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User Preference Analysis of a Sustainable Workstation Design for Online Classes: A Conjoint Analysis Approach

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Abstract: The impact of the COVID-19 pandemic has caused the sudden shift of the interactions between students and teachers from the four corners of the classroom to fully online learning through the workstations. By using a conjoint analysis approach, this study aimed to evaluate the preference of undergraduate students from the Philippines on the workstation design attributes during the pandemic. Seven attributes were examined through orthogonal design: the type of gadget, keyboard, mouse, earpiece, desk, kind of chair, and light device. Through a purposive sampling approach, a total of 315 undergraduate students from the Philippines were gathered. Through an online survey with two holdouts, the respondents voluntarily responded to 51 stimuli produced by IBM SPSS using a 7-point Likert scale. Type of gadget (37.925%) was found to be the most significant attribute preferred by the students, followed by the type of mouse (28.345%), kind of chair (14.840%), type of keyboard (7.548%), earpiece (7.177%), light device (2.109%), and desk (2.056%). It is worth noting that the preferred workstation design combination is the personal computer, mechanical keyboard, wired mouse, headset, height-adjustable table, high-back office chair with neck support, and floor lamp. This study is the first to use a conjoint technique to examine undergraduate students' preferences for workstation design attributes during the COVID-19 pandemic. Finally, by applying the attributes and design developed in this study, the conjoint method can be used and expanded to evaluate the workstation design attributes of other courses and even employees worldwide.

Keywords: workstation design; online classes; user preference; conjoint analysis

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1. Introduction

Due to the impact of the COVID-19 pandemic, universities across the world were prohibited from conducting face-to-face classes and were mandated to have online learning set up to resume the curriculum [1,2]. With the sudden shift to e-learning back in 2020 as a response to the escalating active cases of COVID-19, students were not prepared in the first few months of the lockdown [3]. This shifting has introduced new challenges, causing instructors, students, and parents to become more stressed [4]. Two years into the COVID-19 pandemic, people were left with zero options and were resilient as they managed to adjust to the remote learning and work-from-home setup. Taking the Philippines as an example to represent one of the third-world countries, Magsambol [5] forecasted a total of 44,609 state university and college students who would not enroll for the academic year 2020–2021 due to several reasons such as lack of gadgets, no proper workstation setup, financial problems, and fear of contamination. On the same grounds, as of late 2020, 13% or 4.4 million school-age Filipinos did not enroll that year, wherein 1.7 million were aged 18–20 [6].

However, as face-to-face classes were yet to be seen at that period, students and their parents started purchasing gadgets and workstation equipment to adapt to the new learning setup [7]. Flores [8] reported that in the recent survey conducted by Social Weather Stations (SWS), 58% of enrolled students were able to acquire the required gadgets for an

online class, 27% of them had their equipment, 12% had purchased their own, 10% had borrowed, 9% were given, and 0.3% were rented. Furthermore, 79% of those who bought or rented equipment for distance learning got a smartphone, 13% got a desktop or laptop, 5% got a TV, and 3% received a tablet. In addition, Ziady [9] reported that online sales of furniture companies such as IKEA surged up to 45% during the pandemic as people converted and made a workstation for online classes and work tasks in their houses.

Consequently, the definition of a workstation for students changed due to the current setup. A workstation for online classes is an area in the students' houses that allows them to attend courses virtually and accomplish school tasks. Obeidat and Al-Share [10] mentioned that during online learning, the interactions between students and instructors take place in the workstation, which serves as the location for teaching and learning activities related to design. Not only does the effective interior design of the workstation improve the functionality of such a learning environment but it also boosts the confidence of the individuals who will be participating in the teaching and learning process. Having a separate workstation for online classes alone benefits students because it increases their productivity and satisfaction staying indoors while attending classes, resulting in reduced perceived academic stress and mental health issues [11,12]. However, various attributes and considerations must be considered when designing an efficient and effective workstation for students, especially since they have different situations at home. The attributes of a workstation are the type of gadget used, kind of keyboard, mouse, and earpiece, type of desk and chair, and light device, as these objects are commonly used by students and significantly affect their performance [13,14].

In developing countries, the online learning setup became quite a challenge among students and faculty members. Prasetyo et al. [15] considered the evaluation of online learning platforms during the COVID-19 pandemic through an extended technology acceptance model and the Delone and McLean IS success model. It was seen that the perception of usefulness and perceived ease of use were primary factors for students to accept and utilize a specific platform. Students highlighted that the overall usability of platforms would provide the ease of utility to help them perform better during online learning. In India, Bast [16] presented how the perception and preferences of students would be affected based on where they were residing. Similarly, Muthuprasad et al. [17] explained that students in India preferred smartphones for their online learning education. However, Ong et al. [18] showed such challenges as laboratory activities that cannot be fully accomplished and appreciated during online learning. In addition, Pradana and Syarifuddin [19] highlighted the challenges of online learning in Indonesia. Their study showed how insufficient access to online teaching and learning were evident: most importantly, learning facilities, equipment, and students' study place were not available and inefficient. This provided a basis for challenges in the online learning setup that affects student's learning.

In the Philippines, Ong et al. [20] utilized conjoint analysis to assess the preference for online education among industrial engineering students at various educational levels during the COVID-19 pandemic. However, the attributes used in the study included only students' preference for online delivery of classes, including the delivery type, interface template, term style, final requirement, use of Coursera, practice sets, and delivery platform. Similarly, Ong et al. [21] also used the same methodology to determine senior high school students' preference for online learning, which focused only on six attributes: delivery type, assigned tasks, evaluation, use of virtual laboratory, interface layout, and delivery platform. However, the various attributes identified have their levels, offering the same function but different utilization, efficiency, and comfort that affect the students' preferences.

Students' preference for their workstations influenced their intent to purchase the attributes mentioned. Considering what the students prefer is one approach to assessing their satisfaction and engagement during online classes. Cakiroglu et al. [22] revealed that considering the students' preferences positively motivated them and related to their academic achievements. Likewise, a convenient and user-fit workstation design is essential to creating a stress-free, task-efficient, and comfortable place for students to study [11,12,23].

Supporting this, Xiao et al. [24] discovered an association between the chance of developing new health problems during the pandemic and having an adjustable workstation setup. As technology has progressed over the past few decades, the workstation setup considerably caters to users' convenience, further shaping how people and society develop [25]. In addition, ergonomics was brought into the picture, ensuring a suitable fit in terms of comfort and safety among humans and their tools [26]. Disregarding ergonomics could lead to designs that are uncertain to be economically successful because they do not cater to the users' needs. According to Mohamed Makhbul et al. [14], a non-ergonomic workstation can cause stress to a person. Nirmal et al. [27] discovered that online education has ergonomic concerns; hence, students and teachers should arrange for adequate interventions such as proper setup, equipment, and breaks to ensure health and safety.

