



Article

Prioritizing Protection by Face Masks during COVID-19: The Application of Customer Open Innovation

Yuli Liang *, Gwendolyn Hustvedt and Jasmine Miller

Fashion Merchandising Program, School and Family Consumer Sciences, Texas State University, San Marcos, TX 78666, USA; gmhustvedt@txstate.edu (G.H.); j_m1561@txstate.edu (J.M.)

* Correspondence: yuliliang@txstate.edu; Tel.: +1-(512)245-4650

Abstract: This research investigated consumers' purchase intention and preferences for face masks during the COVID-19 global pandemic. The Theory of Planned Behavior (TPB) was used as the theoretical framework. Empirical data (with 215 valid responses) were collected nationwide from the United States via Qualtrics Panel services. Exploratory factor analysis, confirmatory factor analysis, structural equation modeling, and multi-group comparison (chi-square difference) were used to estimate construct validity and test the proposed hypotheses and theoretical framework. Results indicated that consumers' purchase intention towards face masks was predicted by consumers' attitude towards functional attributes, subjective norm, and perceived behavior control. But, in contrast with previous research, purchase intention was not predicted by attitudes towards aesthetic attributes and attitude towards social attributes. Purchase intention positively influenced consumers' actual purchase behavior towards face masks. Workplace association moderated the path from social attitudes to purchase intention. Based on these results, theoretical and practical implications are discussed.

Keywords: COVID-19; pandemic; TPB; purchase intention; face masks; open innovation



Citation: Liang, Y.; Hustvedt, G.; Miller, J. Prioritizing Protection by Face Masks during COVID-19: The Application of Customer Open Innovation. *J. Open Innov. Technol. Mark. Complex.* **2022**, *8*, 43. <https://doi.org/10.3390/joitmc8010043>

Received: 20 January 2022

Accepted: 13 February 2022

Published: 17 February 2022

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1. Introduction

During the COVID-19 pandemic, consumers around the world were advised to use cloth masks rather than purchase medical grade N95 and disposable surgical masks to prevent a shortage of personal protective equipment (PPE) for frontline health workers [1]. Responding to this crisis in the supply chain would require dexterous and open innovation [2]. The lack of dominance by existing manufacturers in the non-medical masks space coupled with a reluctance to develop standards for what is, in many respects, a fashion product, meant that small-scale entrepreneurial production could begin quickly. Within weeks, flexible apparel manufacturers also began to produce a wide variety of mask styles [3]. The masks' design elements, including placement of seams or pleats, can be used to categorize face masks into four main types: cup; envelope; axe-head, and pleated [4]. A perusal of U.S.-based news articles from late 2020 that included photographs of mask wearers demonstrates all four of these types together with non-mask types of face coverings (such as bandanas and neck gaiters). However, possibly because of the lack of specific advice about wearing masks early in the pandemic, and the proliferation of several non-disposable mask varieties, no specific style, brand, or even price level had yet to take the lead in the public's use in the U.S. by early in the last quarter of 2020, the time frame of this study.

Despite the intended public health outcomes of this consumption, there are dimensions of decision making that consumers may have learned from purchasing other textile products, such as apparel, that potentially affect face masks' consumption. This situation provides a unique opportunity for researchers to observe both the development of consumer decision-making in a fresh area within a short time, without many of the habitual

bases of evaluation and choice (e.g., brand or price). It has become increasingly clear that during a pandemic of an airborne virus, everyone benefits from the consumers' ability to act fully and appropriately in their choices to protect themselves and others. Asian countries' experience following the SARS epidemic suggests that consumers will need to be prepared to make decisions about the purchase of PPE, such as face masks, for the foreseeable future [5]. Previous research has demonstrated the relation between attitude and purchase intention [6]. For example, in a study on Pakistanis' face mask attitudes and purchase intentions, attitudes toward face masks were found to have a positive and significant effect on purchase intention [7]. The results of this study demonstrated that this measure of attitude, which used such items as "I think it is good to buy masks," predicted the intention to purchase a face mask. However, this model of attitude does not tell us anything about what consumers believe about face masks or what they value in their face mask purchase.

Therefore, by using the variables in greater detail with the theory of planned behavior (TPB) model [8], the goal of this empirical study was to examine the behavioral beliefs related to the purchase of cloth face masks. This includes using attitudes toward the functional, aesthetic, and communicative aspects of behavior, attitudes of important others, and beliefs about the circumstances that facilitate or impede purchase behavior to understand the open innovation dynamics of mask consumption. This will allow us to derive implications for manufacturers, retailers, and policymakers responsible for planning for the next phases of the COVID-19 pandemic and subsequent pandemics. By focusing on a face mask that consumers have already purchased and used, this study incorporated both the face masks' search and experience attributes. The measurement of attitudes and perceived behavioral control through the expectancy–value method, in which beliefs are summed with the corresponding value/relevance of the outcome associated with the belief, serves to illuminate the aspects of face mask-related behaviors and outcomes that are relevant to consumers during a pandemic. This illumination is valuable because, while the color, style, or social/communicative value may all play a role in consumers' decisions with respect to their intention to purchase and wear one face mask over another, solid public health research has demonstrated that face masks' fit is the essential product feature that should dominate consumer choice [9]. The innovation potential for the social expressive possibilities of apparel is important to consumers seeking to express their identities [10]. During a time in which face masks come in all styles, prints, and colors, and feature beading, lace, fringe, slogans, cartoons, or even prayers for the dead, this study was designed to identify which face mask attributes and/or beliefs play the most significant role in predicting purchase intention. Face masks are an example of open innovation dynamics because the complex global apparel supply chain had to pivot overnight to produce a new product with unknown requirements for consumers who had never used the product before and had no clear expectation of their functional attributes. All this had to be done in partnership with retailers who in many cases were not familiar with selling public health solutions.

