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ADVANCES IN GLOBAL SERVICES AND RETAIL MANAGEMENT

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How Learning Style Interacts With Voice-Assisted Technology (VAT) in Consumer Task Evaluation

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Abstract

This study explored the idea that consumer learning styles are relevant to the integration of voice-assisted technology (VAT) into consumer products and services. Visual learners found the use of VAT moderately easy when performing simple tasks such playing music, asking about the weather, and asking questions. Auditory learners exhibited stronger sentiment scores as well as willingness to use VAT for tasks that are more complex. Practitioners should focus on improvements in other aspects of modality to strengthen visual learners' involvement with VAT devices. Auditory learners are best supported through the design of niche products and services that are differentiated by investment in voice technology.

Keywords: learning style, technology acceptance, voice technology

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Introduction

Voice-assisted technology (VAT) has been added to multiple devices that are regularly purchased by consumers across the globe, including smart mobile phones, smart home devices such as the Amazon Echo, and even autonomous automobiles driven by voice commands (Zhou et al., 2019). The addition of voice as a device feature has strengthened the sales of such devices and machines worldwide. By 2022, 66.3 million households in the United States are estimated to own a voice-activated smart home device (Statista, 2021). Voice is a natural and commonly performed human function (Liberman & Whalen, 2000). Voice-assisted technologies have evolved to more closely approximate natural language processing, making VAT functionality more attractive to the average consumer (Libai et al., 2020). A study by Ammari, Kaye, Tsai, and Bentley (2019) found that Amazon Alexa devices recognized a total of 193,665 commands. Consumers have embraced this hands-free and natural form of engagement with technology. More than half (56.4%) of smart phone users rely on the unit's voice assistant like Apple Siri or Google Assistant (Kinsella, 2020). Consumers build and maintain relationships with their VAT devices (Schweitzer, Belk, Jordan, & Ortner, 2019).

Voice-assisted devices are used by consumers for online shopping and for the completion of multiple daily tasks, including accessing news and playing music (Jones, 2018). More than half (55%) of smart phone owners use voice commands when searching for information (Enge, 2020). There has been unprecedented growth in the acceptance of VAT in the home (McLean & Osei-Frimpong, 2019), e.g., controlling household equipment and fixtures (Sen, Chakrabarty,

Toshniwal, & Bhaumik, 2015). VAT devices are showing increases in daily usage: smart phone use averages two hours and 51 minutes per day (Turner, 2021), and smart home devices are used for an average of 72 minutes during the weekend (Nielsen, 2018).

Research on the use of VAT is promising. Studies have been conducted on its use in health care (Glasper, 2019; Kim & Oumarou, 2020), hotels (Clark, 2002), fitness (Chung, Griffin, Selezneva, & Gotz, 2018), military operations, (Malkin, 1984) and manufacturing (Billi, Canavesio, Ciaramella, & Nebbia, 1995; Jezierski & du Preez, 2009). However, there is little insight into which consumers might adopt VAT more readily (Coskun-Setirek & Mardikyan, 2017). One gap in knowledge is whether learning style associates in any significant way with the use of VAT for basic human and consumer activities (Fernandes & Oliveira, 2021). Learning style is defined in this paper as differentiating people on their reactions to (or a preference for) certain types of stimuli when performing a task, i.e., visual, auditory, and kinesthetic (Fleming & Mills, 1992).

It was the objective of the current study to examine the role of learning style in VAT acceptance for consumer tasks. This exploratory study applied the well-known Unified Theory of Acceptance and Use of Technology (UTAUT) that explains consumer adoptions of technologies (Venkatesh, Morris, Davis, & Davis, 2003). To properly situate the current study in the field, the next section expands the definition of learning style and then explains its potential relationship with variables considered within the Unified Theory of Acceptance and Use of Technology.

Literature Review

Overview of Learning Styles

Learning styles have been a focus of research for a long time. Gregorc (1982) introduced a two-fold measurement tool labelling people as concrete or abstract (i.e., perception) and sequential or random (i.e., ordering). Kolb's (1985) Learning Style Inventory focused on the experiential aspect of learning. Sproles and Sproles (1990) categorized learning styles as serious, active, observational, passive, detailed, and struggling. They reported a direct and causal relationship between consumer decision making and learning styles. Sims and Sims (1995) viewed learning styles as either cognitive, perceptual or behavioral. The idea that learning style can be measured in terms of perceptual modality strengths – visual, auditory, tactile, and kinesthetic – was introduced by Dunn, Dunn and Price (1989). Sarasin (1999) later combined tactile and kinesthetic. Auditory learners like to talk and listen. Visual learners think in pictures and prefer to read and watch, while kinesthetic learners need hands-on activities and movement (Kanar, 1995). This is the theory adopted in this paper, since the main concern is the role of voice technology as a stimulus for consumer evaluations of tasks they perform.

