



Article

Impact of the COVID-19 Pandemic on Online Consumer Purchasing Behavior

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Abstract: With the spread of the COVID-19 pandemic and the increasing importance of e-commerce, the study of online consumer behavior is of particular relevance. The purpose of this study was to form a methodological approach to assess the relationships and the level of influence of the factors activating the purchasing behavior of online consumers against the background of the COVID-19 pandemic. The research methodology was based on the transformation of Cattell’s questionnaire and the implementation of correlation analysis. To determine the predisposition of online consumer behavior at the time of making a purchase decision, this study used the questionnaire method. The survey was conducted among online shoppers in the top 10 countries in terms of e-commerce market growth. The scientific contribution is the proposed methodological toolkit to assess the purchasing behavior of online consumers, which identifies the most influential factors in their purchasing behavior and provides an opportunity to assess the dynamics of their activity during the study period, to identify key trends and determine changes in their behavior. The research revealed what changes in online consumer buying behavior are typical in the COVID-19 pandemic. The impact of consumer awareness and experience has increased. Online consumers have become more experienced, which has influenced the activity of their buying behavior. This study proved the shifting influence of online consumer purchasing behavior factors during the pandemic. The increasing importance of the speed of decision making by consumers when purchasing goods and services online was determined.

Keywords: behavior; correlation; e-commerce; multi-factor analysis; online shopper; pandemic; reflexive characteristics



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1. Introduction

The global economy in general and international trade in particular have suffered and continue to suffer massive losses from the coronavirus pandemic. The uncertainty in which businesses and end consumers found themselves immersed is further aggravated by multiple factors. Those include income decline, cross-border travel restrictions, shifting consumer demand, and the changing behavior of market actors, to name a few [1]. Global lockdown, social distancing, and other measures introduced to limit the spread of the COVID-19 pandemic have urged consumers to purchase more on the online marketplaces [2]. The business landscape faced rapid transformations during the quarantine period as a result. Ultimately, the corona crisis accelerated the development of digital commerce. Globally, a new digitally immersed consumer has emerged, a more selective one, with financial difficulties.

Income losses, limited transport opportunities, and pandemic mitigation measures, which caused the reduction of supplier activities, have forced B2B manufacturers and sellers to reduce production and marketing costs, find new suppliers both abroad and within the country, and accelerate decision making. National companies received opportunities to diversify their product portfolio for the purposes of import substitution and to supply other firms and branches of foreign companies with necessary resources [3,4]. B2C markets, on the other hand, encountered a decline in purchasing power and cross-border mobility. On top of that, consumers shifted toward health and safety while maintaining a preference for inexpensive goods and services [5]. Products that bring comfort and a sense of coziness to a living space received more attention than they normally would. Overall, the uncertainty and unpredictability of the situation made consumers postpone some of their demands [6]. The industrial market and consumer market both faced a need to accelerate digitalization and make it easy to find and purchase items online [7,8].

The pandemic sparked a meteoric rise in online sales. As visits to physical stores were restricted, and many were running low on money, consumers went online to shop, causing online purchases to grow higher and higher [9]. Consumers were generally mindful shoppers even before the pandemic [10]. Because of this, some shopping categories such as experiences were gradually downgraded on their priority lists, and COVID-19 accelerated things in this direction [11].

The COVID-19 pandemic has affected the lifestyles and motivations of many people, such that their purchasing behaviors also changed. The present study seeks to assess these changes. In achieving this goal, the study determined the impact of the pandemic on e-commerce across industries to identify the priorities of online consumers. It also identified the most important factors influencing online consumers' shopping behavior based on a multi-stage survey as the pandemic spread. Based on the correlation analysis the presence of relationships between the studied factors and the complex indicator of activation of online consumer behavior was determined, the direction of their changes against the background of the pandemic was investigated.

This study aims to test the proposed approach to assessing the purchasing behavior of online consumers, which can contribute to the identification of trends and patterns of online shopping. Therefore, it can be a component of a comprehensive toolkit in the design of e-commerce strategy, used both at the state level and for individual companies.