2. Literature Review and Hypotheses Development

A modified approach to the standard theory of planned behavior was chosen in order to understand consumer behavior for this new category of apparel product. The wide variety of observed masks, along with the unevenness of availability and marketing information, not to mention some confusion in public health guidelines, means that a richer exploration could be obtained by expanding an examination of the behavioral beliefs, which are typically measured as part of the theory of planned behavior. An apparel-based theory, the functional expressive and aesthetic (FEA) model, was chosen to facilitate this expansion.

2.1. Modified Theory of Planned Behavior

The TPB was developed by expanding the theory of reasoned action and adding perceived behavioral control. Behavioral intention, which is a behavior's proximal cause, is the TPB' central element. According to the TPB framework, individuals' attitudes toward

the behavior, subjective norm, and perceived behavioral control influence behavioral intention. This theory was developed based upon an expectancy-value model of attitude to describe the formation of attitude toward a behavior by using the outcome evaluation and the outcome's importance to model attitude. It has been used widely in textile and apparel research to understand the consumers' behavior [11,12]. This classic TPB model has been used widely to measure brand attitude [13] and attitude toward purchase intention [12]. After COVID-19 began, this model was used also to study consumers' behavior in switching shopping channels [14] and people's mask-wearing intentions [15]. Despite the relative simplicity and undoubted ubiquity of the model the theory proposes, the TPB remains a fundamental tool used to understand and predict consumer behavior, particularly as a starting point to examine new behaviors, which the purchase of a reusable cloth face mask represents.

Developed by Lamb and Kallal [16], the functional expressive and aesthetic (FEA) consumer needs model has been used for more than 25 years to understand the way an apparel product's properties meet consumer needs [17]. In their study of the relatively new market for modest activewear in the U.S., Hwang and Kim demonstrated that FEA dimensions can be incorporated into the TPB to examine which FEA dimensions influence consumers' purchase decision [11]. In this study, the goal was to understand the way FEA dimensions contribute to consumers' decision to purchase a face mask, specifically, to repurchase the face mask they prefer the most.

2.2. Attitude

The attitude toward a behavior is referred to as a person's evaluation of it, and consists of a person's salient beliefs in evaluating the outcomes of engaging in the behavior [18]. Ajzen stated that behavioral belief "... is the person's subjective probability that performing a behavior of interest will lead to a certain outcome or provide a certain experience" [19] (p. 315). In this study, the beliefs that purchasing the preferred face mask (a behavior) can protect the consumer (an outcome), make him/her feel comfortable (an experience), or allow the consumer to go into public areas (either an outcome or experience) were included. The selection of behavioral beliefs, also based on the FEA framework, included aesthetic attributes (e.g., color, print), functional attributes (e.g., comfort, fit, protection/safety), and expressive or social-communicative (e.g., identity/status). All three of these dimensions were validated by a content analysis of online review comments purchasers of face masks left.

By using the expectancy-value model of attitude toward face mask purchase to separate out the attitude's social, aesthetic, and functional aspects, we can pinpoint clearly behavioral beliefs' contribution to the intention to repurchase the face mask they have already evaluated according to these dimensions. Therefore, Hypotheses 1–3 were proposed:

Hypothesis 1 (H1). *The attitude toward their preferred face mask's aesthetic attributes (aesthetic attitudes) positively influences the intention to repurchase their preferred face mask positively.*

Hypothesis 2 (H2). *The attitude toward their preferred face mask's functional attributes (functional attitudes) positively influences the intention to repurchase their preferred face mask positively.*

Hypothesis 3 (H3). *The attitude toward their preferred face mask's social attributes (social attitudes) positively influences the intention to repurchase their preferred face mask positively.*

2.3. Subjective Norm

Ajzen and Fishbein defined subjective norm (SN) as an individual's "... perception of the social pressures put on him or her to perform or not to perform the behavior" [20] (p. 6). It represents the degree to which an individual is aware of a salient referent's opinion [18]. Previous studies have found that subjective norm can influence the intention to purchase and use clothing and accessories significantly [15,21].

Purchasing face masks may be considered essential during a pandemic, as it affects not only the health of consumers themselves, but also that of their significant referents. As Duong et al. indicated, consumers believe that people who are important to them would expect them to wear a face mask when in public places [22]. It is reasonable to predict that consumers will value the protection that a mask can provide for their significant referents, whose opinions may matter to them sufficiently to motivate them to purchase a face mask. Further, face mask mandates in certain municipalities or workplaces, create normative pressure to ensure that face masks are worn, which potentially can determine purchase intention because of this subjective norm. Therefore, the following hypothesis was proposed:

Hypothesis 4 (H4). *The perception of a subjective norm related to their preferred face mask positively influences the intention to repurchase their preferred face mask positively.*

2.4. Perceived Behavioral Control

Perceived behavioral control (PBC) refers to an individual's evaluation of his/her own ability to perform a specific behavior [23], and has been included as an exogenous variable that affects behavioral intention directly [24]. The more opportunities and resources individuals believe they have, the greater their perceived behavior control over the behavior [24]. As Ajzen (2020) indicated, similarly to attitudes and subjective norms, perceived behavioral control can be modeled as based upon accessible control beliefs, which are "... concerned with the presence of factors that can facilitate or impede performance of the behavior" [19] (p. 315).