Multiple studies on workstation design have emerged in the past months due to the developing health and social risk to students and office workers during the pandemic. However, past researchers mainly focused on evaluating the different equipment used during online classes and proposing ergonomic designs for desks, chairs, keyboards, mice, etc., to mitigate the risks separately. Despite the availability of studies about workstation design, there is insufficient literature focusing on the workstation design preference based on students' perspectives and experiences. In the Philippines, a study conducted by Jajoo et al. [13] focused on analyzing the current setup of work-from-home employees and designing a comfortable office workstation. Their results showed that adjustable chairs and tables are necessary to promote comfort and work efficiency. Furthermore, illumination through a table lamp, light-painted walls, and a comfortable temperature through a portable fan will also affect their work.

Since considering the students' preferences during online classes significantly affects their performance, this study utilized a conjoint analysis approach. Conjoint analysis is a standard method used in market research to determine the consumers' and users' decision-making regarding their preferences [20,21]. Despite the insufficient literature utilizing the conjoint analysis to measure the students' preferences on their workstation setup during online classes, few studies evaluated the students' preferences regarding online learning. Given this, no previous studies have used a conjoint analysis method to examine user preferences for workstation design during the COVID-19 pandemic.

Utilizing a conjoint analysis approach (CAA), this study aimed to determine the combination of workstation design attributes most preferred by undergraduate students in the Philippines during online learning only. In particular, the present study considered seven attributes: type of gadget, keyboard, mouse, earpiece, desk, chair, and light fixture. CAA with orthogonal design was used to evaluate the users' preference for the workstation design. Lastly, the study further examines the specifications (attributes) and levels to elaborate on the preference of students in online learning workstation design.

As a result, the present study recommends a convenient workstation design based on the users' preferences. The results also give leverage to the marketing strategy of gadget developers, business owners, and retailers, since they will be able to recognize and understand which attribute of a workstation design the users value, among others, as well as the significance of each attribute on their decision-making [21]. Business owners need to understand their customers' purchase intentions and match their preferences to help the business competitively to stay in the market. Finally, the study's findings may be utilized by students, teachers, and employees in the same online setup, globally, even in a post-pandemic setup, as universities are offering at least blended or even fully online setup.

2. Methodology

2.1. Conceptual Framework

As seen in Figure 1, four phases were used to achieve the objectives of this study. Initially, the researcher determined the attributes and levels of a workstation design through related literature. Next, the researcher generated the stimulus or combinations of levels per attribute by utilizing the orthogonal design in SPSS. After that, the respondents evaluated

each combination presented to them through an online questionnaire as the study's data gathering. Through preliminary runs, 150 random samples were obtained to validate the combinations considered. A Pearson correlation value of 0.90 was obtained and found to be valid [20,21]. Full dissemination of the questionnaire using a 7-point Likert scale was conducted.

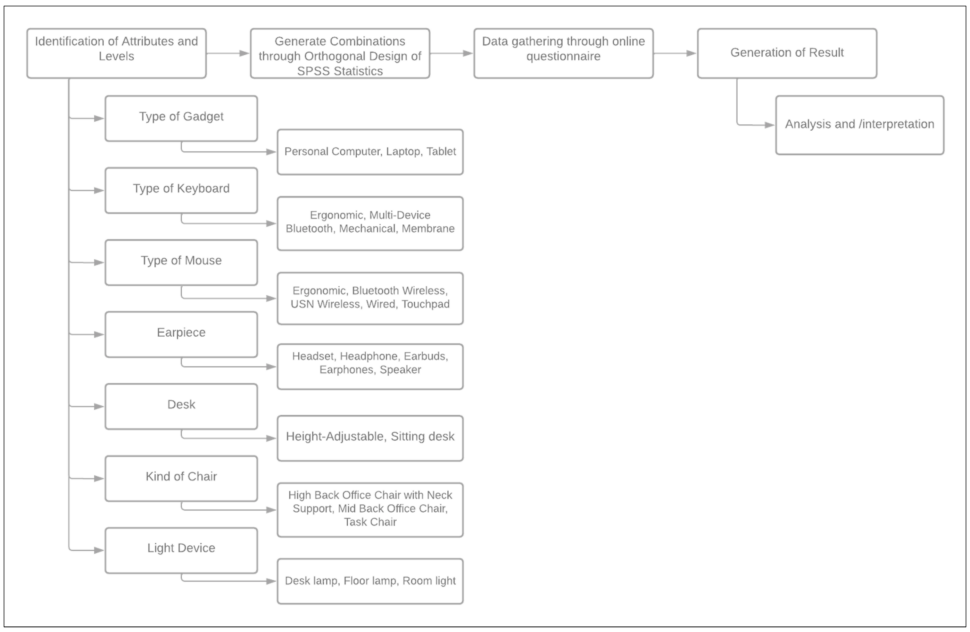

Figure 1. Conceptual Framework.

2.2. Data Gathering

This study aimed to accumulate data from users of workstations during online classes, particularly the undergraduate students in the Philippines, regardless of their course. The target respondents were undergraduate students, because they are the group who spend more time in their workstations due to numerous online activities, such as discussions, meetings, online presentations, and tasks [28,29]. In the Philippines, undergraduate students are usually 18 to 26 years old [30]. Female and male groups of undergraduate students' anthropometric measurements do not have significant differences [31], which is favorable in developing an ideal workstation design for the said group level. Hence, only 18- to 26-year-old undergraduate students were considered for this study.

As cited in the study of Li and Wang [32], the minimum sample size required in conjoint analysis research is 75. Based on that, the study required at least 315 participants to rate the stimuli generated by SPSS 25. Furthermore, due to the COVID-19 pandemic, the responses were obtained through online survey using Google Forms dispersed through various social media platforms, as Sethuraman et al. [33] recommended. The questionnaire was open from April 2022 to May 2022 to give ample time to students to answer the online survey. Using a purposive sampling approach, the survey was intended for undergraduate students who were currently enrolled through online learning. Lastly, since Filipino undergraduate students were the target respondents, data collection was conducted in the Philippines and not restricted to a single geographic area.

2.3. Demographics

Through purposive sampling, 315 Filipino undergraduate students participated in this study. As seen in Table 1, most respondents were aged 20–21 years (65.40%), 39.37% were male, 58.41% female, and 2.22% preferred not to mention their gender. Furthermore, most of the respondents were located in National Capital Region (NCR) (44.44%) and Calabarzon (Region IV-A) (40.00%). In sum, 76.83% were enrolled in a private school and 23.17%

in a public school. The courses of the respondents were engineering (45.71%), business (17.78%), social sciences (13.33%), health sciences (11.11%), architecture and design (6.35%), formal sciences (1.59%), natural sciences (0.95%), public administration (0.95%), agriculture (0.63%), media and communication (0.63%), humanities (0.32%), education (0.32%), and transportation (0.32%). Most of the respondents' height (in cm) ranged from 155.76 to 170.50 (51.11%), and 141.00 to 155.75 (30.16%). Lastly, most of the respondents' weight (in cm) ranged from 36.00–57.00 (48.57%), and 57.01–78.00 (40.32%).

Table 1. Demographics.

