you like to participate in interactive games at vending machines to win points or prizes? Why?
	Would points earned from games encourage you to use vending machines more often?
	What product combinations would you like to see for a combo purchase offer?
	Would you like to receive promotions or "gifts" for your purchases?
	What kind of incentive would you like to receive?

Table 1 Procedure Summary

The sample was collected through a snowball approach. It consisted of twenty VM users, aged between 20 and 50. All the participants willingly gave their written consent for the interview. The inclusion criteria were using VM at least once per week, both for eating and drinking. Interviews were taken online through video calls and took an average of 45 min. Each interview has been recorded and transcribed. The analysis of verbatim transcripts involved three coding phases based on Gioia et al. (2013). In each phase, the authors closely collaborated to align and discuss coding structures, aiming to agree on code definitions before moving ahead (Gioia, 2021).

The open coding process began with a line-by-line analysis of transcripts to identify 53 first-order codes reflecting VM characteristics (e.g., "actual assortment," "desired assortment")

and consumer attitudes (e.g., “decision process,” “need of looking at the products”). In the second step, we grouped the first-order codes according to prior research about the attitude towards food choice and food consumption (Silva et al., 2023) and new technologies (Akdim et al., 2022). We identified also, innovation in the retail sector, such as artificial intelligence in retail, gamification, and digital payment (Guha et al., 2021). This process led to the identification of 12 codes (e.g. “actual assortment”, “desired assortment”, “possible integration in the VMs”, “payments methods” and “sustainable actions in VMs”). The third step (generating propositions) involved the aggregation of the second-order themes. In this step, we compared consumer narratives with literature about personal attitudes toward food choice, and experience with technologies. This process led to the aggregation of the second-order codes into three final codes.

3. **Findings**

Different consumer habits, expectations, and possible improvements in the vending sector emerged. The insights derived from the interviews were grouped under three main themes: (1) consumer habits and purchase experiences, (2) technologies, and (3) gamification.

3.1. ***Consumer’s habits and purchase experiences***

VMs are mostly used in workplaces, universities, and hospitals (Whatnall, Patterson, and Hutchesson, 2020). However, consumers use also VMs outdoors, for example when are missing something at home (i.e. pasta, canned tuna, coffee):

> “*If I was missing coffee at home, I would go there (to VM) to get it and if it wasn't there... or I would look somewhere else for something open to buy it*” (Alessandro, 38)

Moreover, going to VM is something more than grabbing a snack, it is also a meeting point:

> “*When I go to the VM, I can meet with another person to discuss what to get and share my day. In the end, it's a bit of an archetypal kind of situation, a "camera cafe*[3]"(Leonardo, 28)

Then, for Marco, the assortment of products is an important aspect to consider for improving the VM buying experience. For him, it would be better to buy more local and fresh food. So, he would like to find this kind of product also in the VMs. The freshness of products is perceived when buying not long-lasting products. So, the ones that are pre-packed but their assortment is changed more often (i.e. sandwiches and salads).

> “*The fact that the product is presented as a local product and it would not come from the other side of the world, personally, is important for me. It would encourage me to buy more products and more often to VMs*” (Marco, 27)

These kinds of goods are ideal for the ones looking for a fast meal if they have a short lunch break or they don’t want to go out because of the weather. Then, the willingness to try new things led to imagining a VM filled with ethnic food. There could be products both in the snacks (i.e. donuts) or ready-to-go meals (i.e. ramen). Filling VMs with ethnic and fresh food would probably enlarge the target by catching those who are used to buying this kind of food through other channels and would like to have access to it more easily using VMs.

[3] 1 It’s an Italian TV show characterized by the use of a single setting. The situation comedy tells the story of the employees of an Italian company grappling with the problems of everyday life. The various situations are taken from the point of view of a coffee machine located in the relax area.

"*They could sell for example Japanese mochi, those sweets where there's bean paste inside. Or they put in Reese's, which are American sweets with salty caramel inside*" (Andrea, 25)

Another aspect that arose during the interviews was the possible implementation of olfactory feedback. It would be a nice match with the visual feedback that you can get, so far. It could make the experience more immersive, involving, and different.