Previous research has supported perceived behavioral control's positive influence on healthcare decision-making [25,26] and the intention to purchase apparel [18]. However, the radical revision of the conditions in which consumer behavior can operate during a global pandemic includes a removal of many elements of control, making an exploration of this variable especially pertinent to face mask consumption [27]. Consistent with previous research, in face mask consumption, consumers' requisite resources are having time, money, and accessibility to purchase face masks. If consumers wish to purchase a face mask, if they can access it and control the way they purchase it, their intention to do so will increase. Thus, possessing the requisite resources and accessibility facilitates consumers' intention to purchase face masks:

Hypothesis 5 (H5). *Perceived behavior control over the purchase of their preferred face mask positively influences the intention to repurchase their preferred face mask positively.*

2.5. Actual Behavior

The TPB's focus is behavioral intention, the formation of a plan to engage in a behavior. However, it can serve as a useful validation of the model if the behavioral intention is associated with actual behavior. The intention to purchase was conceptualized as the likelihood of purchase in the near future [18]. TPB model assumed that the behavior intention leads to actual behavior, and this was supported by many previous studies [18]. Therefore, the following hypothesis was proposed:

Hypothesis 6 (H6). *Face masks' prior purchase predicts the intention to repurchase their preferred face mask positively.*

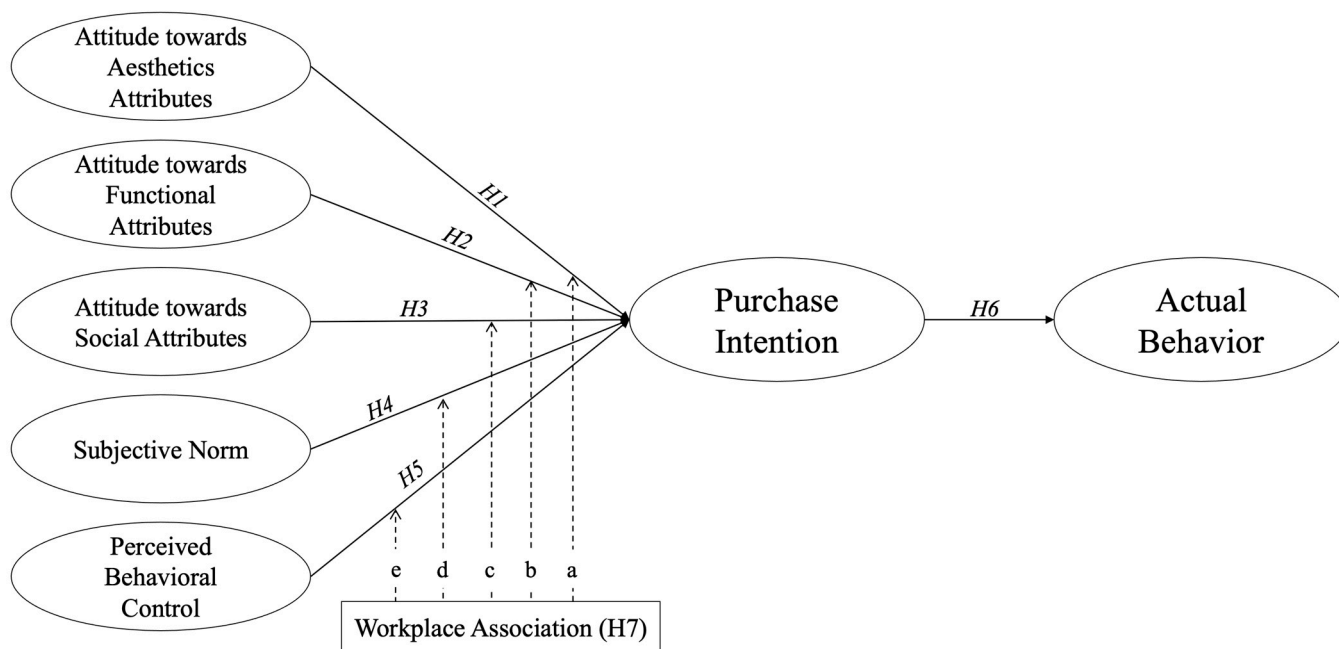
2.6. Moderating Effects of Workplace Association

Wearing face masks assumed an association with the workplace and education immediately, as businesses and schools struggled to make these spaces safe. However, for many, employment means "working from home" or becoming newly unemployed, with attendant changes in referent social groups or perceptions of behavioral control. Some occupations and social roles require greater association with the workplace, while certain

other roles did not require, or required only a minimal association [28,29]. It is also possible that people associated with a workplace may have received specific guidance from employers or university administrations about face masks’ ideal attributes, which may be reflected in the formation of their behavioral beliefs concerning the masks’ aesthetic, functional, or social attributes, and thus, influence their attitudes. Given that mask wearing is a public behavior [22] and people who have a “workplace” (defined for our purposes as employment or school) association and those who do not may have different exposure to the public, we examined workplace association as a moderator. Thus, the following hypothesis was proposed:

Hypothesis 7 (H7). *The effects of (a) aesthetic attitudes, (b) functional attitudes, (c) social attitudes, (d) subjective norm, and (e) perceived behavioral control on purchase intention are stronger for consumers with (vs. without) a workplace association, and purchase intention’s effect on actual behavior is stronger for consumers with (vs. without) a workplace association.*

The conceptual framework shown in Figure 1 includes the model variables and proposed hypotheses.



Note: Dash arrow lines indicate moderating effects.

Figure 1. Conceptual framework.

3. Methods

3.1. Sampling and Sample

Firstly, the researchers conducted a content analysis of consumers’ online reviews of cloth face masks to prepare the questionnaire.

