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RESEARCH OF IT INFLUENCE ON THE PRICE PERCEPTION

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Introduction. The study contributes to the theoretical knowledge by expanding understanding of auditory encoding of prices, further testing the working memory capacities, and understanding the psychological underpinnings of price perceptions. From a managerial perspective, our findings will help marketers to better understand the cognitive processes of price perception while voice-ordering through smart devices, thus improving company pricing decisions and increasing number of sales.

Aim and tasks. In this study, we aim to understand the psychological underpinnings of price perception during "auditory" price information encoding. In particular, we research how the price pronunciation order of the item on sale (first the sale price and then the usual price or vice versa) affects the sale evaluation and subsequent purchase intention.

Results. Prior to making predictions about price perception through auditory sense and its subsequent evaluation, we need to understand the cognitive processes underlying numbers encoding. Numerical cognition process follows five stages: (1) initial exposure to numerical information (i.e., numerical presentation in visual or verbal format), (2) numerical information encoding, (3) representation of the numerical information in memory, (4) retrieval of that information in order to perform some cognitive task (e.g. price evaluation), and (5) consumer response based on processed information. Thus, the internal consistency reliability of the questions has already been tested using Cronbach's alpha parameter and has been proved to be of the appropriate level. Lastly, in addition to these context-related questions, we include two attention checks questions and the question on the questionnaire purpose in order to control for random box-checking and exclude responses which guessed the study reasons from further analysis.

Conclusions. From a theoretical standpoint, this study contributes to two literature streams: (1) marketing literature on pricing and (2) the psychological literature on numerical cognition. In the pricing area, the findings of the study further support and shed light on the application of the anchoring effect during purchase decisions. The study taps into the area of conscious and unconscious comparisons with price anchors and helps to reconcile previous researches who found different effects of price anchors on willingness to pay for the product or service. In addition, the study provides novel insights regarding pricing decisions in "auditory" rather than "visual" domain, laying a foundation for further exploration of this area.

Keywords: IT marketing, price perception, IOT, smart devices, anchoring.

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ДОСЛІДЖЕННЯ ВПЛИВУ ІНФОРМАЦІЙНИХ ТЕХНОЛОГІЙ НА СПРИЙНЯТТЯ ЦІНИ

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Вступ. Дослідження сприяє теоретичним знанням шляхом розширення розуміння слухового кодування цін, подальшого тестування робочої пам'яті та розуміння психологічних підстав сприйняття цін. З точки зору менеджменту, висновки допоможуть маркетологам краще зрозуміти когнітивні процеси сприйняття цін при одночасному голосовому упорядкуванні через смарт-пристрої, тим самим покращуючи рішення щодо ціни на компанії та збільшуючи кількість продажів.

Мета та завдання. Зрозуміти психологічні основи сприйняття цін під час кодування «аудиторної» цінової інформації. Зокрема, дослідити, як порядок вимови ціни на предмет продажу (спочатку ціна продажу, а потім звичайна ціна або навпаки) впливає на оцінку продажу та наступний намір придбання.

Результати. Перш ніж робити прогнози щодо сприйняття цін за допомогою слухового сенсу та подальшої його оцінки, потрібно зрозуміти когнітивні процеси, що лежать в основі кодування чисел. Процес чисельного пізнання проходить п'ять етапів: (1) початкове опромінення числової інформації (тобто числове представлення у візуальному чи словесному форматі), (2) числове кодування інформації, (3) подання числової інформації в пам'яті, (4) пошук ця інформація для виконання певного пізнавального завдання (наприклад, оцінка цін) та (5) реагування споживачів на основі обробленої інформації. Таким чином, надійність внутрішньої узгодженості питань перевірена за допомогою альфа-параметра Кронбаха і було доведено відповідний рівень.