The structure of the study includes an introduction, a literature review that points to the increasing scientific interest in e-commerce issues during the pandemic, a methodology describing the proposed approach, the results, their discussion, and conclusions.

2. Literature Review

By 2020, the number of e-commerce publications had almost tripled compared to 2000. At the same time, it increased 1.4 times over the past year. This tendency indicates a rise in academic interest toward e-commerce during the COVID-19 period.

Seven clusters were found through the analysis of e-commerce publications (Figure 1). These clusters are distributed as follows:

- Cluster 1 (shown in red) is the largest and encompasses 307 items, which appear fewer than 5 times in the studied papers. Scholars have paid considerable attention to issues associated with Internet advancement, concentrating in particular on security. The red cluster is related to business models and strategies, business process optimization and management, competitiveness, legislative regulation, possible barriers and risk assessment, technological readiness, etc.
- Cluster 2 (green, 57 items) embraces the interests in consumer satisfaction, policy communication, data protection, and related issues. Particular attention is devoted to marketing, in particular B2B (business-to-business) and B2C (business-to-consumer) initiatives.
- Cluster 3 (blue, 45 items) is dedicated to business ethics. Publications in this cluster focus more on pricing, improving online platforms, attracting customers, increasing

- their loyalty, enhancing the quality and reliability of services, boosting reputation, personalizing the customer experience, and more.
- Cluster 4 (yellow, 42 items) is related to big data processing, artificial intelligence, deep learning, text mining, social networking, information systems, information security, and such.
- Cluster 5 (purple, 34 items) includes the works about the relationship between purchaser pleasure, customer loyalty and retention, and the e-service quality of e-commerce platforms.
- Cluster 6 (blue, 14 items) contains papers dedicated to online selling through social networks, e-loyalty, online marketing, web design, and more.
- Cluster 7 (orange, 7 items) is the smallest cluster with papers that explore the relationship between neural networks, game theory, simulation, and C2C (consumer-to-consumer) e-commerce.

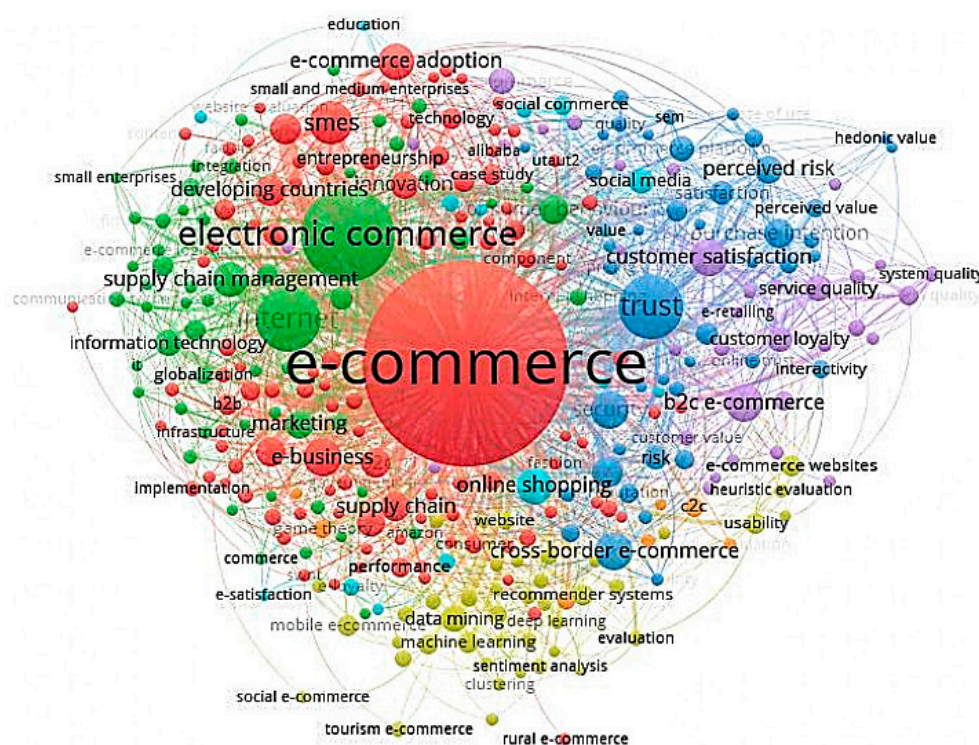


Figure 1. A map showing thematic focuses of scientific publications released between 2000 and 2020. Source: created with VOSviewer using data from Scopus.