Respondent's Profile	Category	N	%
Gender	Male	124	39.37
	Female	184	58.41
	Prefer Not to Say	7	2.22
Age	18–19	22	6.98
	20–21	206	65.40
	22–23	80	25.40
	24–26	7	2.22
Location	Ilocos Region (Region I)	4	1.27
	Cagayan Valley (Region II)	5	1.59
	Central Luzon (Region III)	26	8.25
	Calabarzon (Region IV-A)	126	40.00
	Mimaropa Region	3	0.95
	Bicol Region (Region V)	5	1.59
	Central Visayas (Region VII)	2	0.63
	Zamboanga Peninsula (Region IX)	1	0.32
	Northern Mindanao (Region X)	2	0.63
	National Capital Region (NCR)	140	44.44
	Cordillera Administrative Region (CAR)	1	0.32
Educational Level	Undergraduate	315	100.00
Type of School	Private School	242	76.83
	Public School	73	23.17
Course	Humanities	1	0.32
	Social Sciences	42	13.33
	Natural Sciences	3	0.95
	Formal Sciences	5	1.59
	Agriculture	2	0.63
	Architecture and Design	20	6.35
	Business	56	17.78
	Health Sciences	35	11.11
	Education	1	0.32
	Engineering	144	45.71
	Media and Communication	2	0.63
	Public Administration	3	0.95
	Transportation	1	0.32
Height (in cm)	141.00–155.75	95	30.16
	155.76–170.50	161	51.11
	170.51–185.25	56	17.78
	185.26–200.00	3	0.95
Weight (in cm)	36.00–57.00	153	48.57
	57.01–78.00	127	40.32
	78.01–99.00	28	8.89
	99.01–120.00	7	2.22

2.4. Conjoint Design

Table 2 presents the attributes and levels of a workstation design for online classes usually considered by the users. Specifically, the study considered seven attributes, namely, type of gadget (personal computer, laptop, or tablet), type of keyboard (ergonomic keyboard, multidevice Bluetooth keyboard, mechanical keyboard, or membrane keyboard), type of mouse (ergonomic mouse, Bluetooth wireless mouse, USB wireless mouse, wired mouse, or touchpad), earpiece (headset, headphone, earbuds, earphones, or speaker), desk (height-adjustable table or sitting desk), kind of chair (high-back office chair with neck rest, mid-back office chair, or task chair), and light device (desk lamp, floor lamp, or room light).

Table 2. Attributes and Levels of Workstation Design.

Attributes	Levels
Type of Gadget	Personal Computer, Laptop, Tablet
Type of Keyboard	Ergonomic Keyboard, Multidevice Bluetooth Keyboard, Mechanical Keyboard, Membrane Keyboard
Type of Mouse	Ergonomic Mouse, Bluetooth Wireless Mouse, USB Wireless Mouse, Wired Mouse, Touchpad
Earpiece	Headset, Headphone, Earbuds, Earphones, Speaker
Desk	Height-Adjustable Table, Sitting Desk
Kind of Chair	High-Back Office Chair with Neck Rest, Mid-Back Office Chair, Task Chair
Light Device	Desk Lamp, Floor Lamp, Room Light

The attribute type of gadget refers to the electronic device the students primarily use to attend online classes and perform their tasks. Emerson et al. [34] identified desktop or personal computers, laptops, and tablets as essential tools for communication and task-making of users. Several studies have found that different technological aspects of the type of computing facilities, such as gadgets, can affect student performance, which suggests that differences in the gadgets available to students may be significant. According to Ong et al. [21], students found that testing devices with larger screens were easier to read. In a study conducted by Prasetyo et al. [15], the researchers discovered differences in the levels of performance on online tests achieved by various devices in at least one state. Furthermore, the intention of students to purchase a particular gadget to utilize for an online class depends on three factors: financial capability, availability of the product, and preference [34]. Thus, the type of gadget significantly affects the students' school performance, since they have different technological capabilities.

The second attribute, the keyboard type refers to the students' device to directly input data or text into their gadget [35]. According to Ling [36], users' familiarity and proficiency with a particular type of keyboard could affect their efficiency and performance on their tasks. This is because the degree of familiarity with the keyboard or other input devices used in the assessments may affect the speed and accuracy of answering questions. It has also been discovered in prior studies that familiarity with computers, which includes knowledge of and experience with the input device, affects writing performance [37,38]. Thus, the type of keyboard students use during online learning significantly affects their efficiency, accuracy, and effectiveness in writing assessments. The present study considered four levels: ergonomic keyboard, Bluetooth keyboard, mechanical keyboard, and membrane keyboard or the standard desktop keyboards as the type of writing device during online learning. These keyboards may have the same function, but differ in providing efficient key layout, typing comfort, and convenience to users, affecting their work efficiency.

Furthermore, like a keyboard, a mouse is a primary tool in a workstation to input data to a computer, which is why it is considered the third attribute in this study [35]. According to prior studies, the student interaction data, especially mouse movement data, could help better model and understand students' learning behaviors [39,40]. Mouse movement trajectories, which include the mouse interaction timestamp, mouse event type, and mouse

coordinates, can predict student performance in interactive online question pools, as stated by Wei et al. [41]. In the present study, two types of mouse attributes were identified: wired and wireless. However, according to Betts [42], various improvements in mice concerning convenience and efficiency have emerged in the last few years, yet they were not subjected to study. These levels include an ergonomic mouse, Bluetooth wireless mouse, USB wireless mouse, and laptop touchpad. Thus, these levels were used for the mouse attributes in the study.

The fourth attribute, earpiece, refers to the aural device usually plugged into a speaker port. The students use this to listen and communicate during online classes. Kozlowski's [43] study mentioned that hearing device affects the user's productivity since they have different acoustic signal values. According to Tangkiengsirisin and Kalra [44], the earpiece used for online learning can affect the learning process and students' social presence. Additionally, the earpiece can be a communication medium, which would affect the quality and effectiveness of the communication during online learning. In the present study, the levels identified for this attribute are the headset, headphones, earbuds, earphones, and speaker.

The desk is the fifth attribute considered in this study. This refers to the particular table the students set up their devices. According to Emerson et al. [34], the desk's height affects the overall performance of the users, especially if it is not fit for them. In a study that was carried out by Shen et al. [45], the authors investigated the effect of ergonomic desk design on the improvement of motor accuracy in the writing performance of students. The design and dimensions of furniture, such as desks, have been shown to affect the students' physical responses and their performance in a study conducted by Castellucci et al. [46]. It was determined that one of the most critical factors in improving the physical responses of some students was ensuring that the dimensions of the students' furniture were compatible with the students' anthropometric characteristics. The use of high furniture, sit–stand furniture, and tilt tables and seats are all design dimensions that contribute to positive effects. Therefore, the kind of desk that students use when they are engaged in online learning demonstrates a positive impact on their performance as well as their physical responses. Two levels of desk attributes are considered for this study: height-adjustable table and sitting desk.