The concept of learning styles is widely accepted among educational professionals. One study found that 94 percent of educators believe there is a positive correlation between being taught in one's preferred learning style and student task performance (Dekker, Lee, Howard-Jones, & Jolles, 2012). The general public also believes that learning to do tasks occurs best when training methods and tools accommodate a person's preferred learning style (Rogowsky, Callhoun, & Tallal, 2015). However, empirical support for these premises is still limited. Pashler, McDaniel, Rohrer, and Bjork (2008) in particular called for studies that explore whether different learning styles in the presence of one or more learning methods/stimuli interact with task performance outcomes.

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Auditory, visual, and kinesthetic stimuli have been explored in relation to consumer behavior and perceptions of products. Product-embedded visual and auditory cues (including multisensory products) can influence consumer product perception (Spence & Zampini, 2006), e.g., enjoyment (Yang, Lee, & Zo, 2017). Different modalities can trigger different reactions. Özcan, Cupchik and Schifferstein (2017) found that the appearance of visual products influenced consumer pleasure while auditory cues (sounds from mechanical devices such as shavers) impacted perceptions of product power or effectiveness. Visual cues also influenced consumer perceptions of flavor (Zampini, Sanabria, Phillips, & Spence, 2007).

Another study investigated the relationship between technology acceptance and learning style. Based on Kolb (1985), Hu and Hui (2011) categorized students as conceptual/experience and observation/experimental learners. They found a significant correlation between technology-based learning and learning style on perception of learning outcomes. Learning style, however, has not yet been examined as a factor that might moderate consumer reactions and perceptions of modality-specific technologies (such as voice) used to perform tasks. This study treats learning style (based on visual, auditory, and kinesthetic style types) as a variable of interest for evaluating consumers' perceptions of growing voice technology and its use in common tasks.

The Research Framework of the Study

This study investigated how consumers perceive performing ordinary daily tasks using VAT devices, while additionally considering their preferred learning style. Mainstream theory related to technology adoption for human and consumer tasks was employed to operationalize the concept of task evaluation, Relevant constructs included perceptions of user effort/facilitating conditions, hedonic appreciation of performing a task using the technology, and habitual use/intention to use the technology to perform tasks.

Effort and Facilitating Conditions

The initial Unified Theory of Acceptance and Use of Technology (UTAUT) focused on the impact of technology on consumer behavior (Venkatesh, et al., 2003). A second version was introduced in 2012 (Venkatesh, Thong, & Xu, 2012). Consumer intention to use a technology is impacted by expected effort/performance and societal influences (Venkatesh, Thong, & Xu, 2016). This model is widely used as it can be applied to any type of technological innovation. It assesses consumer views of expected effort and habitual use. It also explores facilitating conditions of using the technology – necessary knowledge, required resources, availability of help, and compatibility with other technology. This led to the first research proposition in this study:

- RP1: In the presence of VAT, learning style is associated with specific antecedents specified in technology acceptance models, (i.e., beliefs about ease-of-use/effort and facilitating conditions).

Hedonic Motivation

Hedonic and utilitarian consumer perceptions are closely linked to consumer use of technology models. Hedonic values are playful (Babin, Darden, & Griffin, 1994) while utilitarian values provide convenience (Teo, 2001). Consumer use of voice-activated smart home devices is

supported by hedonic value (i.e., entertainment) instead of practical, utilitarian values (Yang, et al., 2017). Several studies noted that consumer enjoyment is the strongest predictor of using voice-activated assistants (Kowalczuk, 2018; Yang & Lee, 2019).

Hedonic perceptions can be measured through reported emotions. The consumer has perceived emotions related to the use of technology. Scherer (1986) found a strong correlation between recognized emotional states and voice communication. Consumers believe VAT provides many benefits, ranging from mediation to entertainment. Bernhaupt, Murko, Pottier, and Battut (2019) reported that 90 percent of users thought these devices had the ability to improve the users' mood. Consumers like to interact with voice technology because it conveys emotion (McStay, 2018). Other studies reported that consumers viewed voice activated technology as a partner (Schweitzer et al., 2019) and used it as a coping strategy (Foehr & Germelmann, 2020).

- RP2: In the presence of VAT, learning style is associated with self-reported hedonic/emotional reactions to the use of VAT devices.