Висновки. З теоретичної точки зору, це дослідження сприяє двом літературним потокам: (1) маркетингова література щодо ціноутворення та (2) психологічна література про числове пізнання. У сфері ціноутворення результати дослідження додатково підтверджують та висвітлюють застосування ефекту прив'язки під час прийняття рішень про придбання. Дослідження стосується сфери свідомого та несвідомого зіставлень із якорями цін та допомагає узгодити попередні дослідження, які виявили різний вплив цінових якорів на готовність платити за товар чи послугу. Крім того, дослідження надає нову інформацію щодо рішень щодо ціноутворення в «слуховій», а не в «візуальній» сфері, що створює фундамент для подальшого дослідження цієї галузі.

Ключові слова: ІТ-маркетинг, сприйняття цін, ІОТ**,** інтелектуальні пристрої, якірні асоціації.

Introduction. How do individuals make their purchase decisions when they hear rather than see the price? The adoption of smart speakers (e.g., Amazon Echo), and usage of voice assistants (e.g., Amazon Alexa) are on the rise, leading to the development of voice commerce. However, since most of the previous research was based on "visual" purchase decisions, little is known about our "auditory" price perceptions and subsequent influence of voice-controlled devices on our purchase patterns. In this study, we aim to understand the psychological underpinnings of price perception during "auditory" price information encoding. In particular, we research how the price pronunciation order of the item on sale (first the sale price and then the usual price or vice versa) affects the sale evaluation and subsequent purchase intention. To address this question, we appeal to cognitive psychology. First, we hypothesize that due to the anchoring effect it is beneficial to pronounce the usual (higher) price first. Second, we predict that the price length will moderate this effect due to underlying numerical cognition processes. To test our hypotheses, we conduct 2 experiential studies, during which 8 groups of participants are exposed to different voice-shopping situations. The findings in this study contribute to the literature in pricing and numerical cognition, shedding more light on cognitive processes underlying sale prices encoding, evaluation, and subsequent response.

The study contributes to the theoretical knowledge by (1) expanding understanding of auditory encoding of prices, (2) further testing the working memory capacities, and (3) understanding the psychological underpinnings of price perceptions. From a managerial perspective, our findings will help marketers to better understand the cognitive processes of price perception while voice-ordering through smart devices, thus improving company pricing decisions and increasing number of sales.

Voice-controlled smart speakers (Amazon Echo, Google Home, or Apple Homepod), and voice assistants (Amazon Alexa, Google Assistant, or Apple Siri) are increasingly penetrating our everyday lives. It took only two years for smart speakers to reach the mark of 50 million users (Perez, 2018) and now be part of every third US household (Jordan, 2019). At the same time, the number of voice assistants users is expected to triple from 2.5 to 8 billion by the end of 2023 (Smith, 2018), becoming one of the most lucrative areas for research and investment.

The adoption of these new technologies leads to subsequent development of voice commerce. According to Walker Sands report, 42% of smart speaker owners have already made a voice purchase through this device in the past year (Jordan, 2019). This trend toward voice-purchasing poses new challenges for marketers. One of them is sale promotion. If previously purchase decisions were often prompted through merchandise and visual price presentation (e.g., price size, color, location), the shift of shopping to audio dimension leads to so-called "Zero UI" shopping experience, nullifying the relevance of previous research on visual price manipulations (e.g. Grewal, Roggeveen, & Nordfält, 2017; Kahn, 2017).

Analysis recent research and publications. Despite the increasing adoption of voice-controlled devices, little is known about their influence on our purchase patterns (Gollnhofer & Schüller, 2018). Previous research on sale perception predominantly concentrated on consumer evaluation of prices in the visual domain (e.g. Biswas, Bhowmick, Guha, & Grewal, 2013; Milosavljevic, Navalpakkam, Koch, & Rangel, 2012). At the same time, research on auditory price perception concentrates on cognitive psychological processes of numbers processing and price memory (Vanhuele, Laurent, & Dreze, 2006; Coulter, Choi, & Monroe, 2012) displacing them from the context of actual purchase situations. Thus, currently, there is no research available which investigates how do consumers perceive prices and make subsequent decisions based on hearing sense – a gap addressed by this study. Narrowing down, the research question of this study is "*How does the order of price pronunciation (first the sale price and then the usual price or vice versa) moderated by price length affect the evaluation of the sale and subsequent purchase intention of the product*?".