In a six-week period in October to November in 2020, a total of 504 face mask review comments from retailer websites were collected before reaching saturation, 19.64% (99) from Amazon, 47.02% (237) from Etsy, 12.11% (61) from Jaanuu, and 21.23% (107) from The Tie Bar. Common themes observed in the comments included a focus on face masks’ aesthetics (e.g., “Very cute, I get compliments from all my consumers”), their functionality (e.g., “The material is super soft and fits my face almost perfectly”), as well as the way the masks supported consumers’ identity or social roles (e.g., “high quality protection that lets me show off my school pride”). These themes were used to build items for each of the

variables in the model in addition to those items suggested in the literature by validating the occurrence of behavioral beliefs from each of the domains of FEA model.

Secondly, based upon the results of the review and the measures from established research, functional, social, and aesthetic attitudes, perceived behavioral control, subjective norm, purchase intention, and actual behavior were included in the questionnaire. Participants were asked about the source of advice to purchase face masks, the places they had made those purchases, and whether they had conducted research about face masks. After viewing pictures of the four face mask styles and non-mask styles (such as bandannas and gaiters), participants were asked about their preferences for the styles and their purchase preferences when shopping for face masks, as well as all the items used to measure the variables in the theoretical model. The questionnaire took approximately 15 min to complete.

Finally, the researchers purchased a sample of US consumers from Qualtrics online panels. The focus of the random sample provided by Qualtrics was on any persons residing in the US who had purchased face masks previously and was comprised of 40% men and 60% women of any age or ethnicity. Qualtrics contacted their qualified potential participants, asking them to complete this online, self-administered questionnaire created through the Qualtrics survey system. To meet the research objectives of measuring real world experience with mask purchases, rather than opinions, the stipulation was made that the participants must have previously made a face mask purchase. This narrowed the pool of possible participants considerably, meaning that, after a one-week period of data collection, 239 responses were collected. After cleaning to remove unengaged responses, a total of 215 valid responses were used in the data analysis.

3.2. Measurement

The review of literature was used to identify measures of sufficient quality to reflect the variables included in the proposed model (see Table 1). Valid and reliable measures from previous research were either adopted or else adapted for use in this study. To include consumers' most recent and related comments and feedback, the content analysis was also consulted, and the themes identified were adapted to prepare the measurements.

Table 1. Research measurement and its source.

| Construct | Variable Type | Source | Format after Adapted |
|--|---------------------|----------------------|--|
| Attitude towards functional attributes | Exogenous variable | Online reviews; [1] | 4-item scale; 5-point Likert-type * (strongly disagree/strongly agree and not at all Important/extremely important) |
| Attitude towards social attributes | Exogenous variable | Online reviews | 3-item scale; 5-point Likert-type (strongly disagree/strongly agree and not at all Important/extremely important) |
| Attitude towards aesthetics attributes | Exogenous variable | Online reviews | 3-item scale; 5-point Likert-type (strongly disagree/strongly agree and not at all Important/Extremely important) |
| Subjective norm | Exogenous variable | Online reviews; [30] | 6-item scale; 5-point Likert-type (strongly disagree/strongly agree and not at all Important/extremely important) |
| Perceived behavioral control | Exogenous variable | Online reviews; [31] | 8-item scale; 5-point Likert-type (strongly disagree/strongly agree and not at all relevant/extremely relevant) |
| Purchase Intention | Endogenous variable | | 3-item scale (in the next month, in the next three months, and in the next six months); 5-point scale (0, 1–3, 4–6, 7–9, 10 or more) |
| Actual behavior | Endogenous variable | [18] | Single item (quantity purchased during past six months) |

Note. * The expectancy value model of the attitudes, subjective norm, and perceived behavioral control variables requires multiplication of the two corresponding items resulting in combined items ranging from 1 to 25.

SPSS and Amos were used to perform the descriptive statistics, reliability, exploratory factor analysis, confirmatory factor analysis, structural equation modeling, and multi-group comparison (Chi-squared difference).

4. Results

4.1. Sample

Table 2 contains the demographic characteristics and mask preference of research participants. Most survey respondents (70.7%) ranged between 18 and 44 years old (range = 18 to 78). Based on their response to demographic questions, participants can be categorized based on whether they have workplace association (e.g., students, people who are currently looking for work, and, employed full or part-time; *n* = 151) or do not have workplace association (e.g., the retired, people who are not currently looking for work, homemaker, and people who are not able to work; *n* = 64) based on their employment status.

Table 2. Demographic characteristics and mask preference of research sample (*n* = 215).

| Characteristic | Percent | Characteristic | Percent |
|-------------------------------|---------|--|---------|
| Gender | | Workplace | |
| Men | 39.1 | Employed full time (40 or more hours per week) | 42.3 |
| Women | 60.9 | Employed part time (up to 39 h per week) | 12.6 |
| Age | | Unemployed (currently looking for work) | 7.0 |
| 18–24 | 14.4 | Self-employed | 2.3 |
| 25–34 | 29.3 | Graduate student | 1.9 |
| 35–44 | 27.0 | Undergraduate student | 4.2 |
| 45–54 | 8.4 | Unemployed (not currently looking for work) | 1.9 |
| 55–64 | 11.6 | Retired | 13.0 |
| 65 and above | 9.3 | Homemaker | 9.7 |
| Ethnicity | | Unable to work | 5.1 |
| Caucasian | 65.6 | Masks categories tried | |
| African American | 17.7 | Medical masks | 64.7 |
| Asian/Asian American | 3.7 | Cloth face masks | 79.5 |
| Hispanic/Latino | 11.6 | Cloth Non-face masks | 20.0 |
| Native American | 0.9 | Face mask type most preferred | |
| Other | 0.5 | Cone | 7.9 |
| Education | | Envelope | 13.0 |
| Less than high school | 1.9 | Ax-head | 40.0 |
| High School graduate | 28.4 | Panel | 39.1 |
| Some college | 22.3 | Have tried face mask type and disliked | |
| 2-year degree | 13.5 | Cone | 42.3 |
| 4-year degree | 21.9 | Envelope | 20.5 |
| Professional degree | 10.1 | Ax-head | 27.4 |
| Doctorate | 1.9 | Panel | 20.5 |
| Total Household Income | | Non-face mask type tried | |
| Less than \$10,000 | 11.6 | Gaiter | 35.3 |
| \$10,000–\$29,999 | 20.4 | Bandana | 22.3 |
| \$30,000–\$49,999 | 23.3 | I do not like non-mask type | 42.4 |
| \$50,000–\$79,999 | 19.5 | Masks purchased in past 6 months | |
| \$80,000–\$99,999 | 7.0 | 0 | 7.7 |
| \$100,000–\$199,999 | 14.9 | 1–5 | 49.0 |
| \$200,000 or more | 3.3 | 6–10 | 22.9 |
| Marital Status | | 11–20 | 8.3 |
| Married | 48.8 | More than 20 | 12.1 |
| Single | 46.0 | Recommended guidelines followed | |
| Other | 5.2 | CDC | 37.1 |
| | | WHO | 11.3 |
| | | Workplace (e.g., school or employer) | 11.3 |
| | | Other | 0.6 |
| | | None | 39.7 |