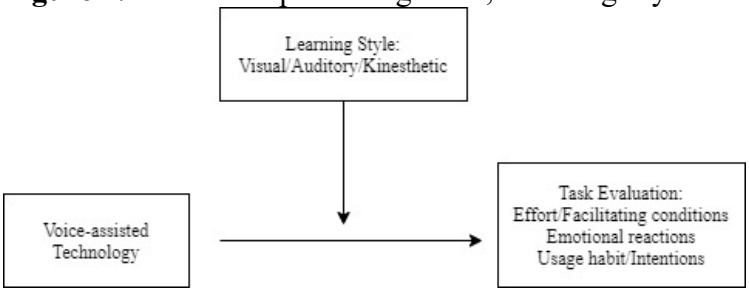
Habitual Use of Voice and Intentions to Perform Tasks

Previous work on UTAUT also introduced usage habit and intentions as outcome measures in technology acceptance research. Perceived usability of a technology acts as a strong predictor of usage (Davis, Bagozzi, & Warshaw, 1989). Zaharia and Würfel (2020) applied UTAUT2 to the adoption of voice-activated smart home speakers. They noted that perceived effort expectancy, performance expectancy and hedonic motivation affected intention to perform VAT-assisted tasks. This explains in part the growing use of voice-activated technology, which consumers like due to its ease of use to perform a wide variety of tasks. Simple VAT commands allow users to send texts, set a timer, get weather forecasts, and make phone calls (Hoy, 2018).

- RP3: In the presence of VAT, learning style is associated with habitual or intended use of VAT in performing consumer tasks.

In summary, this study expanded UTAUT research by examining a particular case that is relevant to the field of consumer behavior: that of different types of consumers (learning styles) employing voice technology (perceptual modality/stimulus) for consumer tasks (see Figure 1).

Figure 1. Relationships Among VAT, Learning Style and Task Evaluation



Task evaluation in this paper is defined as stimulus dependent whereby the presence of the perceptual modality of voice plays the role of an additional 'stimulus' in the mix of factors that impact perceptions of consumer task implementation (Wright & Zhang, 2009). Consumers employ/react to voice as a means of gathering, giving, or processing information in order to

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perform a task. The voice modality is expected to influence consumers' evaluations of VAT-assisted tasks differentially, depending on an individual user's learning style.

Methods

A secondary data set was received from a commercial marketing firm (see Acknowledgement) and used to test relationships among learning style, VAT, and important UTAUT variables. The firm used Prime Panels to distribute the survey among paid respondents. This survey method is widely used in consumer research (Yang et al., 2017; Yang & Lee, 2019). The firm targeted US residents who owned at least one VAT device and who made purchases in multiple product categories using online shopping over the past year. A total of 1,040 discrete records were used in further statistical analysis. Per system indicators, the average time to complete surveys was 17 minutes.

Variables made available to the authors included learning style values created from five items (see Appendix A) based on Beatrice (2009), which was an adaptation of a 30-question verbalizer-visualizer questionnaire (Richardson, 1977). The survey included three UTAUT measures (effort expectancy, habit, and facilitating conditions) (Venkatesh, et al., 2012) and additional items measuring reported emotions (Babin et al., 1994). The primary analysis comprised a series of ANOVA treatments to discern any associations between learning style and task evaluation measures, assuming respondents were employing VAT for common human and consumer tasks.

Results

Overall characteristics of the sample group were as follows. Women were slightly higher (54.6%) in number than men (45.4%). Average age was 39.8, while primary ethnic identifications comprised White (74.8%), Black (12.8), and Hispanic/Latino (10.5%). More than half of respondents were married (54.4%) followed by single/never married (35.4%). Almost half of the sample had children under the age of 18 (48.3%). The majority of respondents were characterized as visual learners (75.2%), followed by auditory (20.3%), and kinesthetic (4.5%). There were no significant differences in the demographic profiles across the three learning style groups.

With respect to RP1 (task evaluation measures related to perceived task effort and facilitating conditions - see Table 1), there are some initial findings. First, visual learners reported using VAT to be less effort than did auditory learners. Secondly, among the facilitating conditions items, no differences emerged across learning types regarding the first two personal or innate abilities to handle tasks using VAT. Both visual and auditory learners reported greater access to technological assistance from others than did kinesthetic learners.

Looking at Table 2, referring to RP2 on hedonic measures, auditory learners had stronger emotion scores than visual or kinesthetic learners across all items. In terms of statistical significance, three items met a 95% confidence level: For auditory learners, VAT tasks are delightful, thrilling, and necessary. The results that relate to RP3 on habitual use and usage intentions are found in Tables 1, 3, and 4. Findings in Table 1 indicated that auditory learners scored significantly higher than visual learners did on the item "I am addicted to using VAT." There were no significant differences on the two mildly-phrased items of 'forming a habit' and 'seeing VAT as a natural activity.' ANOVA was also used to explore the relationship of learning style with common daily task habits (Table 3) as well as consumer-specific task intentions (Table 4). Table 3 suggests that auditory

learners expressed significantly lower frequencies (than either visual or kinesthetic learners did) of using VAT for playing music, asking about the weather, and asking questions. In contrast, auditory learners were significantly higher (than visual learners) in using VAT for gaming and online banking. The findings in Table 4 show that auditory learners report having significantly greater intentions (than visual learners) to use VAT to online order across many product categories.