To address this question, we appeal to three fields of research in cognitive psychology: literature on anchoring effect, numerical cognition, and the architecture of working memory.

The anchoring effect (Tversky & Kahneman, 1974) is used to explain the initial relation between sale prices and the evaluation of the deal. At the same time, numerical cognition – numerical encoding process and internal representation (Ashcraft, 1992; Dehaene, 1992), and the architecture of working memory – Baddeley's model of working memory (Baddeley, 1992), elaborate on the brain's capacity limitations for pricing information and help to predict and explain psychological processes triggered by the lengths of the price.

Aim and tasks. In this research, we concentrate on sale price perception during voice-based purchases. In order to differentiate between different prices, we call the price before the sale – the "usual price" and the price after the sale was applied – the "sale price". The independent (manipulated) variable of the study is the order of the price pronunciation –whether the sale price is pronounced first (e.g., "the sandwich today is 8 EUR on sale from 10 EUR") or the second (e.g., "the sandwich is 10 EUR, today is on sale for 8 EUR). The dependent variable is the consumer's sale reaction and subsequent purchase intention. We also introduce the mediator of "value perception of the sale" since it is directly responsible for the consumer's further decision to make the purchase or not (Alford & Biswas, 2002).

To build a conceptual framework and come up with hypotheses, we start with the explanation of the cognitive processes related to numbers encoding, proceed with the description of anchoring effect, and finish with the introduction of the price length moderating effect explained by the limited capacity of working memory.

Results. Prior to making predictions about price perception through auditory sense and its subsequent evaluation, we need to understand the cognitive processes underlying numbers encoding.

According to Ashcraft and Dehaene (1992), numerical cognition process follows five stages: (1) initial exposure to numerical information (i.e., numerical presentation in visual or verbal format), (2) numerical information encoding, (3) representation of the numerical information in memory, (4) retrieval of that information in order to perform some cognitive task (e.g. price evaluation), and (5) consumer response based on processed information. For the further easiness of reference, the first three steps of this process are illustrated in Figure 1, (retrieved from Coulter et al., 2012). Subsequently, this study concentrates on the fourth and fifth stages of the numerical cognition process.

To explain the first three stages of numerical cognition process, Dehaene (1992) developed a "Triple-Code" Model in which he asserted that numbers can be encoded in three different forms: (1) visual – written Arabic form (e.g., 15), (2) verbal (phonological representation of numbers) – the way numbers are pronounced (e.g., "fifteen"), and (3) analog (magnitude) – relative judgment of the size of the number (e.g., more than 10, less than 20). Previous research showed that these three types of encoding are neurologically interconnected (Figure 1) but are responsible for different tasks during arithmetic computations and number processing (Dehaene, Dehaene-Lambertz, & Cohen, 1998). Moreover, it is suggested that both visual and verbal stimuli can lead to number encoding in "non-corresponding" visual or auditory format, depending on the task at hand (Luna & Kim, 2009), and both forms of encoding automatically lead to analog code (Adaval & Monroe, 2002; Coulter & Coulter, 2010).

This means that (1) while researching auditory price perception we can expect the same cognitive psychological processes as were proven applicable for visual-based encoding (e.g. anchoring effect), (2) the magnitude of effects can be higher/lower due to brain capacity and different processes involved in arithmetic computations (further explained by Baddley's model of working memory), (3) analog code is a variable of interest responsible for subsequent price evaluation.