"Chair" refers to the furniture on which the students sit during online classes. There have been studies done on student seating from a variety of viewpoints. One of the areas of emphasis is seating preference, which focuses on the reason students choose specific seats and how this choice affects their performance [47]. Similarly, the study conducted by Gumasing et al. [26] discovered that workstation design featuring comfortable chairs, tiered seating, and appropriate lighting resulted in higher levels of overall student satisfaction. Emerson et al. [34] also mentioned that chair height and material are fundamental factors to consider when purchasing the equipment since they can increase pressure on the user's popliteal space is too high or the lower back too low. Thus, the identified levels of computer chairs used in the present study included high-back office chairs with neck rest, mid-back office chairs, and task chairs, following the study of Gumasing et al. [26].

Lastly, the type of light fixture is the seventh attribute considered in the present study since lightning affects the contentment and productivity of students while executing their school tasks [13]. The lighting system has been shown in previous research to benefit the students' ability to concentrate. Consequently, emphasis on how essential proper lighting is to the educational process has been studied [48]. A study conducted by Singh et al. [49] also found that lighting had a significant impact on the students' ability to concentrate and their overall performance. Illumination levels ranging from 250 to 500 lux were associated with higher levels of student concentration, resulting in higher test scores and improved overall performance. In most cases, research on illumination has focused on how different lighting conditions affect the performance of various tasks. However, in the present study, students' preferences regarding lighting levels were investigated, taking into account a wide range of human responses to lighting, such as comfort, aesthetics, and performance.

Thus, the levels considered for lighting attributes in the present study are desk lamps, floor lamps, and room light.

2.5. Statistical Analysis

Through the orthogonal design of the SPSS Statistics software, the study generated stimuli or a set of combinations of the considered levels per attribute in the study. The orthogonal design was used to ensure a manageable quantity of stimuli. Initially, the software generated an optimal amount of 49 stimuli, to which two holdout cases were added to verify the accuracy of the results. By comparing how effectively conjoint utilities estimate outcomes from the holdout cases, the internal validity of the conjoint task was assessed [50]. The participants were presented with 51 stimuli (Appendix A) that were evaluated by a 7-point Likert scale, with 1 representing "strongly disagree" and 7 representing "strongly agree".

3. Results

Table 3 presents the utilities and the average importance score among the attributes of workstation design for online classes. According to Hair et al. [51], the utility estimates signify how much a user values a particular level of attributes, while the importance score indicates how important an attribute of a workstation design is to a user. The greater the influence on user preference, the higher the utility estimate and importance score.

Table 3. Utilities and Average Importance Scores.

Attributes	Preference	Utility Estimates	Std. Error	Average Score of Importance
Type of Gadget	Personal Computer	0.401	0.030	37.925
	Laptop	0.273	0.033	
	Tablet	−0.673	0.033	
Type of Keyboard	Ergonomic	0.008	0.038	7.548
	Multidevice Bluetooth	0.009	0.038	
	Mechanical	0.099	0.038	
	Membrane	−0.115	0.048	
Type of Mouse	Ergonomic	0.095	0.040	28.345
	Bluetooth Wireless	0.204	0.040	
	USB Wireless	0.170	0.052	
	Wired	0.131	0.052	
	Touchpad	−0.599	0.052	
Earpiece	Headset	0.134	0.040	7.177
	Headphones	0.014	0.040	
	Earbuds	−0.042	0.052	
	Earphones	−0.038	0.052	
	Speaker	−0.069	0.052	
Desk	Height-Adjustable Table	0.029	0.023	2.056
	Sitting Desk	−0.029	0.023	
Kind of Chair	High-Back Office Chair with Neck Rest	0.189	0.030	14.840
	Mid-Back Office Chair	0.042	0.033	
	Task Chair	−0.231	0.033	
Light Device	Desk Lamp	−0.009	0.030	2.109
	Floor Lamp	0.034	0.033	
	Room Light	−0.025	0.033	
(Constant)		4.793	0.027	

Based on the importance scores, results showed that the most significant attributes for users are the type of gadget (37.925%), followed by the type of mouse (28.345%), kind of

chair (14.840%), type of keyboard (7.548%), earpiece (7.177%), light device (2.109%), and desk (2.056%). Specifically, in the first attribute, type of gadget, the users preferred personal computer (0.401), followed by laptop (0.273) and tablet (−0.673). Second, mechanical (0.099) was most favored by the users within the type of keyboard attribute, succeeded by multidevice Bluetooth (0.009). Third, for mouse types, Bluetooth wireless obtained the highest utility score of 0.204, followed by USB wireless (0.170). Fourth, for the earpiece attribute, users desired a headset (0.134), succeeded by headphones (0.014). Fifth, within the desk attribute, users preferred a height-adjustable table (0.029) to a sitting desk (−0.029). Sixth, a high-back office chair with a neck rest (0.189) was most favored in terms of type of chair. Lastly, for light device, the floor lamp obtained the highest utility score of 0.034, followed by the desk lamp (−0.009).

The ranking of 51 stimuli evaluated by the respondents is presented in Appendix B. With a total utility score of 1.017, it is evident that combination 4 was the most preferred by the users. The attributes under this combination were a personal computer, mechanical keyboard, wired mouse, headset, height-adjustable table, high-back office chair with neck support, and floor lamp. On the other hand, it is observable that the users' least-favored combination was the workstation design in combination 2, with a total utility score of −1.356. This combination consisted of a tablet, ergonomic keyboard, touchpad, headset, sitting desk, task chair, and floor lamp.

Table 4 represents the validation of the results. Akoglu [52] used Kendall's tau and Pearson's R values to determine the reliability of the results and the relationship between actual and predicted preference. Values greater than or equal to 0.8 indicate strong and consistent results for each tool. Results showed that the Pearson's R-value obtained in this study is 0.978 (greater than 0.80) [32], which indicates a strong relationship between the actual and estimated preferences of the workstation users. Additionally, Kendall's tau value of 0.978 and Kendall's tau coefficient for holdouts of 1.000 denote internal consistency among the responses [20,21].

Table 4. Correlation.

	Value	Significance
Pearson's R	0.978	0.000
Kendall's Tau	0.901	0.000
Kendall's Tau for Holdouts	1.000	.

4. Discussion

The conjoint analysis of the different stimuli showed that the most preferred stimulus of a workstation design by undergraduate students was a personal computer, mechanical keyboard, Bluetooth wireless mouse, headset, height-adjustable table, high-back office chair with neck support, and floor lamp with a total utility score of 1.090. On the other hand, with a total utility score of −1.741, the least favored was a tablet, membrane keyboard, touchpad as the mouse, speaker, sitting desk, task chair, and floor lamp.

The type of gadget was the most significant attribute considered by the users, with an importance score of 37.925%. The most favored was a personal computer, whereas the least favored was a tablet. A workstation's primary feature includes the gadget, since it is the student's medium to attend classes and perform school tasks. Prasetyo et al. [15] discussed that using gadgets is one of the advances the education industry has adopted due to technological advancements for teachers and students. Supporting this, Marpuah et al. [53] discovered that gadgets play a vital function as a source of learning, enabling the learning process to be comfortable for students during online classes. In this case, it is better for the students to use a personal computer, which may be due to the processing power, physical size, and memory. This creates an effective and efficient learning process that increases student-learning outcomes.