The respondents were also asked about where they purchase face masks. A majority (61.9%) report purchasing face masks from a local store while a large percentage (48.4%) report purchasing them online. With its online market dominance, it is unsurprising that the largest share (37.2%) of respondents indicate purchasing face masks from Amazon. eBay (14%) and Etsy (7.9%) are the next most frequent choice. When asked if they read comments or reviews before purchasing face masks, 32.1% indicated they had not, while 47% used comments at online stores and 34.9% used reviews posted by various websites.

4.2. Exploratory Factor Analysis

The exploratory factor analysis (EFA) was conducted on 28 scale items of the variables using the principal component analysis method. Three items measuring perceived behavior control and three items measuring subjective norm were dropped because of low loading (<0.70) [32]. Because of high cross loading (>0.40) [32], one item of social attitudes and one item of purchase intention were dropped from inclusion. The final EFA solution with a total of 20 items measuring seven factors accounted for 79.741% of the total variance explained. All Cronbach’s alpha ranged from 0.776 to 0.961 while all commonalities ranged between 0.650 and 0.910, demonstrating the scale had a good reliability. All the EFA loadings ranging from 0.851 to 0.933.

4.3. Confirmatory Factor Analysis

The confirmatory factor analysis (CFA) was then conducted on consumers’ evaluation of functional attitudes, social attitudes, and aesthetic attitudes, subjective norm, perceived behavioral control, and purchase intention of face masks. In CFA, one item (from perceived behavior control) of high modification indices was dropped, and all other items within six factors remained. CFA on all remaining 18 items (except the item from actual purchase) demonstrated an excellent fit and convergent validity ($\chi^2 = 203.575$; $df = 120$; $\chi^2/df = 1.696$; $p < 0.001$, root mean square residual [RMSEA] = 0.057, goodness-of-fit index [GFI] = 0.910, comparative fit index [CFI] = 0.970). The construct validity of individual constructs in the model indicated by EFA was also supported by these indices. The results of EFA and CFA are presented in Table 3.

Table 3. Exploratory factor analysis and confirmatory factor analysis results.

| Factor | Scale Item | Mean | Mode | StD | EFA Loadings | CFA Loadings |
|--|--|--------|-----------------|-------|--------------|--------------|
| Attitude towards Functional Attributes (Reliability = 0.901, Composite Reliability = 0.902, AVE = 0.698) | By purchasing the face mask I prefer the most, ... | | | | | |
| | I will have a face mask that protects me | 19.856 | 25 | 6.350 | 0.823 | 0.859 |
| | I will have a face mask that protects people I care about | 19.888 | 25 | 6.150 | 0.871 | 0.863 |
| | I will have a face mask that is comfortable | 20.239 | 25 | 5.653 | 0.759 | 0.769 |
| Attitude towards Social Attributes (Reliability = 0.833, Composite Reliability = 0.838, AVE = 0.722) | I will have a face mask that fits me well enough to filter the air | 19.395 | 25 | 6.063 | 0.834 | 0.848 |
| | I will have a face mask that lets me go into public spaces | 19.526 | 25 | 6.382 | 0.796 | 0.898 |
| Attitude towards Aesthetics Attributes (Reliability = 0.933, Composite Reliability = 0.934, AVE = 0.824) | I will have a face mask that is versatile enough to wear in different situations, such as work, shopping, or socializing | 17.772 | 25 | 6.937 | 0.702 | 0.798 |
| | I will have a face mask that is attractive | 13.181 | 25 | 7.589 | 0.905 | 0.881 |
| | I will have a face mask that works with my style | 13.316 | 16 ^a | 7.438 | 0.923 | 0.934 |
| | I will have a face mask that looks good on my face | 13.088 | 25 | 7.504 | 0.899 | 0.908 |

Table 3. Cont.