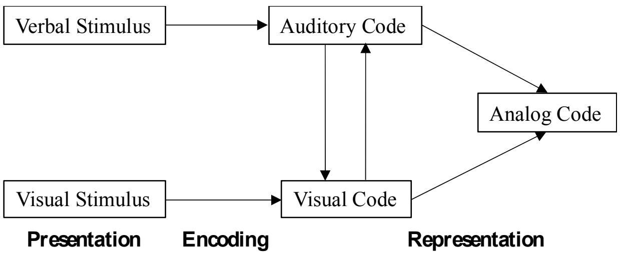

Fig. 1. Price presentation, encoding, and representation.

The anchoring effect (Tversky & Kahneman, 1974) – also referred to as anchoring-and adjustment heuristic – is an effect when an individual makes a biased judgment based on initially presented values. In their study, Tversky and Kahneman (1974) showed that when individuals are asked to make a numeric evaluation, they look for cues in the environment and use those cues to make a final judgment. Further research in this area showed that anchoring effect is applicable to diverse situations, including legal procedures (Englich, 2006; Lalot, Quiamzade, & Falomir-Pichastor, 2019), and purchase decisions (Davis & Bagchi, 2018; Adaval & Wyer, 2011).

In marketing literature, it was shown that consumers use diverse external (non-numeric) cues as anchors to form price expectations. For instance, Verhoeven, Rompay, and Pruyn (2009) found that environmental elements such as other customers or restaurant table decorations influence consumers' expectations about restaurant prices. At the same time, Barbera et al. (2018) established that weather and temperature-related visual cues affect consumer valuations of a service product. However, despite the numerous research on non-numeric anchoring cues, numeric reference points remain to have the most direct and profound influence on price expectation formation (Ariely, Loewenstein, & Prelec, 2003).

According to anchoring research, individuals pay more attention to the first stimuli (Epley & Gilovich, 2010; Tversky & Kahneman, 1974). Thus, consumers use the first price they are exposed to as an anchor to form consequent judgments about the value of the sale.

Moreover, based on anchor value, consumers form a range of prices they consider to be viable and are unmotivated to examine other options that go beyond identified boundaries (Quattrone, Lawrence, Finkel, & Andrus, 1984). Building on this statement, Epley and Gilovich (2010) found that consumers assign more value to the sale when the anchor price is high – thus, the first price is a higher boundary of an identified range – than when it is low. That said, people prefer adjusting downward from the anchor rather than upward.

Combining this information with Triple-Code numeric system described in 2.1, the first price can be considered as an "analog" code which influences the subsequent sale judgment – either the individual perceives the second price "lower than" or "higher than" the initial one. That is, from a process perspective, the order of price pronunciation may influence how valuable the individual perceives a sale. Based on the information described above, we assume that in (1) auditory dimension the price anchoring effect will work the same way as in previous "visual-based" studies and thus (2) when a higher (usual) price is presented first, it works as an anchor, resulting in a more favorable evaluation of a sale.

H1. *The usual price pronounced first leads to a (a) higher value perception of a sale and subsequent (b) higher purchase intention.*

In their seminal work, Alan Baddeley and Graham Hitch (1974) proposed that the short-term memory (later referred to as working memory). Later the model was expanded with the third slave system – episodic buffer, which integrates information from the short-term memory to the long-term one (Baddeley, 2000). The model is based on the assumption that each slave system (i.e., phonological loop or visual-spatial sketchpad) has limited storage and working capacity but can simultaneously perform cognitive tasks. This explains the fact why we cannot comprehend the parallel speech of two individuals but at the same time can listen to someone while drawing a picture.

In this research, the variable of our interest is the phonological loop and the amount of (numerical) information that fits in it.

Elaborating on the Baddley's Model of Working Memory, future studies established that the memory span equals to the number of words that the person can read aloud in 1.5 – 2 seconds (Baddeley, 2001), which on average, when applied to working memory for price information, constitutes for approximately 13 syllables (e.g. "forty-one Euros") for English-speaking consumers (Vanhuele et al., 2006). Prices that contain more syllables do not fit into the phonological loop and thus are remembered worse. As a result, Vanhuele et al. (2006) assert that each extra syllable in a price decreases its chances of being recalled by about 20%.