The systematization of scientific publications made it possible to single out several studies that play a fundamental role in the development of e-commerce and online shopping behavior theories. Some scientists concluded that motivation, environment, political factors [12,13], accessibility, and communication [14] have a substantial influence on the attitude of online consumers to e-services. Other scholars have devoted themselves to consumer trust and its effect on online shopping behavior [15,16]. In particular, trust is a major driver of the long-term buyer–seller relationship [17].

Shopper behavior is influenced by a range of factors, objective and subjective. Last year, the pandemic was one such factor. The growth of COVID-19 cases and its consequences (such as quarantine, isolation, social distancing and community containment) impacted not only the attitude of people toward health but also their buying behavior [18].

People in lockdown were ordering online more often than normal. They also reduced their discretionary costs, became more selective, and shifted to local brands [19]. Demand for digital technologies (e.g., satellite broadband and video conferencing applications) has surged [20,21].

As most consumers were forced to eat at home during the lockdown period, the food and beverage industry saw an increase in online sales. With many online shoppers reporting a decline in income [22], it is no surprise that affordable brands were more preferred at that point [23]. If earlier a consumer basket included a wide range of goods and services, then during the pandemic the focus was on essential items, medication, antiseptics and disinfectants, delivery services, etc. [24]. Shopping patterns specific to the holiday season also underwent substantial changes. An average budget for holiday shopping was smaller during the pandemic as compared with previous years, and many shoppers (nearly all generations) turned to contactless shopping [25]. The basic purchasing criteria remained the price, availability, and convenience, and a new criterion has emerged—hygiene [26]. Along with the growth of food sales, the pandemic saw an increase in the sales of medical supplies, children's products, sporting items, and entertainment goods [27]. The percentage of spontaneous purchases decreased, and the percentage of planned purchases increased [28]. The rationalization of shopping behavior during the pandemic encouraged most companies to rethink their business strategies and consider a new situational driver of procurement to retain and attract new customers [29].

Consumer behavior was influenced both by the COVID-19 pandemic itself and by government restrictions. Consumers of all generations during the COVID-19 crisis were more likely to buy goods and services digitally [30]. Overall, there was a significant shift toward e-commerce spending. The frequency of shopping also increased [31]. Factors that drive online consumer behavior during the COVID-19 pandemic include strong and sustained growth in the number of Internet users and increased awareness of online shopping, increasingly active online product releases, low prices due to bulk purchases, etc. [32]. The COVID-19 pandemic, social distancing, and staying at home are expected to push consumers to shop online. However, uncertain consumer demand and supply chain issues could affect the e-commerce industry. The COVID-19 pandemic issue may also affect large merchants, who are experiencing a decrease in casual shopping, supply chain disruption, and increased purchases of essential hygiene and disinfection products, groceries, and other products [33].

Considering the changes in consumer behavior caused by COVID-19, marketing research in this area has also undergone changes. More and more marketing research on consumer behavior is taking place online (online questionnaires, call center surveys, and focus groups conducted via video conferencing or telephone conversations). Entrepreneurs had to adapt quickly and find innovative ways to interact with customers [34]. Although the situation has been unpredictable, and decisions are not always easy to make, the current changes themselves cannot be called fundamentally new. Real-time analysis of changing consumer behavior, integration of online and offline channels, automation, flexibility, and attention to community values have all been discussed before. The pandemic simply resulted in the increased scientific interest in these activities. In the new world, the role of online analytics increases significantly: total quarantine is reflected in user behavior. Without understanding what exactly has changed, companies cannot plan their future actions [35]. This applies to both marketing and sales in general. Whatever the world, the new kinds of research, methods and technologies learned during the pandemic are not temporary but are being confidently implemented and opening up a new space for managing online consumer behavior.