Table 1. ANOVA Results of UTAUT Variables on Learning Style, Given VAT Use

	Total sample **N = 1039**	***Visual*** **N = 781**	***Auditory*** **N = 211**	***Kinesthetic*** **N = 47**			
Strongly Disagree (1) to Strongly Agree (7)	**Mean**	**Mean**	**Mean**	**Mean**	**F-statistic**	***df***	**p-value***
Effort/ease of use							
Learning how to use VAT is easy for me	5.62	5.70	5.35	5.40	5.511	2	.004
I find VAT easy to use	5.70	5.78	5.48	5.36	5.910	2	.003
It is easy for me to become skillful using VAT	5.54	5.60	5.37	5.23	3.613	2	.027
Facilitating conditions							
I have the resources necessary to use VAT	5.54	5.58	5.43	5.43	1.135	2	.322
I have the knowledge necessary to use VAT	5.66	5.71	5.50	5.57	2.104	2	1.22
I can get help from others when I have difficulties using VAT	4.97	4.99	5.03	4.30	4.100	2	.017
Habitual use							
The use of VAT has become a habit for me	5.01	4.98	5.10	5.17	.711	2	.491
I am addicted to using VAT	4.04	3.93	4.43	4.21	5.720	2	.003
Using VAT has become natural for me	4.99	4.99	5.04	4.83	.303	2	.736

Note. *Significant at p <= .05

Table 2. ANOVA Results of Emotion Measures on Learning Style Given VAT Use

	Total sample **N = 1039**	***Visual*** **N = 781**	***Auditory*** **N = 211**	***Kinesthetic*** **N = 47**			
VAT is	**Mean**	**Mean**	**Mean**	**Mean**	**F-statistic**	***df***	**p-value***
Bad/good	5.15	5.11	5.34	5.00	2.666	2	.070
Unfavorable/favorable	4.97	4.94	5.12	4.81	1.628	2	.197
Unpleasant/pleasant	5.08	5.06	5.22	4.83	2.166	2	.115
Not fun/fun	5.10	5.10	5.13	4.94	.367	2	.693
Dull/exciting	4.94	4.91	5.09	4.79	1.718	2	.180
Not delightful/delightful	4.87	4.84	5.06	4.57	3.227	2	.040
Unenjoyable/enjoyable	5.02	4.98	5.16	5.04	1.314	2	.269
Not thrilling/thrilling	4.58	4.51	4.84	4.49	4.143	2	.016
Ineffective/effective	5.14	5.12	5.22	4.96	.889	2	.411
Not functional/functional	5.19	5.20	5.23	4.85	1.644	2	.194
Unhelpful/helpful	5.25	5.24	5.30	5.04	.720	2	.487
Impractical/practical	5.11	5.09	5.22	4.87	1.422	2	.239
Unnecessary/necessary	4.35	4.29	4.64	4.02	4.609	2	.010
Useless/useful	5.18	5.16	5.29	4.98	1.226	2	.294

Note. *Significant at p <= .05

Table 3. ANOVA Results of Common VAT Tasks on Learning Style

	Total sample **N = 1039**	***Visual*** **N = 781**	***Auditory*** **N = 211**	***Kinesthetic*** **N = 47**			
I use VAT to ….	**% yes**	**% yes**	**% yes**	**% yes**	**Chi-square**	***df***	**p-value***
Play music	80.3%	82.1%	71.6%	89.4%	14.156	2	.001
Ask about the weather	77.4%	78.7%	70.6%	85.1%	7.950	2	.019
Ask questions	74.5%	76.6%	65.9%	78.7%	10.458	2	.005
Get the news	60.3%	60.3%	57.8%	70.2%	2.469	2	.291
Research products	36.1%	35.3%	38.4%	38.3%	.773	2	.679
Smart home control	34.0%	33.3%	37.4%	29.8%	1.660	2	.436
Buy products	29.9%	29.6%	32.2%	25.5%	1.011	2	.603
Order services	27.7%	26.5%	32.2%	23.4%	3.147	2	.207
Play games	22.7%	20.5%	30.3%	25.5%	9.395	2	.009
Online banking	15.6%	12.4%	24.6%	27.7%	24.310	2	.000

Note. *Significant at p <= .05

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Table 4. ANOVA Results of Consumer Intentions (VAT online ordering) on Learning Style