Consequently, the disability of recalling the price (stage 4 in 2.1.) influences the consumer's response to the price (stage 5).

Consistent with extant research described above, we predict that the length of the price information will influence the encoding process, and as a result, alter the anchoring effect. Thus, we hypothesize that the (1) price length moderates the relationship between price pronunciation order and value perception of the sale, and (2) two long prices will not be remembered due to limited capacity of the phonological loop, resulting in absence of anchoring effect and higher evaluation of the situation when the sale (lower) price is presented first and thus remembered.

H2 a. *When both prices are short, the usual price pronounced first leads to a higher value perception of a sale and subsequent purchase intention.*

H2 b. *When both prices are long, the sale price pronounced first leads to a higher value perception of a sale and subsequent purchase intention.*

In addition to this, we can observe an interesting effect when two prices do not match in length. Coulter et al. (2012) found that price length pronunciation influences price magnitude perception. That is, the same price pronounced differently can induce different responses from consumers. For instance, the pronunciation of a four-digit price as a combination of two two-digit numbers (e.g., "fifteen forty-six") rather than thousands (e.g., "one thousand four hundred forty-six") leads to the lower price perception and higher purchase intention in the first case. Alternatively, the inclusion of cents digits (e.g., 15 EUR and 15.05 EUR) in a price's Arabic written form influences the length of verbal price representation in consumer's memory, resulting in higher price magnitude assessment as well. This effect is explained by price syllabic length – more syllables lead to longer processing time, which leads to greater magnitude perception (Coulter et al., 2012).

Thus, according to these findings, we predict that (1) when the usual price has more syllables than the sale price, the usual price is perceived higher than it is, thus intensifying the positive sale evaluation due to the anchoring effect. However, (2) when the sale price has more syllables than the usual price (e.g., the usual price – 29 EUR and the sale price – 25.30 EUR), despite the sale price being lower than the usual price, it can be unconsciously perceived to be of the same or even higher magnitude than the usual price. In this case, we expect that the price pronunciation order will not make a difference since the anchoring effect will not take place.

H2 c. *When the usual price is long and the sale price is short, the usual price pronounced first leads to a higher value perception of a sale and subsequent purchase intention.*

H2 d. *When the usual price is short and the sale price is long, the value perception of a sale and subsequent purchase intention are not affected price pronunciation order.*

The conceptual model of the study (illustrated in Figure 2) provides a summarized visualization of all the hypotheses in this study.

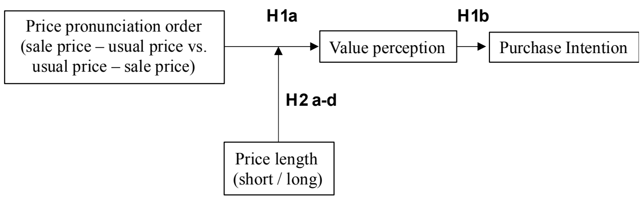

Fig. 2. Research Conceptual Model

To test the proposed hypotheses H1 and H2, and thus to evaluate the impact of the price pronunciation order on purchase intention, we conduct two studies. Study 1 targets to test H1, and Study 2 – respectively H2.

The general research design is the following: (1) subjects participate in an experiment that mimics half an hour preparation of the meal in a circle of new acquaintances, being at some point exposed to the proposition to purchase one grocery product on sale through the smart speaker, (2) during the experiment, subjects are provided with computer tablets on which they see questions corresponding to the stage of the experiment and are asked to reply to each of them. Participants are asked with different non-study related questions (described in “3.4. Experiment procedure” part) to distract their attention from the locus of the experiment – questions on the sale value perception. Upon the completion of the experiment and data collection, we run statistical tests to examine the proposed relationships.