| Factor | Scale Item | Mean | Mode | StD | EFA Loadings | CFA Loadings |
|---|---|--------|------|-------|--------------|--------------|
| Thinking of the face mask you most prefer, how do you agree with these statements? | | | | | | |
| Perceived Behavior Control (Reliability = 0.889, Composite Reliability = 0.837, AVE = 0.636) | I know where to purchase this face mask | 16.516 | 25 | 6.391 | 0.728 | 0.844 |
| | I know that this face mask is in stock for me to purchase | 16.107 | 25 | 6.633 | 0.766 | 0.871 |
| | I can have free shipping when I purchase this face mask | 13.670 | 25 | 7.167 | 0.807 | na |
| | I can buy this face mask without waiting for it on backorder | 15.293 | 25 | 7.173 | 0.803 | 0.804 |
| | I can use online shipping to purchase this face mask | 15.516 | 25 | 7.499 | 0.754 | 0.652 |
| Subjective Norm (Reliability = 0.929, Composite Reliability = 0.930, AVE = 0.817) | My employer believes I should purchase this face mask | 12.498 | 25 | 7.909 | 0.908 | 0.937 |
| | My co-workers believe I should purchase this face mask | 11.358 | 25 | 7.483 | 0.867 | 0.905 |
| | The people I come in contact with at work, such as customers or clients, believe I should purchase this face mask | 12.247 | 25 | 7.876 | 0.861 | 0.868 |
| Purchase Intention (Reliability = 0.851, Composite Reliability = 0.855, AVE = 0.747) | How many of this face mask will you purchase in the next month? | 2.51 | 2 | 1.307 | 0.892 | 0.919 |
| | How many of this face mask will you purchase in the next three months? | 2.73 | 2 | 1.344 | 0.818 | 0.806 |
| Actual Purchase ^b (Composite Reliability = 1.0) | Over the past 6 months, how many face masks of this type have you purchased? | 2.079 | 2 | 1.260 | 0.874 | na |

Note. AVE = average variance extracted. ^a Multiple modes exist. The smallest value is shown. ^b Composite reliability, AVE, and CFA loading cannot be computed because only one item was used to measure the actual purchase.

As presented in Table 3, each item loaded significantly on its proposed constructs. As all the composite reliabilities are above 0.837, the results provided evidence of reliability of the measures [32]. For each construct, a good internal consistency of multiple indicators was shown in the results. The results indicated that AVE ranged from 0.636 to 0.824, which exceeded the recommended value of 0.50 [33]. In addition, all standardized CFA loadings were significant ($p < 0.001$) and exceeded 0.50 (ranging from 0.652 to 0.934), demonstrating good convergent validity [32,34]. Moreover, as shown in Table 4, discriminant validity was confirmed because AVE for each construct was greater than the results of squared correlations between constructs [32,33].

Table 4. Squared correlation matrix with AVE on the diagonal.

| | Purchase Intention | Attitude towards Functional Attributes | Attitude towards Social Attributes | Attitude towards Aesthetics Attributes | Perceived Behavior Control | Subjective Norm |
|--|--------------------|--|------------------------------------|--|----------------------------|-----------------|
| Purchase intention | 0.864 | | | | | |
| Attitude towards functional attributes | 0.213 | 0.836 | | | | |
| Attitude towards social attributes | 0.066 | 0.831 | 0.849 | | | |
| Attitude towards aesthetics attributes | 0.107 | 0.295 | 0.308 | 0.908 | | |
| Perceived behavior control | 0.360 | 0.580 | 0.597 | 0.267 | 0.797 | |
| Subjective norm | 0.426 | 0.254 | 0.249 | 0.365 | 0.469 | 0.904 |

Note. Values along the diagonal indicate the average variance extracted for each construct. Off-diagonal values indicate squared correlations between constructs.

4.4. Model Development and Hypotheses Testing

The research model was tested using structural equation modeling [32,35]. Fit indices showed the model fit as very good ($\chi^2 = 224.776$, $df = 137$, $\chi^2/df = 1.641$, $p < 0.001$, RMSEA = 0.055, CFI = 0.969, and GFI = 0.906). A comparison of this fit against values recommended for model estimation result is also satisfied [35]. Results of hypothesis testing are shown in Figure 1. As indicated in the results, functional attitudes, subjective norm, and perceived behavioral control positively influenced intention to purchase; aesthetics attitudes and social attitudes did not influence purchase intention of face mask. Purchase intention had a direct and positive influence on consumers' actual purchase behavior of face mask, helping to validate the model. Therefore, H2, H4, H5, and H6 were supported; H1 and H3 were not supported. Testing results were presented in Table 5.

Table 5. Summary of hypotheses (H1–H6) and testing results.

| Path To | Path From | Path Coefficient | <i>p</i> | Hypothesis Testing |
|--------------------|--|------------------|----------|--------------------|
| Purchase intention | Attitude towards aesthetics attributes | −0.059 | ns | H1 not supported |
| | Attitude towards functional attributes | 0.346 | * | H2 supported |
| | Attitude towards social attributes | −0.396 | ns | H3 not supported |
| | Subjective norm | 0.352 | ** | H4 supported |
| Actual purchase | Perceived behavioral control | 0.263 | * | H5 supported |
| | Purchase intention | 0.500 | ** | H6 supported |

Note. ** $p < 0.001$, * $p < 0.05$, ns: not significant.

4.5. Multi-Group Comparisons for Workplace Association Groups

To test moderating effects of workplace connection, respondents were separated into two groups (with workplace connection: $n = 151$ and without workplace connection: $n = 64$). MANOVA test demonstrates that consumers with workplace association are younger, have better education level, and higher income than the consumers without workplace connection, but without significant difference in ethnicity. The measurement invariance was first tested in CFA. Results indicated that configural invariance, metric invariance, and scalar invariance was exhibited across consumers with (vs. without) workplace connection. Multiple group comparisons were then conducted to examine whether the magnitude of the influence from aesthetic attitudes, functional attitudes, social attitudes, subjective norm, and perceived behavioral control on the intention to purchase their preferred face mask again differed across the workplace association groups [32,36].