"*It would be interesting to introduce not only visual feedback but also feedback from another sense. If I had to make a choice, obviously the visual choice is the quickest, from my perspective. However, if there were the possibility of olfactory feedback, for example, it could be interesting to better understand whether I could like a product or not*" (Marco, 27)

Previous literature analyzed the impact of conscious odor exposure and found that it may influence self-reported appetite (Ferriday & Brunstrom, 2011; Ramaekers et al., 2014). Moreover, according to the sensory-specific appetite (SSA) food odor cues may convey information related to the macronutrient content, based on the taste and caloric content, of the associated food and thereby may induce congruent appetite and possibly even food choice and intake (Ferriday & Brunstrom, 2011; Ramaekers, Boesveldt, Gort, et al., 2014; Ramaekers, Boesveldt, Lakemond, van Boekel, & Luning, 2014; Zoon, de Graaf, & Boesveldt, 2016).

3.2. ***Technologies***

During the interviews, we discussed also communication strategies, that could be applied in the VM setting. We considered both digital communications, i.e., showing written messages on the smart VM and positioning a banner on the product (i.e., a colored banner, a flag, etc.) that could point out vegan, lactose/gluten-free products, and low-fat choices. Both methods may be used also for marketing purposes such as signaling the product most sold in that period or highlighting some promotions (i.e. price reduction).

"It would be helpful! I could certainly identify and purchase a product more easily if it had a banner. For example, "product of the month" or "most purchased," compared to another one that doesn't have any banner" (Lucia, 28).

Considering the technological implementation and the familiarity of users with online shopping and mobile apps, we tried to investigate the potential of proximity marketing strategies too. Specifically, considering the spread of the use of mobile Apps in the VM sector, messages and news could be sent directly through the app. It emerged that users would react positively even if the message had been sent by an app or by an AI system because it would be considered a kind of relationship.

"It's a very nice thing, because, in any case, it's almost a relationship. You know it's a machine. But still, it's almost something personalized, tailor-made" (Serena)

On the other side, Mariella (50) said that for her, it is more important the tone of voice used to send the message, rather than the content of the message. Of course, she wouldn't want to feel pressured or judged (by a machine). She explained that she would like to receive a personalized message, for example, based on the daily purchase. It would be possible. For example, collecting data of the users through the app.

"It should be catchy but at the same time soft… it could be nice also if it was sent with a cute picture… I would imagine a message, as it was said by a friend… friendly advice" (Mariella, 50)

Moreover, for the users, it is crucial to be engaged in the selling process of VMs. In particular, more loyal users would like the chance to collaborate with the company and be involved in the processes such as choosing the assortment. By now, the collection of products is chosen by the sales and marketing department of the VM company, based on the request of the clients. However, it is not always based on the consumer's preferences.

> *"I would like to have the opportunity to choose which products to find within the VM. So, I have a list of things, and I am asked, which one would you prefer to have? It would increase the probability of finding the product almost always. If you use the application for shopping, it can see that you buy it frequently, so it could be available to you, in the VM you use"* (Jessica, 30)

Then, they would like to write reviews about products, which is also an occasion for sharing ideas with colleagues and/or friends, considering that going to VMs is an experience, to share with others.

> *"If there's something that intrigues me but I've never purchased it, I will try it and I would like to write a review, maybe sharing with the others my thoughts about the products"* (Marco, 27)

Finally, the growing use of augmented reality (AR) (Rauschnabel et al., 2022) due to its unique attributes (e.g., contextualization, portability, assortment) has profoundly influenced retailing (Kumar et al., 2024). By combining virtual elements with the physical environment in real-time, AR provides consumers with a rich multisensory experience (Azuma, 1997; Caboni et al., 2024). To the best of our knowledge, it was never tested in the VM sector, however, during our interviews, it emerged as a possible integration.

> *"The very first thing that comes to my mind is augmented reality. For example, the possibility via AR to visualize a product, I don't know... it would be interesting... and fun"* (Leonardo S., 28)

Considering smart VMs which present products directly through a digital screen, could help consumers gather more information about the product, especially about the ingredients and the nutritional information, which are aspects more and more important for consumers when choosing a product (Beatty & Smith., 1987). Due to the characteristic of VMs, where you can only look at the front of the package, often consumers are not aware of all the ingredients and the nutritional facts, which instead, for many people is a food-choice driver.

3.3. ***Gamification***

While games (Koivisto & Hamari, 2019) and price discounts (Grewal et al., 1998) have favorable effects on their own, psychological research on motivation suggests that these tools might also hinder each other when combined (Deci, Koestner & Ryan, 1999). This is the starting point for gamification strategies. During the interviews we discussed gamification and its relation to marketing strategy, considering that creating a gameful experience is a promising way to engage consumers with the brand, increase customer loyalty, and encourage them to purchase (Bauer, 2020; Eppman, 2018). Participants expressed their interest in promotions and loyalty programs with activities and a system for collecting points. It could lead them to buy more and increase their loyalty to VMs.