The experimental study design is widely implemented by researchers both in pricing and numeric processing areas (e.g. Coulter et al., 2012; Vanhuele et al., 2006). Even though laboratory experiments have lower ecological validity relative to field studies, we prioritize initially reaching high internal validity to prove the hypothesized connections. In addition, a laboratory experiment allows for better control for confound variables which can influence individual’s decision on purchase intention (e.g., the volume of the speaker, individual’s internally stored information on exact product price based on previous purchases, ability to look up the price on the phone/another digital device, and other distraction which can occur during real-life situations).

Study 1 and Study 2 have the same experimental procedure, the only differences between them are the (1) order of the experiment – Study 1 is conducted initially to serve as a proofing basis for Study 2 that anchoring effect works in this situation, and (2) number of groups participating in the study. For Study 1, we use 2 groups (the sale price pronounced first vs. the sale price pronounced second), while for Study 2 we use 6 groups – 2 groups to test each respective hypothesis H2 b-d. To test hypothesis H2 a, the data from Study 1 can be taken. We use a between-subjects design with random assignment across conditions rather than within-subject one to avoid (1) possible storage of price information from the previous experiment in participant’s mind and thus acting as a confound variable and (2) participants’ guessing of the reason of the experiment and making biased responses.

In this part, by “stimuli” we consider auditory material of price pronunciation used during the experiment. To control for the tempo, volume, and tone of the speech, we record one person pronouncing prices for all scenarios. Later, using a special software, we apply a filter on the voice to make it sound as an actual voice assistant (Siri, Alexa, or Google assistant) to make the experiment more realistic.

While developing “voice scenarios”, we also control for other words used in the recordings in order not to differ two situations (the sale price pronounced first vs. the sale price pronounced second) on anything rather than actual prices.

It was proven than other semantic cues such as “compare at” or “was X, now X” can also influence purchase decisions (Grewal et al., 1996), hence needed to be controlled for. Thus, we use two identical grammatical structures in both price order pronunciation situations.

To be consistent with Hypotheses, each scenario requires a precise evaluation of the number of syllables contained within the price (e.g., “thirteen” stands for 8 syllables while “twenty-five” stands for 10 syllables). Moreover, besides syllables control, we also need to account for discount depth and maintain it on the same level in all scenarios, since it was proven to be another factor responsible for the sale attractiveness (e.g., Biswas et al., 2013). Based on these restrictions, we chose “27 and 23” to be short numbers (both constitute for 11 syllables, 16 syllables with “krone” currency) and “27.35 and 23.35” to be long numbers (21 syllables and 10 syllables for “krone” and “cents”, totaling in 31 syllables) for the experiment.

In the experiment, we use an “Organic Coconut Chips” as a product to be purchased since it (1) falls within grocery category, which is the most commonly voice-shopped category (20%) (Jordan, 2019), (2) applicable to our experiment scenario of cooking, (3) is not commonly purchased product the price of which participants remember and can retrieve from the memory. However, we also conduct a pre-study to prove the last assumption. As a currency, we use Norwegian kronas since (1) it is the currency of the country of respondents, and (2) the prices in this currency are expressed in higher digitals than in EUR or USD (e.g. 11 kronas is 1 Euro), allowing for more space in syllables manipulation on small items such as grocery products. The full script for voice-recordings which are used to play through the smart speaker during the experiment is given in Appendix 1.

For 8 experiments within the study – 2 (the first vs. the second sale price order pronunciation) * 4 (total number of different scenarios – H2a-d) – we recruit 800 participants through BI Norwegian Business School university internal communication systems, leading to 100 participants per 1 experimental group.

This number satisfies the minimum requirement of 97 participants per experiment for the selected population size of 2.5 billion people (the approximate current number of smart speaker users) with the standard Confidence level of 95% and Margin of error of 10% (SurveyMonkey, 2020).