Lade et al. [54] found that students have different opinions on utilizing other gadgets for an online class because these devices have additional technical capabilities and usability,

especially when students need to download various school-related applications. Although Ozok et al. [55] found that tablets are more versatile and portable for students to use, they also concluded that tablets have technical limitations and can compromise output quality. Hence, a personal computer or laptop is better used for heavy tasks, especially since most respondents were engineering students, who usually need applications for plate-making, coding, data analysis, etc. [56].

Next, the second-highest attribute influencing the users' decision was the type of mouse (28.345%). Users preferred Bluetooth wireless (0.204), followed by USB wireless (0.170), wired (0.131), ergonomic (0.095), and touchpad (−0.599). A mouse is another vital component in the workstation since it is utilized for data input [35]. Betts [42] stated that gadget developers took advantage of technological advancement to improve devices' convenience and efficiency, especially in an online setup. Consequently, many people now have access to seamless data transmission to several devices because of the Bluetooth feature [21]. Furthermore, it has become one of the favored approaches for wireless communications due to its versatility and effectiveness as a connectivity mechanism. Joshi et al. [57] stated that a mouse is more challenging when it contains additional electronics. These additional electronics may be extra buttons, additional weight, and wires that may tangle upon movement. Supporting this, Conroy et al. [58] found that users prefer a lighter mouse because their computer activities become faster and more accurate. An external mouse improves productivity levels and guarantees all-day comfort for users [59]. This could be supported by the result that users would not prefer the touchpad, which limits movement and navigation effectively.

The kind of chair was the third-highest attribute considered by the users (14.840%). The most preferred was the high-back office chair with neck rest (0.189), succeeded by the mid-back office chair (0.042), and task chair (−0.231). The chair is essential in a workstation design because this improves the students' concentration during online classes and task making [60]. A high-back office chair with a neck rest is considered ergonomic because it provides additional support to the upper-back area [61]. Al-Hinai et al. [60] found out that an ergonomic chair design is significant in ensuring students' comfort and proven usability. Students in an online class setup prefer ergonomic furniture because it lessens their stress and improves motivation [62]. Suzuki et al. [63] stated that poor ergonomics and posture due to inefficient chair designs could cause musculoskeletal discomfort to students, especially when seated for long hours. If not given intervention, this can further develop into other medical problems, particularly in the upper extremities. This further validates that students would not prefer a regular task chair.

Fourth, keyboard type was also an attribute considered based on the preferences of the consumer (7.548%), and the most valued type was mechanical (0.099), then multidevice Bluetooth (0.009), ergonomic (0.008), and membrane (−0.115). With a more significantly lower score compared to the top three attributes, keyboards are more of an extra device, but can still affect a student's productivity and efficiency. Like a mouse, a keyboard is an essential element in a workstation because this is utilized to enter data into the students' devices [35]. Mechanical keyboards are increasing in popularity among computer users because they enable faster typing and require less physical effort to activate the key switch due to the additional tactile and auditory feedback from the key-switch design [64,65]. The findings in the study of Pham and Kelling [65] demonstrated a statistical difference between flexor-muscle effort on a mechanical keyboard and a standard membrane keyboard. Considering the online class setup, a mechanical keyboard is preferred by students because it is easy to use, efficient, and aesthetically pleasing [66]. Usually, sounds upon typing and placement of a keyboard affect student's preferences in choosing this device.

With an importance score of 7.177%, the earpiece was considered the fifth-most important attribute evaluated based on user preferences. Valued the most under this category was the headset (0.134). On the other hand, the least favored were the speakers (−0.069). According to Kozlowski [43], since each acoustic device has varying acoustic signal values, it influences the user's productivity. Since their invention, headphones/headsets have

become a significant user audio device [67]. They outperform loudspeakers in terms of portability, privacy, and cost. Users prefer headphones, since they are designed to cover the earlobe or block the ear canal, effectively muffling outside noise [67], consequently, improving the students' focus and creating an immersive listening experience [68]. On the other hand, Zelechowska et al. [67] found that using speakers during online classes can result in increased self-consciousness and distraction. Hence, to improve the clarity of communication between the teacher and students during online courses, using a headset instead of the device's built-in microphone and speakers is a better option. This presents better input and output quality, especially when conveying communication between student and teacher.

The findings show that light devices and desks were the users' most minor value considerations, with importance scores of 2.109 and 2.056, respectively. Among the light devices, the most favored was the floor lamp (0.034), followed by desk lamp (−0.009) and room light (−0.025). To provide users with more suitable illumination, lights specifically designed for a working environment have increased in value in the market [69]. Jajoo et al. [13] and Singh et al. [49] showed that supplementary lights are substantial because they provide more illumination to the users, making them more focused. Hence, a floor lamp and desk lamp can affect the students' visual comfort and aids in increasing the students' productivity and satisfaction during online classes. At the same time, poor lighting conditions can have adverse effects on students [70].

Lastly, the least-considered attribute by the users was the type of desk, wherein a height-adjustable desk was favored over a sitting desk. Nevala and Choi [71] suggested that working in a sitting posture was less efficient and put more significant pressure on the workers' upper extremities than working in a standing posture. A height-adjustable desk allows the users to sit or stand depending on the situation that best satisfies their comfort. The height-adjustable workstation can lessen sedentary habits and inactivity in an online class [71,72]. Although Aschenberger et al. [62] stated that students prefer ergonomic furniture in an online setup, the findings of this study showed that the undergraduate participants valued the kind of chair more than the desk. This is because their upper extremities are more prone to musculoskeletal discomfort if there is no proper back support during the hours of sitting [27].

4.1. Practical Implications

The findings showed that the type of gadget and mouse significantly influenced the users' preference for a workstation design. Since the respondents are primarily engineering students, who usually need to download and utilize different software in classes, they considered the type of gadget, particularly personal computer, to be the most significant attribute. Due to its capacities, the gadget alone plays a crucial role in the students' learning process. Additionally, students' intention to purchase different gadgets can still be affected if gadget developers initiate a transformative technology that would benefit the gadget and the users. The second-most favored attribute was the mouse. This attribute influenced users' preferences because intensive mouse use has a proven relationship with increased risk of upper-extremity musculoskeletal disorders. Hence, a user-fit mouse must be given importance.

The results of this study can serve as a baseline in determining students' preference in workstation design, since this is the first study to determine workstation-design attributes during online classes. When preference is considered, this study may serve as a foundation for improving students' engagement. Since the findings present a business opportunity, gadget developers must take these into account. These attributes significantly influence the users' purchase decisions, so we recommend considering highly the different levels found from the results. Gadget and furniture sellers could grow their business if they evaluate the quality of the equipment they offer in relation to the students' preferences.

It is suggested that combinations of the different devices may be placed as displays among workstation industries to promote and highlight the resulting preferences among students. This will help buyers imagine their setup at home upon choosing several devices.

Placing moderately significant devices between highly significant devices may encourage buying among consumers. We suggest that the type of device should be at the forefront, followed by desks, keyboards, mouse, earpiece, lamps, and kind of chair, so that consumers can see all different devices before completion. This kind of setup would promote buyers to consider all necessities with the top three significant attributes between less significant attributes to heighten their intention to purchase the items.