> *"I think it could be interesting to imagine a reward system, for each product bought, you collect points and they become a discount coupon. You can check the amount of your purchases, on the App. You scan a QRcode, for example, on the VM, and*

automatically, you can check the "points" you collected or the "special offer" (Leonardo, 28)

Moreover, gamification experiences are interesting also to engage consumers in having a different habit or behavior. It could not only be related to product purchases but also to rewarding sustainable choices, i.e. when choosing "option without cup" or products with FT label.[4]

"I believe that this system would encourage people to a kind of competition between them and push people unconsciously to be more sustainable. For example, you can collect points if you choose products with Rainforest alliance certification or with Fairtrade label or also if you can choose the option "without cup" (Andrea, 25)

Finally, this kind of experience could have a positive impact on consumers' choices, for example, by promoting healthier choices through a reward system. Gamification strategies could also involve limited-time offers and the introduction of multiplayer or collaborative games in the VM or the App for education and/or entertainment purposes.

5. Conclusions, Implications, and Future Development

The present study aims to contribute to the literature on VMs, exploring consumer experiences in a context pervaded by new technologies. We found that going to VMs, is a more complex experience than we could imagine. For someone is a meeting point, for others a "no-contact zone" to have a break and relax alone. What traditionally seems an impulse buying process, with technological advancement, is becoming a more planned activity, thanks to the possibility of accessing more information in advance, personalized considering specific needs, about products and assortments via App. Consumers look for a deeper variety of assortments, they would like to live more immersive experiences tasting new products, considering the traditional offer of VMs. Users are looking for "fresh meals", meant as not long-lasting goods (i.e. pre-packed mixed salads) and also ethnic food (i.e. mochi, reeses, and donuts). Someone seems interested in having the chance to find local food. According to Birch et al. (2018), consumers prefer local food primarily due to concerns about food transparency, including knowledge of its origin and production conditions, and because they associate local food with health, social, economic, and environmental benefits. From a managerial point of view, it is important to consider the transparency of food origins even in the VM sector, for example reflecting on the implementation of systems for giving information to consumers before buying the products.

From a managerial perspective, VMs should not be viewed merely as automated retail channels but as dynamic spaces that can adapt to diverse consumer expectations. By offering personalized communications, experimenting with innovative retail technologies like AR and VR, and addressing the demand for local options, VMs can redefine their role in the retail landscape. Specifically, technological advancements like augmented reality (AR), gamification, and app-based personalization are reshaping consumer interactions with VMs. Some users seem interested in having a more engaging experience buying at VMs and they are willing to download and use Apps, receive customized information or promotions, and adopt new digital technologies implemented by artificial intelligence (such as virtual assistants and games). Future implementation of technologies in VMs could include personalized recommendations based on past purchases, which can enhance the user experience by suggesting new products or

[4] FT labels distinguish themselves from other commercial front of-package labels used on food products by communicating ethical considerations involved in the sourcing and production of products based on a third-party certification (Fair Trade USA, 2020).

promotions that match their preferences. Other innovations could include dynamic pricing based on stock or habits and social sharing features with referral rewards. These innovations enhance user engagement by offering immersive and interactive experiences, encouraging repeat usage, and creating opportunities for tailored marketing. Additionally, the integration of loyalty programs and collaborative consumer involvement in product selection can foster deeper connections between users and VM brands.

Future research should delve deeper into the under-researched aspects of VM shopping experiences highlighted. Specifically, further exploration is needed to assess the impact of gamification strategies on consumer engagement, loyalty, and sustainable behaviors, as well as to investigate the potential of augmented and virtual reality (AR and VR) in enhancing user experiences for marketing and educational purposes. Another promising avenue involves studying the dual role of VMs as both social meeting points and solitary spaces, analyzing how this dynamic influences consumer satisfaction and usage patterns. By addressing these areas, future studies can build on this research's foundation, advancing the transformation of VMs into innovative, consumer-centric, and technologically advanced retail environments. Additionally, to present a broader perspective on this topic, future research could consider the opinions of non-VM users. Specifically, starting from understanding what makes some people not use VMs. Then, imagine possible integration (i.e. technologies) that could bring non-users closer to users. Finally, evaluate the impact of technologies on non-users' experience, evaluating if these integrations could make their experience better or worse.

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