Each month, the School conducts a BI-dinner – a free dinner for all students, prepared by student-volunteers themselves. To ease the recruitment process, we attract participants on the grounds of them volunteering for BI-dinner (or another food-related event) preparation. We target to have equal gender representation in the sample, with students coming from diverse countries. This sampling method does not account for different ages and incomes. However, the main smart speakers' voice-shopping users are millennials from middle- to high-income families (Jordan, 2019; Yeshchenko, Koval, Tsvirko, 2019), which are represented in our sample. Thus, we consider that this sample is generalizable to the rest of the population.

As a cover story, participants will be told that the university is considering the new design of the dinner area at the 7th floor in BI Norwegian Business School Oslo campus building, and thus needs help from them to evaluate the current area on the lighting, layout, sound propagation ability and aesthetics of the area. Lightning, layout, and aesthetics parameters are non-study related variables used to distract participants' attention, while by asking to concentrate on the sound propagation in the room we make sure that participants pay attention to information coming from the smart speaker during the required moment of the experiment. The setting of the experiment is the following. Participants are invited to the half an hour preparation of BI-dinner, previously notified that they will be asked to fill in a questionnaire on dinner area attributes. In the middle of each cooking table, we place a smart speaker, which plays music during most of the experiment and helps conduct the act of voice-shopping during the target part of the experiment. Each participating sub-group consists of 5 experiment participants and 1 experiment coordinator. This number was chosen to maintain the intimacy of the collaboration between participants (replicates a usual situation of dinner preparation with friends), while allowing clothe access to the smart speaker in order to properly hear the price information at the required moment.

When participants enter the room, we distribute them with computer tablets, notifying them that coordinator will let them know when any questions will appear on the screen so they can respond to the questionnaire, and informing that the data is used only in its aggregated form, ensuring anonymity and confidentiality of personal data in accordance with GDPR and NSD regulations. Then, participants start cooking, replying to the random dinner area-questions during the experiment. This request is followed by one of the voice-recordings written in Appendix 1. After this act, the questions on the sale price perception and purchase intention appear on the device tablets screens. The experiment coordinator justifies these questions specifying that they indirectly assess sound propagation in the room through psychological effects.

By organizing the experiment this way, we target to maximize the ecological validity of the experiment and generalize the study results on other voice-shopping settings, thus reaching external validity.

The questionnaire will be developed using Qualtrics software since it is a convenient tool for survey development and allows for direct data collection for further analysis. This type of Likert scale is commonly applied in marketing literature to measure attitudes and has an advantage of easiness in construction, administration by researchers, and understanding of questions by participants.

It provides a quantitative (rather than binary Yes/No) data that can be further analyzed in more detail with relative ease. However, worth noting that the Likert scale has an ordinal scale and the commonly spread practice of comparing means based on this scale is disputable since the intervals between values cannot be presumed equal (Malhotra, Nunan, & Birks, 2017).

Further elaborating on the questionnaire, questions on lighting, layout, and aesthetics of the area are adopted from the previous study on customer experience in hospitability industry (Ruy & Han, 2011), while the "sale value perception" and "purchase intentions" items are adopted from the previous study on consumer evaluations of sale prices (Biswas et al., 2013).

Thus, the internal consistency reliability of the questions has already been tested using Cronbach's alpha parameter and has been proved to be of the appropriate level. Lastly, in addition to these context-related questions, we include two attention checks questions and the question on the questionnaire purpose in order to control for random box-checking and exclude responses which guessed the study reasons from further analysis.

First, to test the H1, we run t-test to observe if acquired results of "value perception" and "purchase intention" in two situations (the sale price pronounced first vs. the second) are statistically different from each other. Second, to test H2, we use ANOVA 2*4 analysis to observe for any interaction effect between the order of price pronunciation and price length. Based on hypotheses, we predict that the highest sale value perception and purchase intention will be among respondent from the group which heard the long usual price first, followed by the short sale price.