4.2. Limitations

Despite strong findings and results of this study, several limitations are still present. First, this study considered only the preference of different devices utilized for online setups among undergraduate students in general. Clustering different courses and programs of students is suggested. This may result in differences in output of preference depending on the course or programs. Through k-means clustering, marketing segmentation may help deduce the findings that may also be utilized by industries. The survey was distributed online due to the COVID-19 pandemic. Since no control could be made for the location or type of university (public or private), it is suggested that comparative preference analysis may be conducted to uncover distinctly differences among private- and public-school students, their location, and even type of residence. This may provide other findings with enough data collected, since universities (public and private) in the Philippines provide different services. Similarly, as discussed by Bast [16], students living in urban and rural areas also provide different perspectives to online learning alongside their preferences. In addition, anthropometric measurement may also be considered to compare and contrast based on levels presenting significant preferences. Lastly, since workstation-design attributes and levels considered in the study were based on the common gadgets and furniture used during online classes, future research including other attributes and considering different levels that may influence users' preferences is recommended. Different attributes must be taken into account because they could influence importance rankings. Future research may therefore elaborate on the conclusions of preferences for workstations.

5. Conclusions

The sudden shift to e-learning due to COVID-19 compelled parents and students to convert a space in their houses and make a workstation for online classes. A workstation is an area in the students' houses where they complete schoolwork and, most importantly, attend classes. This study utilized the orthogonal design of the conjoint analysis approach to determine users' most preferred combination of workstation attributes: the type of gadget, keyboard, mouse, earpiece, desk, chair, and light device. Using purposive sampling, 315 undergraduate students participated in the online questionnaire comprising 51 stimuli.

The findings showed that the type of gadget was the most considered attribute affecting user preference, followed by the type of mouse, kind of chair, type of keyboard, earpiece, light device, and desk. Under the type of gadget attribute, the most preferred was the personal computer, while Bluetooth wireless was the most favored type of mouse. The kind of chair users favored most was the high-back office chair with a neck rest. Mechanical obtained the highest utility score for type of keyboard and headset for the earpiece. For the light, the most desired was the floor lamp. Lastly, a height-adjustable table was the most favored type of desk.

This study is the first to examine user preferences for workstation design since the pandemic. The results will benefit gadget developers, business owners, and retailers regarding user preferences for different attributes of workstation design. In particular, the results of this study will help industries understand the importance of each feature to users' decision-making and which workstation-design attributes users value the most. The findings and suggestions of this study may be considered by different sectors of industries to create marketing strategies for consumers. Lastly, the study's findings may be utilized by students, teachers, and employees in the same online setup globally, even in a postpandemic setup.

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Appendix A

Table A1. Stimulus.

Combination	Type of Gadget		Type of Mouse	Earpiece	Desk	Kind of Chair	Light Device
1	Laptop	Ergonomic Keyboard	Wired Mouse	Speaker	Sitting Desk	High-Back Office Chair with Neck Support	Floor Lamp
2	Tablet	Ergonomic Keyboard	Touchpad	Headset	Sitting Desk	Task Chair	Floor Lamp
3	Laptop	Mechanical Keyboard	Ergonomic Mouse	Earbuds	Height-Adjustable table	High-Back Office Chair with Neck Support	Floor Lamp
4	Personal Computer	Mechanical Keyboard	Wired Mouse	Headset	Height-Adjustable table	High-Back Office Chair with Neck Support	Floor Lamp
5	Tablet	Multidevice Bluetooth Keyboard	USB Wireless mouse	Earphones	Height-Adjustable table	Mid-Back Office Chair	Floor Lamp
6	Personal Computer	Ergonomic Keyboard	Wired Mouse	Earbuds	Sitting Desk	Mid-Back Office Chair	Room Light
7	Laptop	Multidevice Bluetooth Keyboard	Ergonomic Mouse	Headset	Sitting Desk	Task Chair	Desk Lamp

Table A1. *Cont.*

Combination	Type of Gadget		Type of Mouse	Earpiece	Desk	Kind of Chair	Light Device
8	Personal Computer	Multidevice Bluetooth Keyboard	Bluetooth Wireless Mouse	Earphones	Sitting Desk	High-Back Office Chair with Neck Support	Floor Lamp
9	Tablet	Mechanical Keyboard	Bluetooth Wireless Mouse	Headset	Sitting Desk	Task Chair	Desk Lamp
10	Tablet	Multidevice Bluetooth Keyboard	Bluetooth Wireless Mouse	Earbuds	Height-Adjustable table	Task Chair	Desk Lamp
11	Tablet	Ergonomic Keyboard	USB Wireless mouse	Headphone	Sitting Desk	High-Back Office Chair with Neck Support	Desk Lamp
12	Personal Computer	Ergonomic Keyboard	Ergonomic Mouse	Earphones	Height-Adjustable table	High-Back Office Chair with Neck Support	Desk Lamp
13	Personal Computer	Membrane Keyboard	Bluetooth Wireless Mouse	Headphone	Sitting Desk	High-Back Office Chair with Neck Support	Floor Lamp
14	Personal Computer	Membrane Keyboard	Ergonomic Mouse	Headphone	Sitting Desk	Task Chair	Room Light
15	Tablet	Ergonomic Keyboard	Ergonomic Mouse	Earbuds	Sitting Desk	High-Back Office Chair with Neck Support	Desk Lamp
16	Laptop	Ergonomic Keyboard	Bluetooth Wireless Mouse	Headphone	Height-Adjustable table	Mid-Back Office Chair	Desk Lamp
17	Personal Computer	Multidevice Bluetooth Keyboard	Wired Mouse	Headphone	Height-Adjustable table	High-Back Office Chair with Neck Support	Desk Lamp
18	Personal Computer	Mechanical Keyboard	Bluetooth Wireless Mouse	Headset	Height-Adjustable table	Mid-Back Office Chair	Desk Lamp
19	Laptop	Ergonomic Keyboard	Bluetooth Wireless Mouse	Earphones	Height-Adjustable table	Task Chair	Desk Lamp
20	Personal Computer	Ergonomic Keyboard	USB Wireless mouse	Headphone	Height-Adjustable table	Task Chair	Room Light
21	Tablet	Ergonomic Keyboard	Ergonomic Mouse	Headphone	Height-Adjustable table	Mid-Back Office Chair	Floor Lamp
22	Personal Computer	Multidevice Bluetooth Keyboard	Touchpad	Earbuds	Sitting Desk	Mid-Back Office Chair	Desk Lamp