Strongly Disagree (1) to Strongly Agree (7): ***I will use VAT to online order:***	***Total sample*** **N = 1039** **Mean**	***Visual*** **N = 781** **Mean**	***Auditory*** **N = 211** **Mean**	***Kinesthetic*** **N = 47** **Mean**	**F-statistic**	***df***	**p-value***
Food take out	4.83	4.80	5.01	4.68	1.225	2	.294
Health & beauty	4.69	4.60	4.99	4.66	3.622	2	.027
Dining reservations	4.62	4.58	4.89	4.19	3.553	2	.029
Groceries/food	4.56	4.48	4.88	4.45	3.585	2	.028
Electronics	4.49	4.46	4.71	4.06	2.411	2	.090
Flowers	4.49	4.42	4.83	4.11	4.709	2	.009
Pet food	4.44	4.41	4.64	4.15	1.500	2	.224
Bed, bath, & kitchen	4.42	4.10	4.58	4.06	1.661	2	.190
Clothing	4.42	4.34	4.83	3.89	6.938	2	.001
Arts & crafts	4.28	4.19	4.62	4.19	3.870	2	.021
Tools	4.23	4.15	4.57	3.96	4.401	2	.012
Event tickets	4.15	4.07	4.52	3.79	5.326	2	.005
Sporting goods	4.10	3.98	4.56	3.91	7.053	2	.001
Travel booking	4.10	4.01	4.48	3.83	4.922	2	.007
Furniture	3.76	3.66	4.22	3.49	7.194	2	.001
Drugs	3.54	3.43	3.99	3.34	6.296	2	.002

Note. *Significant at p <= .05

Discussion

Visual, auditory, and kinesthetic learning styles are commonly accepted ways of differentiating how individuals engage with cues from various types of perceptual modalities. Voice-activated technology is an example of a modality that supports the performance of consumer tasks. It is highly possible that effective marketing and consumer experience management require greater attention to permitting consumers to have increased choice over the form of stimuli they prefer or the modality they want to use in task completion. Findings from this present study shed additional light on the factors affecting the attractiveness and viability of voice personal assistants and other VAT devices and are congruent with the steadily increasing numbers of marketed and purchased devices outfitted with voice assistant features.

Learning Style and Perceptions of VAT

Reviewing findings from the ANOVA procedures, it appears that some VAT perceptions could be linked to differences in learning style. Since the number of kinesthetic learners was comparatively low, findings will be discussed primarily with a view to differentiating between visual and auditory learners. Firstly, with respect to perceived task effort in using VAT, it was not intuitive to find that visual learners reported less effort in using VAT for task performance. One might have anticipated that auditory learners would have had an easier time utilizing VAT for tasks. However, it is conceivable that auditory learners envision greater potential for VAT, i.e., they might expect to use more of the available VAT functionality due to being comfortable with auditory stimuli. Thus, if auditory learners were seeking to use complex VAT features, this could explain why auditory learners reported comparatively lower scores on ease of use. What this means is that learning style could influence the standard for performance for VAT within learning style groups. Visual learners may not know what they are missing, being content to use limited or low level VAT functionality, and thus, they exhibit greater perceptions of ease of use. This thinking does not seem to extend to perceptions of facilitating conditions or support resources. Although it may take time and effort to fully explore the functionality of VAT, there is every indication that given time and the inclination to do so, all learner types can find backup resources to support their use of VAT technology.

Two impressions need to be communicated regarding the role of learning style in generating emotional reactions to VAT. First, auditory learner scores ranged from slightly to moderately higher than visual learner scores across all of the emotions measured. Second, it is interesting to find that the auditory learners had significantly higher emotion scores for the more aggressive sentiment items: delightful, thrilling, and necessary. It is plausible that auditory learners have a stronger emotional connection to VAT based on these findings. The latter point is additionally substantiated by the finding that auditory learners are more 'addicted' to using VAT than are visual learners. Addiction is the strongest-worded item related to habitual use and again implies a potential for stronger emotional connections between auditory learners and VAT.

Findings regarding the relationship between learning style and using VAT for common daily tasks was again counterintuitive in part. One might have expected auditory learners to be the ones using VAT more across the board in their daily activities. In this sample, visual learners used VAT more for basic tasks such as playing music, asking questions, and asking about the weather. It is worth noting that these are simple tasks to perform no matter what the modality involved. It is in the area of more complex gaming and online banking where significantly higher percentages of auditory learners were performing these tasks. As well, auditory learners exhibited greater intentions of ordering online using voice-assisted technology. These usage findings are indicative of potential differences across learner type; auditory learners are evidently using the voice modality to perform tasks that are more complex.

Practical Considerations for Product Developers/Marketers

From a practitioner point of view, the present findings signal specific concerns that impact product development and marketing strategies. Given that three quarters of the sample were categorized as visual learners, it is doubtful that learning style directly impacts off-the-shelf consumption rates of VAT devices. The predictions seen in the introduction of this paper, i.e., that two-thirds of households in the United States will own a smart home device (Statista, 2021), likely do not depend on the learning style of US consumers.