Conclusions. From a theoretical standpoint, this study contributes to two literature streams: (1) marketing literature on pricing and (2) the psychological literature on numerical cognition. In the pricing area, the findings of the study further support and shed light on the application of the anchoring effect during purchase decisions. The study taps into the area of conscious and unconscious comparisons with price anchors and helps to reconcile previous researches who found different effects of price anchors on willingness to pay for the product or service (e.g., Adaval & Wyer, 2011). In addition, the study provides novel insights regarding pricing decisions in "auditory" rather than "visual" domain, laying a foundation for further exploration of this area.

From a numerical cognition literature perspective, the study offers a further understanding of the psychological underpinnings of price perception – a developing area of interest for researchers (Saini & Thota, 2010). In particular, the study combines the literature on information encoding (Triple-Code Model by Dehaene, 1992) and the architecture of working memory (Baddeley's Model of Working memory by Baddeley and Hitch, 1974). The findings help to understand the 5 stages of the numerical cognition process, which influences the processing of the sale price and subsequent sale evaluation and purchase decision.

From a managerial perspective, study results offer valuable insights for managers involved in product pricing decisions and marketing of the products/services via digital devices. Firstly, the study helps to understand the sale promotion techniques that should be used during selling via a voice-assisted smart device – when the sale price should be pronounced prior to the usual price, and when after the usual price. Secondly, managers can gain insights for pricing decisions of products sold through smart speakers – what should be the price length, and how many "cents" digits it is more profitable to include in it. Lastly, despite the study being focused on the comparison of prices within one product, since smart speakers give only 2-3 options in the "audio" list to choose from (Dawar & Bendle, 2018), it can provide information on competitive positioning with other product providers. The underlying logic of pronouncing the company's product before/after competitors' can be the same as during the sale promotion.

In this study, we test the impact of only one sale price combination on sale value evaluation and subsequent purchase intention. However, sale price evaluation can also be influenced by discount depth. It was established that consumers prone to engage in sale volume calculation only when the discount is moderate (approximately 30%) because the perceived value is uncertain (Grewal, Marmorstein, and Sharma 1996). When the discount is low, consumers generally assume that it is on the level of 10-12% (Blair and Landon, 1981), and when the discount is high, consumers automatically evaluate the sale positively due to apparent difference in price (Grewal et al., 1996). Order of price pronunciation can impact the propensity to calculate discount depth and trigger other numerical cognition processes. For instance, the usual price pronounced first may foster subtraction effect (i.e. calculation of the difference between the usual price and the sale price) and thus be beneficial for moderate sales (Biswas et al., 2013). At the same time, the sale price pronounced first might not trigger the subtraction effect and thus have a different impact on sale evaluation.

In addition, further research can test the hypotheses proposed in the context of the different language groups. The assumptions of phonological loop lengths and price magnitude perception were made based on the English language structure (Vanhuele et al., 2006). However, in other countries numbers can be pronounced differently and thus intensify or diminish the strength of the proposed price length moderation effect. For instance, in German language, double-digit numbers are pronounced in a reverse way to English – units go in front of tens (e.g., 21 stands for "ein und zwanzig" – "one and twenty"). At the same time, Slavic languages (e.g., Ukrainian, Russian, Serbian) do not imply a possibility to pronounce four-digit numbers as a combination of two two-digit ones (e.g., 1568 cannot be articulated as "fifteen, sixty-eight"), and Chinese speakers articulate the hundreds, tens and units position of the number (e.g., 21 is pronounced as "two-ten-one").

Lastly, to verify the external validity of the study, further research can replicate the study in a real-life setting, using actual purchase data. For instance, the further research can be conducted in cooperation with an existing retailer or ideally with the smart-speaker provider (e.g., Amazon, Google or Apple) during which researches could manipulate the order of price pronunciation in usual purchase settings (i.e. consumers homes) and directly conclude consumer reaction based on the number of purchases in both situations.

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