Table A1. *Cont.*

Combination	Type of Gadget		Type of Mouse	Earpiece	Desk	Kind of Chair	Light Device
23	Personal Computer	Mechanical Keyboard	Bluetooth Wireless Mouse	Speaker	Height-Adjustable table	Mid-Back Office Chair	Desk Lamp
24	Tablet	Membrane Keyboard	Wired Mouse	Headset	Height-Adjustable table	Task Chair	Desk Lamp
25	Laptop	Membrane Keyboard	Bluetooth Wireless Mouse	Earbuds	Height-Adjustable table	High-Back Office Chair with Neck Support	Room Light
26	Personal Computer	Ergonomic Keyboard	Bluetooth Wireless Mouse	Speaker	Sitting Desk	Task Chair	Floor Lamp
27	Personal Computer	Ergonomic Keyboard	Ergonomic Mouse	Headset	Height-Adjustable table	High-Back Office Chair with Neck Support	Desk Lamp
28	Personal Computer	Ergonomic Keyboard	Bluetooth Wireless Mouse	Headset	Height-Adjustable table	Mid-Back Office Chair	Room Light
29	Tablet	Mechanical Keyboard	Wired Mouse	Earphones	Sitting Desk	Mid-Back Office Chair	Room Light
30	Personal Computer	Multidevice Bluetooth Keyboard	Ergonomic Mouse	Headset	Sitting Desk	Mid-Back Office Chair	Room Light
31	Personal Computer	Mechanical Keyboard	Wired Mouse	Headset	Sitting Desk	Task Chair	Desk Lamp
32	Personal Computer	Membrane Keyboard	Touchpad	Earphones	Height-Adjustable table	High-Back Office Chair with Neck Support	Desk Lamp
33	Tablet	Mechanical Keyboard	Ergonomic Mouse	Speaker	Height-Adjustable table	High-Back Office Chair with Neck Support	Desk Lamp
34	Laptop	Multidevice Bluetooth Keyboard	Bluetooth Wireless Mouse	Headset	Sitting Desk	High-Back Office Chair with Neck Support	Floor Lamp
35	Personal Computer	Mechanical Keyboard	USB Wireless mouse	Earbuds	Height-Adjustable table	Task Chair	Floor Lamp
36	Personal Computer	Mechanical Keyboard	Ergonomic Mouse	Headphone	Sitting Desk	High-Back Office Chair with Neck Support	Desk Lamp
37	Laptop	Membrane Keyboard	USB Wireless mouse	Speaker	Sitting Desk	Mid-Back Office Chair	Desk Lamp
38	Laptop	Multidevice Bluetooth Keyboard	Wired Mouse	Headphone	Height-Adjustable table	Task Chair	Desk Lamp

Table A1. *Cont.*

Combination	Type of Gadget		Type of Mouse	Earpiece	Desk	Kind of Chair	Light Device
39	Personal Computer	Mechanical Keyboard	Touchpad	Headphone	Height-Adjustable table	Task Chair	Floor Lamp
40	Laptop	Multidevice Bluetooth Keyboard	Ergonomic Mouse	Headphone	Height-Adjustable table	Mid-Back Office Chair	Floor Lamp
41	Tablet	Multidevice Bluetooth Keyboard	Bluetooth Wireless Mouse	Headphone	Height-Adjustable table	High-Back Office Chair with Neck Support	Room Light
42	Tablet	Mechanical Keyboard	Bluetooth Wireless Mouse	Headphone	Sitting Desk	High-Back Office Chair with Neck Support	Room Light
43	Laptop	Mechanical Keyboard	Touchpad	Headphone	Sitting Desk	Mid-Back Office Chair	Desk Lamp
44	Laptop	Mechanical Keyboard	Bluetooth Wireless Mouse	Headphone	Sitting Desk	Mid-Back Office Chair	Desk Lamp
45	Tablet	Membrane Keyboard	Ergonomic Mouse	Headset	Height-Adjustable table	Mid-Back Office Chair	Floor Lamp
46	Laptop	Ergonomic Keyboard	Touchpad	Headset	Height-Adjustable table	High-Back Office Chair with Neck Support	Room Light
47	Personal Computer	Multidevice Bluetooth Keyboard	USB Wireless mouse	Headset	Sitting Desk	High-Back Office Chair with Neck Support	Desk Lamp
48	Laptop	Mechanical Keyboard	Ergonomic Mouse	Earphones	Sitting Desk	Task Chair	Room Light
49	Laptop	Mechanical Keyboard	USB Wireless mouse	Headset	Height-Adjustable table	High-Back Office Chair with Neck Support	Room Light
50	Tablet	Multidevice Bluetooth Keyboard	Touchpad	Speaker	Height-Adjustable table	High-Back Office Chair with Neck Support	Room Light
51	Personal Computer	Multidevice Bluetooth Keyboard	Ergonomic Mouse	Speaker	Height-Adjustable table	Task Chair	Room Light

Appendix B

Table A2. Stimulus Rank.

Combination	Type of Gadget	Type of Keyboard	Type of Mouse	Earpiece	Desk	Kind of Chair	Light Device	Total	Rank
1	Laptop	Ergonomic Keyboard	Wired Mouse	Speaker	Sitting Desk	High-Back Office Chair with Neck Support	Floor Lamp	0.537	18
2	Tablet	Ergonomic Keyboard	Touchpad	Headset	Sitting Desk	Task Chair	Floor Lamp	−1.356	51
3	Laptop	Mechanical Keyboard	Ergonomic Mouse	Earbuds	Height-Adjustable table	High-Back Office Chair with Neck Support	Floor Lamp	0.677	13
4	Personal Computer	Mechanical Keyboard	Wired Mouse	Headset	Height-Adjustable table	High-Back Office Chair with Neck Support	Floor Lamp	1.017	1
5	Tablet	Multidevice Bluetooth Keyboard	USB Wireless mouse	Earphones	Height-Adjustable table	Mid-Back Office Chair	Floor Lamp	−0.427	42
6	Personal Computer	Ergonomic Keyboard	Wired Mouse	Earbuds	Sitting Desk	Mid-Back Office Chair	Room Light	0.486	22
7	Laptop	Multidevice Bluetooth Keyboard	Ergonomic Mouse	Headset	Sitting Desk	Task Chair	Desk Lamp	0.242	27
8	Personal Computer	Multidevice Bluetooth Keyboard	Bluetooth Wireless Mouse	Earphones	Sitting Desk	High-Back Office Chair with Neck Support	Floor Lamp	0.77	8
9	Tablet	Mechanical Keyboard	Bluetooth Wireless Mouse	Headset	Sitting Desk	Task Chair	Desk Lamp	−0.505	47
10	Tablet	Multidevice Bluetooth Keyboard	Bluetooth Wireless Mouse	Earbuds	Height-Adjustable table	Task Chair	Desk Lamp	−0.713	48
11	Tablet	Ergonomic Keyboard	USB Wireless mouse	Headphone	Sitting Desk	High-Back Office Chair with Neck Support	Desk Lamp	−0.33	40
12	Personal Computer	Ergonomic Keyboard	Ergonomic Mouse	Earphones	Height-Adjustable table	High-Back Office Chair with Neck Support	Desk Lamp	0.675	14
13	Personal Computer	Membrane Keyboard	Bluetooth Wireless Mouse	Headphone	Sitting Desk	High-Back Office Chair with Neck Support	Floor Lamp	0.698	11
14	Personal Computer	Membrane Keyboard	Ergonomic Mouse	Headphone	Sitting Desk	Task Chair	Room Light	0.11	32