However, there is a difference between product purchase and subsequent usage. Based on current findings, product developers need to explore learning style further in order to envision how to best serve their customers with VAT devices. The presence of auditory stimuli and voice functionality appears to elicit different levels of emotional sentiment and usage patterns across learning style groups, advancing findings from Spence and Shankar (2010). For the visual learners making up the bulk of the present respondent sample, deploying only a superficial level of voice features may be sufficient. Yet, according to our data, it does not bring visual learners to the level of being delighted and thrilled or viewing voice features as necessary.

Conversely, improvements in other aspects of device modality are likely to be necessary to strengthen visual learners' involvement with VAT devices. One step being taken is to more fully integrate multi-sensory functionality into existing VAT prototypes. For example, newer versions of Amazon Echo and Google Home devices include screens to provide dual-modality communication (Chang, Chen, & Liu, 2009), which would accommodate the larger numbers of visual learners identified in this study.

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Supporting auditory learners through the design of VAT devices may be more difficult due to findings that suggest these users are more demanding and sensible of the potential of voice features. Likely, there is room for niche products and services that are differentiated by investment in voice technology: expanded repertoires of voice commands in smart home devices, spoken dialogues within games, more complex voice-based consumer product searching and filtering (Klaus & Zaichkowsky, 2020), artificial intelligence supported audio interviews for job seekers, and voice-driven counseling for health patients. Nonetheless, it is the opinion of the authors that multiple channels offering multi-modality options will be required in most consumer contexts.

One other alternative is to refocus marketing voice from function-oriented to social belonging, stressing an increase in the humanlike qualities of voice interaction between devices and consumers. The conversational nature of this technology is prompting rapid rates of consumers to personify them as 'real' (Lopatovska & Williams, 2018). Potentially, voice cues can enhance sentiment, regardless of learning type, if marketed effectively as 'friendship.'

Conclusion

This study supports the idea that learning styles are relevant to the integration of voice-assisted technology into consumer products and services. Visual learners dominated in this study sample and appeared to find the use of VAT moderately easy when performing simple tasks such playing music, asking about the weather, and asking questions of their VAT personal assistants. Auditory learners were the second largest learning style group and exhibited stronger sentiment scores as well as willingness to use VAT for tasks that are more complex.

Findings help to explain in part the evolution of VAT device designs, given the large number of respondents categorized as visual learners. Amazon first introduced the Echo device as a purely auditory device. Subsequent generations offered units that combined different modalities to cater to multiple learning styles. The Echo Spot is a voice-enabled alarm clock with a small screen. The Echo Show is a touchscreen device (i.e., tactile) that combines auditory and visual stimuli. Another form of VAT – Apple Siri and Google Assistant – responds to users' auditory prompts with visual feedback and textual information.

This study was limited in several ways. First, the number of kinesthetic learners did not constitute a sufficient comparison group to merit making strong assertions about their reactions to VAT tasks. Secondly, respondents were screened only for prior use of voice-assisted technology, but no attempt to control for device type or VAT device brand was made. Lastly, since the dataset was provided from a secondary source, the authors had limited control over variables studied.

Considering the potential for future research, findings suggest that learning style is an interesting variable to include when testing UTAUT theory. Follow-up research can investigate the degree to which consumers alternate between auditory and visual modalities when engaging with basic consumer tasks such as product searches. The category of product being sought should be examined in this context, since purchasing music might be conducted without any need for visual cues, while the purchase of visually-laden product categories, e.g., clothing, might require multi-model information support.

References

Ammari, T., Kaye, J., Tsai, J. Y., & Bentley, F. (2019). Music, search, and IoT: How people (really) use voice assistants. ACM Transactions on Computer-Human Interaction. 26(3), 17-1.

Babin, B., Darden, W., & Griffin, M. (1994). Work and/or fun: measuring hedonic and utilitarian shopping value. Journal of Consumer Research. 20(4), 644-656

Beatrice, J.A. (2009). Learning to study through critical thinking. Irwin, PA: Career Education Division.

Bernhaupt, R., Murko, C., Pottier, G., & Battut, A. (2019). User acceptance of emotion-aware mood-improving voice assistant. IBC. Retrieved from https://www.ibc.org/user-acceptance-of-emotion-aware-mood-improving-voice-assistants/5076.article

Billi, R., Canavesio, F., Ciaramella, A., & Nebbia, L. (1995). Interactive voice technology at work: the CSELT experience. Speech Communication. 17(3-4), 263-271.

Chang, S., Chen, S., & Liu, Y. (2009). A user study of accessing web applications via voice cellular phone: A model comparison approach. Behaviour & Information Technology, 28(5), 471–484.

Chung, A. E., Griffin, A. C., Selezneva, D., & Gotz, D. (2018). Health and fitness apps for hands-free voice-activated assistants: content analysis. JMIR mHealth and uHealth. 6(9), e174. DOI:10.2196/mhealth.9705

Clark, S. (2002). Room for technology. Hospitality Focus. May. 15-16.