The moderating effects of the workplace association were tested by estimating a constrained multi-group model (Model 1/Base Model with no moderating effects) by constraining the structural weights as equal across these two groups. The result was an acceptable fit ($\chi^2 = 411.827$, $df = 280$; $\chi^2/df = 1.471$; RMSEA = 0.047; CFI = 0.955). The unconstrained multi-group model (Model 2 with moderating effects) was then estimated, by estimating the structural weights uniquely for each group. The result was an acceptable fit ($\chi^2 = 396.368$, $df = 274$; $\chi^2/df = 1.447$; CFI = 0.958; RMSEA = 0.046). Therefore, by comparing the above two models, the results indicated that the Chi-square difference ($\Delta\chi^2 = 15.459$, $df = 6$; $p < 0.05$) was significant at the group level, which indicated the influence from aesthetic attitudes, functional attitudes, social attitudes, subjective norm, and perceived behavioral control on purchase intention toward face masks, and the influence from purchase intention toward the actual purchase of face masks do differ for consumers with (vs. without) workplace connection. Next, the influence from each exogenous variable was further tested with each path constrained one at a time. The results of Chi-square difference were compared with the Chi-square threshold. The results indicate that the prediction of intention to purchase their preferred face mask by social attitudes is significantly different for consumers with and without workplace association (with 99% confidence), with this effect of social attitudes on purchase intention significant only for consumers with workplace association ($\beta = 0.108$). Moreover, the prediction of intention to purchase their preferred face mask by perceived behavior control and is significantly different for

consumers with and without workplace association (with 99% confidence), with this effect of perceived behavior control on purchase intention significant (but negative) only for consumers with workplace association ($\beta = -0.139$). Therefore, H7c was supported and H7a, H7b, H7d, and H7e were not supported.

5. Discussion and Implications

To help product developers, retailers, and policymakers responsible for planning for the next phases of response to the COVID-19 pandemic and subsequent pandemics, this research study's purpose was to expand our understanding of consumers' decisions to purchase face masks.

5.1. Prioritizing Protection in Mask Production and Usage

The study incorporated Lamb and Kallal's FEA model [16] into Fishbein and Ajzen's TPB [8] by splitting attitude into three separate variables. This makes it possible for PPE product developers to understand the role attitudes related to each FEA dimension play in informing purchase intention. The model demonstrated that attitudes toward aesthetic attributes, such as attractiveness, do not predict the intention to repurchase a preferred face mask. This is in contrast with both previous research [11,37,38] and the content analysis's results, which demonstrated that consumers commented upon the aesthetic of face masks for sale on various websites. Even now, aesthetics was not the primary determinant of attitudes toward face mask purchase for U.S. consumers; with long lasting or repeated calls to wear face masks, a mask's appearance may play a greater role in a specific choice in face mask.

However, the attitudes related to the masks' functional attributes did play a significant and moderate ($\beta = 0.346$) role in the intention to repurchase a preferred face mask. From a public health perspective, consumers' belief that a face mask fits sufficiently well to filter air, provides protection, and is comfortable, should be the basis of a decision to purchase a face mask, and these results provided more evidence of the basis of consumer choice than studies that included model attitudes toward masks using simpler items, such as "I think it is important to buy masks" [7]. The functional beliefs related to this attitude domain included both protection of self and "people I care about" in the purchase of the preferred mask, which implies for retailers and public health experts that both aspects of protection should be highlighted in face masks' product descriptions. This is something to consider, as it explains why masks with a poor fit or a non-mask type of face covering that does not provide protection for others are not a suitable choice to reduce an airborne virus's spread.

However, the results indicated that social attitudes influence purchase intention significantly, but negatively. The only two items related to social expressiveness that loaded into the model were related to wearing a mask in public, rather than those items that measured the expression of self-identity, suggesting that face masks constrain, rather than project, consumers' self-identity. Product developers and public health experts can draw implications from this. While producing face masks that appeal to a wide variety of consumer tastes and styles appears to be the best way to increase consumers' purchase and use of face masks, it is important for product developers to consider that consumers may not want their face masks to express their identity. These results suggest that just as consumers do not necessarily want their face masks to be pretty, they do not want to be reminded that they must wear them to go out in public when they are thinking about which face mask to purchase. In considering their next purchase, these results indicate that they are focusing on face masks' comfort and safety aspects. The unexpected negative direction of the effect of attitudes toward face masks' social/expressive attributes may also result from conflicting advice and the sometimes-inflammatory public dialogue surrounding wearing masks.

While previous studies have indicated that subjective norms did not influence consumers' intention to purchase apparel products [18], more recent research on consumers' mask-wearing behavior has indicated that important referents' perceived opinions did play

a significant role in predicting consumers' intention to wear face masks [15,22], which was a conclusion the results of this study supported.

Moreover, the results demonstrated that perceived behavioral control significantly influenced consumers' intention to purchase a face mask. This suggests that consistent with previous research [6], consumers will invest effort to obtain the desired product despite factors, such as availability, that make it difficult. Ajzen's [19] suggestion that perceived behavioral control should be measured using the same expectancy value model as attitude and subjective norm was useful, because it helped illuminate which factors influenced the perception of control. In this study, items related to time and money were dropped during the EFA, and those related to free shipping were dropped during the CFA. The implication for retailers is that communicating that face masks are in stock, without waiting, in stores that are familiar to consumers influences their intention to purchase these face masks positively. Placing face masks near checkout counters, featuring them in circulars or email advertisements, and emphasizing their continued ubiquity for the duration of the crisis, are actions that retailers can take to increase consumers' perception of behavioral control.