Table A2. *Cont.*

Combination	Type of Gadget	Type of Keyboard	Type of Mouse	Earpiece	Desk	Kind of Chair	Light Device	Total	Rank
15	Tablet	Ergonomic Keyboard	Ergonomic Mouse	Earbuds	Sitting Desk	High-Back Office Chair with Neck Support	Desk Lamp	−0.461	45
16	Laptop	Ergonomic Keyboard	Bluetooth Wireless Mouse	Headphone	Height-Adjustable table	Mid-Back Office Chair	Desk Lamp	0.561	17
17	Personal Computer	Multidevice Bluetooth Keyboard	Wired Mouse	Headphone	Height-Adjustable table	High-Back Office Chair with Neck Support	Desk Lamp	0.764	9
18	Personal Computer	Mechanical Keyboard	Bluetooth Wireless Mouse	Headset	Height-Adjustable table	Mid-Back Office Chair	Desk Lamp	0.9	2
19	Laptop	Ergonomic Keyboard	Bluetooth Wireless Mouse	Earphones	Height-Adjustable table	Task Chair	Desk Lamp	0.236	28
20	Personal Computer	Ergonomic Keyboard	USB Wireless mouse	Headphone	Height-Adjustable table	Task Chair	Room Light	0.366	24
21	Tablet	Ergonomic Keyboard	Ergonomic Mouse	Headphone	Height-Adjustable table	Mid-Back Office Chair	Floor Lamp	−0.451	43
22	Personal Computer	Multidevice Bluetooth Keyboard	Touchpad	Earbuds	Sitting Desk	Mid-Back Office Chair	Desk Lamp	−0.227	37
23	Personal Computer	Mechanical Keyboard	Bluetooth Wireless Mouse	Speaker	Height-Adjustable table	Mid-Back Office Chair	Desk Lamp	0.697	12
24	Tablet	Membrane Keyboard	Wired Mouse	Headset	Height-Adjustable table	Task Chair	Desk Lamp	−0.734	49
25	Laptop	Membrane Keyboard	Bluetooth Wireless Mouse	Earbuds	Height-Adjustable table	High-Back Office Chair with Neck Support	Room Light	0.513	19
26	Personal Computer	Ergonomic Keyboard	Bluetooth Wireless Mouse	Speaker	Sitting Desk	Task Chair	Floor Lamp	0.318	25
27	Personal Computer	Ergonomic Keyboard	Ergonomic Mouse	Headset	Height-Adjustable table	High-Back Office Chair with Neck Support	Desk Lamp	0.847	5
28	Personal Computer	Ergonomic Keyboard	Bluetooth Wireless Mouse	Headset	Height-Adjustable table	Mid-Back Office Chair	Room Light	0.793	7
29	Tablet	Mechanical Keyboard	Wired Mouse	Earphones	Sitting Desk	Mid-Back Office Chair	Room Light	−0.493	46

Table A2. *Cont.*

Combination	Type of Gadget	Type of Keyboard	Type of Mouse	Earpiece	Desk	Kind of Chair	Light Device	Total	Rank
30	Personal Computer	Multidevice Bluetooth Keyboard	Ergonomic Mouse	Headset	Sitting Desk	Mid-Back Office Chair	Room Light	0.627	15
31	Personal Computer	Mechanical Keyboard	Wired Mouse	Headset	Sitting Desk	Task Chair	Desk Lamp	0.496	20
32	Personal Computer	Membrane Keyboard	Touchpad	Earphones	Height-Adjustable table	High-Back Office Chair with Neck Support	Desk Lamp	−0.142	34
33	Tablet	Mechanical Keyboard	Ergonomic Mouse	Speaker	Height-Adjustable table	High-Back Office Chair with Neck Support	Desk Lamp	−0.339	41
34	Laptop	Multidevice Bluetooth Keyboard	Bluetooth Wireless Mouse	Headset	Sitting Desk	High-Back Office Chair with Neck Support	Floor Lamp	0.814	6
35	Personal Computer	Mechanical Keyboard	USB Wireless mouse	Earbuds	Height-Adjustable table	Task Chair	Floor Lamp	0.46	23
36	Personal Computer	Mechanical Keyboard	Ergonomic Mouse	Headphone	Sitting Desk	High-Back Office Chair with Neck Support	Desk Lamp	0.76	10
37	Laptop	Membrane Keyboard	USB Wireless mouse	Speaker	Sitting Desk	Mid-Back Office Chair	Desk Lamp	0.263	26
38	Laptop	Multidevice Bluetooth Keyboard	Wired Mouse	Headphone	Height-Adjustable table	Task Chair	Desk Lamp	0.216	29
39	Personal Computer	Mechanical Keyboard	Touchpad	Headphone	Height-Adjustable table	Task Chair	Floor Lamp	−0.253	38
40	Laptop	Multidevice Bluetooth Keyboard	Ergonomic Mouse	Headphone	Height-Adjustable table	Mid-Back Office Chair	Floor Lamp	0.496	21
41	Tablet	Multidevice Bluetooth Keyboard	Bluetooth Wireless Mouse	Headphone	Height-Adjustable table	High-Back Office Chair with Neck Support	Room Light	−0.253	39
42	Tablet	Mechanical Keyboard	Bluetooth Wireless Mouse	Headphone	Sitting Desk	High-Back Office Chair with Neck Support	Room Light	−0.221	36
43	Laptop	Mechanical Keyboard	Touchpad	Headphone	Sitting Desk	Mid-Back Office Chair	Desk Lamp	−0.209	35
44	Laptop	Mechanical Keyboard	Bluetooth Wireless Mouse	Headphone	Sitting Desk	Mid-Back Office Chair	Desk Lamp	0.594	16

Table A2. *Cont.*

Combination	Type of Gadget	Type of Keyboard	Type of Mouse	Earpiece	Desk	Kind of Chair	Light Device	Total	Rank
45	Tablet	Membrane Keyboard	Ergonomic Mouse	Headset	Height-Adjustable table	Mid-Back Office Chair	Floor Lamp	−0.454	44
46	Laptop	Ergonomic Keyboard	Touchpad	Headset	Height-Adjustable table	High-Back Office Chair with Neck Support	Room Light	0.009	33
47	Personal Com-puter	Multidevice Bluetooth Keyboard	USB Wireless mouse	Headset	Sitting Desk	High-Back Office Chair with Neck Support	Desk Lamp	0.865	4
48	Laptop	Mechanical Keyboard	Ergonomic Mouse	Earphones	Sitting Desk	Task Chair	Room Light	0.144	31
49	Laptop	Mechanical Keyboard	USB Wireless mouse	Headset	Height-Adjustable table	High-Back Office Chair with Neck Support	Room Light	0.869	3
50	Tablet	Multidevice Bluetooth Keyboard	Touchpad	Speaker	Height-Adjustable table	High-Back Office Chair with Neck Support	Room Light	−1.139	50
51	Personal Com-puter	Multidevice Bluetooth Keyboard	Ergonomic Mouse	Speaker	Height-Adjustable table	Task Chair	Room Light	0.209	30

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