Coskun-Setirek, A., & Mardikyan, S. (2017). Understanding the adoption of voice activated personal assistants. International Journal of E-Services and Mobile Applications. 9(3), 1-21.

Davis, F. D., Bagozzi, R. P. & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. Management Science. 35(8), 982–1003.

Dekker, S., Lee, N.C., Howard-Jones, P., & Jolles, J. (2012). Neuromyths in education: prevalence and predictors of misconceptions among teachers. Frontiers in Psychology: Educational Psychology. 429, 1-8.

Dunn, R., Dunn, K., & Price, G.E. (1989). Learning styles inventory. Lawrence, KS: Price Systems.

Enge, E. (2020). Mobile voice usage trends in 2020. Retrieved from https://www.perficient.com/insights/research-hub/voice-usage-trends

Fernandes, T., & Oliveira, E. (2021). Understanding consumers' acceptance of automated technologies in service encounters: drivers of digital voice assistant's adoption. Journal of Business Research. 122, 180-191.

Fleming, N. D., & Mills, C. (1992). Not another inventory, rather a catalyst for reflection. To Improve The Academy. 11(1), 137-155.

Foehr, J., & Germelmann, C. C. (2020). Alexa, can I trust you? Exploring consumer paths to trust in smart voice-interaction technologies. Journal of the Association for Consumer Research. 5(2), 181-205.

Glasper, A. (2019). The use of voice-assisted technology to enhance self-care. British Journal of Nursing. 28(16), 1092-1093.

Gregorc, A.F. (1982). Gregorc Style Delineators: development, technical, and administration manual. Maynard, MA: Gabriel Systems.

Hoy, M. B. (2018). Alexa, Siri, Cortana, and more: an introduction to voice assistants. Medical Reference Services Quarterly. 37(1), 81-88.

Hu, P. J. H., & Hui, W. (2011). Is technology-mediated learning made equal for all? Examining the influences of gender and learning style. In Technology Acceptance in Education. 101-122. Leiden, Netherlands: Brill.

Jezierski, R., & du Preez, A. (2009). Voice recognition: the sound of productivity. The Engineer. 33, 1-4.

Jones, V. K. (2018). Voice-activated change: Marketing in the age of artificial intelligence and virtual assistants. Journal of Brand Strategy. 7(3), 233-245.

Kanar, C.C. (1995). The confident student. Boston, MA: Houghton Mifflin Company.

Kim, H. N., & Oumarou, B. (2020). User requirement analysis for smart voice technology for older adults with visual impairments. International Journal of Human–Computer Interaction. 36(16), 1551-1557.

Kinsella, B. (2020). Voice assistant use on smartphones rise, Siri maintains top spot for total users in the U.S. Retrieved from https://voicebot.ai/2020/11/05/voice-assistant-use-on-smartphones-rise-siri-maintains-top-spot-for-total-users-in-the-u-s/

Klaus, P., & Zaichkowsky, J. (2020). AI voice bots: a services marketing research agenda. Journal of Services Marketing. 34(3), 389-398.

Kolb, D. (1985). Learning style inventory. Boston, MA: McBer.

Kowalczuk, P. (2018). Consumer acceptance of smart speakers: a mixed methods approach. Journal of Research in Interactive Marketing. 12(4), 418-431.

Libai, B., Bart, Y., Gensler, S., Hofacker, C. F., Kaplan, A., Kötterheinrich, K., & Kroll, E. B. (2020). Brave new world? On AI and the management of customer relationships. Journal of Interactive Marketing. 51. 45-56.

https://digitalcommons.usf.edu/m3publishing/vol5/iss2021/51
DOI: https://www.doi.org/10.5038/9781955833035