Finally, the results demonstrated that workplace association moderated the path from social attitudes to purchase intention, but not other paths. While the pandemic has led to widespread unemployment and loss of educational opportunities, the social distancing requirements have created a situation where "working from home" means that those with a workplace association are in fact more socially isolated than those without employment or the opportunity to attend school. These results provide implications for policymakers, beginning with the demonstration that workplace association plays an essential role in informing face mask purchase intention. While it may be understandable for employers and educators to be reluctant to provide the guidance required to create a social norm in the face of the political and social controversy surrounding the use of face masks that has arisen in the various places, the results of this study suggested that workplace social norms are important determinants of consumer behavior. The fact that family, friends, and other important people were not included among the groups whose opinions determined the formation of face mask purchase intention indicates that those who seek to increase public health behavior, both related to face masks and other future interventions, should not have a plan to influence the public that depends solely upon these close relationships.

5.2. Open Innovation Dynamics in Mask Production and Consumption

The apparel, textile, and fashion industries were certainly not the only industries to pivot during the COVID-19 pandemic towards innovative means of meeting consumer needs through new products or new points of sale [39,40]. Because face masks have been new products for consumers in many parts of the world, fashion brands may draw on brand loyalty [41], loyalty created by ethnocentrism [42] or marketing mix [26] to encourage consumers to choose their face masks. However, a dynamic product development process that uses open innovation would increase product competitiveness [43], especially if the development takes a multidexterity approach to produce a portfolio of several viable product options [2]. The rapid product and adoption of face masks by consumers during the COVID-19 pandemic has provided a real-world application of open innovation in a market space without a dominant brand-only basic product specification (covers nose and mouth) that includes rapid prototyping and omni-channel sales. While open, integrated supply chains are the bedrock of the modern innovation economy [44], the COVID-19 pandemic severely tested supply chain relationships, requiring even more innovation to meet the demand for face masks.

Immediate implications from this study for those seeking to market face masks include marketing based on functional attributes (e.g., provided protection) rather than aesthetic attributes (e.g., styling) and the suggestion that consumers feel constrained from identifying with their face masks, unlike other apparel items and accessories. While studies of luxury fashion products suggest that a consumer's face consciousness (the desire to present oneself favorably) predict the desire to express their identity through wearing a product [10], the

only two items related to social expressiveness that loaded into the model were related to mask wearing in public, rather than those items measuring the expression of self-identity. While producing face masks that appeal to a wide variety of consumer tastes and styles seem to be the best way to increase consumer purchase of face masks, it is important to consider that consumers may not want to enjoy wearing their face masks. “Functional, healthy, and unremarkable” face masks seem to be what consumers, especially men, are looking for whose aesthetic attitudes did have a significant but negative impact on purchase intention.

The changing nature of the workplace is another major impact of the COVID-19 pandemic that has driven open innovation [29]. Workplace associations, defined to include students in their school “workplaces” and those working from home, was demonstrated to moderate face mask repurchase intention by significantly increasing the impact of social norms set by workplaces. The fact that family, friends, and neighbors were not included among the groups whose opinions were driving the formation of purchase intention provides implications for those who would seek to increase public health behavior. This applies not only to face masks but other future interventions, where manufacturers and policy makers should consider working more closely with industry of all sectors to include public health intervention as a regularly considered category of focus for open innovation.

In a time when the workplace is distant or nonexistent due to the pandemic, the impact of workplace association is more vital than ever. For retailers, the facilitating conditions included in the influence that perceived behavioral control had on purchase intention demonstrates that improving facilitation through steps, such as communicating to consumers that face masks are in stock, without waiting, at familiar stores will influence their intention to purchase the face masks. Countries such as South Korea, which had a more rapid response on the part of the public in wearing face masks facilitated consumer behavioral control by making masks available widely [5]. During future public health emergencies, businesses should be prepared to acknowledge and act on their ability to create norms surrounding behaviors, such as face mask purchase, that produce widespread social good.

6. Limitations and Future Research

There are limitations to the ability to generalize this study’s results. First, at the time the study was conducted, the vaccines were not available yet but the news about vaccines was becoming increasingly positive, which might explain the inability of the intention to purchase in 6 months to load into the model, but also suggests that the results should be interpreted with caution. General hopefulness might have served to dampen the intention to purchase face masks for a pandemic that many people hope will end quickly; however, this limitation means the results would be more applicable in a situation of greater emergency, which will doubtless recur. In that case, the open innovation and development of entirely new products that have an apparel aspect to meet unforeseen demand should find these results useful. Second, this study used a small sample of American consumers and was not designed to consider political affiliation during the analysis, and thus, this attitude domain’s influence was left unexplored, which is a limitation in hindsight. While clothing and textile researchers may not commonly include questions about political orientation in their studies, the politicization of face masks in the U.S. during the COVID-19 pandemic indicates that future research on face masks, including those in other countries, should contain a question about political affiliation as well as other demographic questions.

Finally, there is a connection between open-source product innovation for public health management and for adaptation for climate change [45]. A dialog should be maintained between the efforts made to encourage the development of innovative technology (e.g., energy efficient products) [46] and materials (e.g., recycled PET) [47] for climate adaptation and technology/materials for public health (e.g., air and water filtration). The clothing, textile, and fashion industry plays a major role in driving climate change and the rapid, open innovation response observed by the industry to the COVID-19 pandemic models is what may be required in the future to respond to climate change.

Author Contributions: Conceptualization, Y.L. and G.H.; methodology, Y.L. and G.H.; software, Y.L.; validation, Y.L., G.H. and J.M.; formal analysis, Y.L.; investigation, Y.L., G.H., and J.M.; resources, Y.L. and G.H.; data curation, Y.L.; writing—original draft preparation, Y.L. and G.H.; writing—review and editing, Y.L. and G.H.; visualization, Y.L. and J.M.; supervision, Y.L. and G.H.; project administration, Y.L. and G.H.; funding acquisition, Y.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was approved by the Institutional Review Board of Texas State University [IRB Reference Number 7504] on 23 November 2020.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

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