Liberman, A. M., & Whalen, D. H. (2000). On the relation of speech to language. Trends in Cognitive Sciences. 4(5), 187-196.
Lopatovska, I., & Williams, H. (2018). Personification of the Amazon Alexa: BFF or a mindless companion. Proceedings of the 2018 Conference on Human Information Interaction & Retrieval. 265-268.
Malkin, F. J. (1984). US Army helicopter voice technology applications. SAE Transactions. 692-696.
McLean, G., & Osei-Frimpong, K. (2019). Hey Alexa… examine the variables influencing the use of artificial intelligent in-home voice assistants. Computers in Human Behavior. 99, 28-37.
McStay, A. (2018). Emotional AI: the Rise of Empathic Media. Thousand Oaks, CA: SAGE Publishing.
Nielsen (2018). (Smart) speaking my language: despite their vast capabilities, smart speakers are all about the music. Retrieved from https://www.nielsen.com/us/en/insights/article/2018/smart-speaking-my-language-despite-their-vast-capabilities-smart-speakers-all-about-the-music/.
Özcan, E., Cupchik, G. C., & Schifferstein, H. N. (2017). Auditory and visual contributions to affective product quality. International Journal of Design. 11(1), 35-50.
Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2008). Learning styles: concepts and evidence. Psychological Science in the Public Interest. 9, 105-119.
Richardson, A. (1977). Verbalizer-visualizer: a cognitive style dimension. Journal of Mental Imagery. 1, 109-126.
Rogowsky, B. A., Calhoun, B. M., & Tallal, P. (2015). Matching learning style to instructional method: Effects on comprehension. Journal of Educational Psychology. 107(1), 64-78.
Sarasin, L.C. (1999). Learning style perspectives: impact in the classroom. Madison, WI: Atwood Publishing.
Scherer, K. (1986). Vocal affect expression: a review and a model for future research. Psychological Bulletin. 99(2), 143-165
Schweitzer, F., Belk, R., Jordan, W., & Ortner, M. (2019). Servant, friend or master? The relationships users build with voice-controlled smart devices. Journal of Marketing Management. 35(7-8), 693-715.
Sen, S., Chakrabarty, S., Toshniwal, R., & Bhaumik, A. (2015). Design of an intelligent voice-controlled home automation system. International Journal of Computer Applications. 121(15), 39-42.
Sims, R.R., & Sims, S.J. (1995). The importance of learning styles: understanding the implications for learning, course design and education. Westport, CT: Greenwood Press.
Spence, C., & Shankar, M.U. (2010). The influence of auditory cues on the perception, and response to, food and drink. Journal of Sensory Studies. 25, 406-430.
Spence, C., & Zampini, M. (2006). Auditory contributions to multisensory product perception. Acta Acustica United with Acustica. 92(6), 1009-1025.
Sproles, E. K., & Sproles, G. B. (1990). Consumer decision-making styles as a function of individual learning styles. Journal of Consumer Affairs. 24(1), 134-147.
Statista (2021). Smart home devices and smart speaker ownership in the U.S. 2015-2022. Retrieved from https://www.statista.com/statistics/794624/us-smart-home-devices-smart-speaker-ownership-forecast/
Teo, T. (2001). Demographic and motivation variables associated with internet usage activities. Internet Research. 11(2), 125-137.
Turner, A. (2021). Smartphone addiction facts & phone usage statistics: the definitive guide. Retrieved from https://www.bankmycell.com/blog/smartphone-addiction/#chapter1
Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of Information technology: toward a unified view. MIS Quarterly. 27(3), 425-478.
Venkatesh, V., Thong, J., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. MIS Quarterly. 36(1), 157-178.
Venkatesh, V., Thong, J., & Xu, X. (2016). Unified theory of acceptance and use of technology: a synthesis and the road ahead. Journal of the Association for Information Systems. 17(5), 328-376.
Wright, B. A., & Zhang, Y. (2009). A review of the generalization of auditory learning. Philosophical Transactions of the Royal Society B: Biological Sciences. 364(1515), 301-311.
Yang, H., & Lee, H. (2019). Understanding user behavior of virtual personal assistant devices. Information Systems and Ebusiness Management. 17(1), 65-87.
Yang, H., Lee, H., & Zo, H. (2017). User acceptance of smart home services: An extension of the theory of planned behavior. Industrial Management & Data Systems. 117(1), 68-89.
Zaharia, S., & Würfel, M. (2020). Voice commerce - studying the acceptance of smart speakers. International Conference on Human Interaction and Emerging Technologies. 449-454.
Zampini, M., Sanabria, D., Phillips, N., & Spence, C. (2007). The multisensory perception of flavor: assessing the influence of color cues on flavor discrimination responses. Food Quality and Preference. 18(7), 975-984.

Zhou, M., Qin, Z., Lin, X., Hu, S., Wang, Q., & Ren, K. (2019). Hidden voice commands: attacks and defenses on the VCS of autonomous driving cars. IEEE Wireless Communications. 26(5), 128-133.

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Appendix A: Learning Style Questions

1. If I must learn how to do something, I learn best when I:
   - Watch someone show me how.
   - Hear someone tell me how.
   - Try to do it myself.

2. When I read, I often find that I:
   - Visualize when I am reading in my mind's eye.
   - Read out loud or hear the words inside my head.
   - Fidget and try to "feel" the content.

3. If I had to remember a list of items, I would remember it best if:
   - Wrote them down.
   - Said them over and over to myself.
   - Use my fingers to remember each item.

4. When given written instructions on how to build something, I:
   - Read them silently and try to visualize how the parts will fit together.
   - Read them out loud and talk to myself as I put the parts together.
   - Try to put the parts together first and read later.

5. If someone had to verbally describe something to another person, I would:
   - Try to visualize what he/she was saying.
   - Enjoy listening but want to interrupt and talk myself.
   - Become bored if his/her description got too long and detailed.

Scoring Note: Designation of learning style was based on a propriety formula used by the commercial marketing firm.

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