Companies must focus on the digital capabilities of their consumers and clearly identify where they need to gain their trust [36]. Each of the trends above has accelerated significantly with the onset of the pandemic. As research shows, the cumulative impact of the pandemic on consumer behavior has significant implications for business. Companies can no longer defend their pricing policies with factors that no longer have a benefit and are not crucial to a consumer in the new reality [37].

In general, based on the reviewed modern sources of literature, one can identify the following areas of research on online consumer behavior:

- Marketing factors (e.g., product design, price, promotion, packaging, positioning, and distribution) [38];
- Personality characteristics (such as age, gender, education, and income) [39];
- Psychological drivers (purchase motives, product perception, and attitude to the product) [40];
- Situational framework (the physical environment at the time of purchase, the environment, and the time factor) [41];
- Social determinants (social status, reference groups, and family) [42];
- Cultural factors (religion, social class) [43];
- Intergenerational behavior [44].

Despite the variety of studies on online shoppers and their preferences, the factors that influence purchasing behavior remain insufficiently understood. The reviewed studies are quite multidirectional, focused on individual components of online consumer behavior. Therefore, there is a need to develop a comprehensive approach that will simultaneously consider the level of electronic instability, the commitment of an individual to introversion, adaptability to online shopping, the availability of appropriate consumer experience, as well as the speed of decision making. The presence of this knowledge gap necessitates a deep comprehensive exploration of online purchasing behavior in unstable pandemic conditions with respect to its key drivers. The purpose of this study is to develop a composite measure of online purchasing behavior amid the COVID-19 pandemic based on its drivers and use it to examine the effect COVID-19 had on the purchasing behavior of online consumers. In the process of achieving this goal, the following hypotheses were formed:

Hypothesis 1 (H1). *Online consumer behavior in the face of the COVID-19 pandemic focuses on an individual's commitment to introversion.*

Hypothesis 2 (H2). *The behavior of online consumers against the background of the COVID-19 pandemic becomes dependent on their experience and decision-making speed.*

3. Materials and Methods

Factors selected for inclusion in the Composite Index of Online Purchasing Behavior (K_i^{1-Q}) are qualities of a reflexive consumer deduced from Cattell's personality profile. These include (1) Constancy of Online Purchasing Behavior, INI^{1-Q} ; (2) Introversion, CNI^{1-Q} ; (3) Adaptiveness, ANI^{1-Q} ; (4) Consumer Awareness & Experience, $CENI^{1-Q}$; and (5) Promptness in Decision Making, $CENI^{1-Q}$. An increase in the value of the Composite Index will indicate that shoppers became more active online.

The present study exploits the questionnaire method to measure reflexive personality traits. The survey was conducted among online shoppers in the top 10 fastest growing e-commerce countries, namely, China, the United States, the United Kingdom, Japan, Germany, France, South Korea, Canada, Russia, and Brazil. It was conducted in 2020 and repeated 4 times during the said period. The initial survey took place in the first 10 days of June and then was repeated in August, October, and December.

Participants (online consumers) were recruited by invitation through online marketplaces. Invitations were sent to individuals who added at least one product to their shopping carts for purchase. All recruits who agreed to participate in the survey were redirected to Google Forms. The initial sample included 4112 online shoppers. However, some respondents did not reach the final survey, which took place in December. Those who failed to answer all questions clearly were also excluded from the analysis. The final sample thus included 3042 online shoppers.

To enable the extrapolation of survey results to the general population, it is necessary to make sure that the given sample is representative of the entire population. The general information about respondents (e.g., sex, age, place of residence, marital status, number of children, clickstream information, etc.) was gathered with their consent by using analytics

services and from customer databases. The required sample size can be calculated using the following formula [45] or by finding a sample size calculator online:

$$n = \frac{z^2 pqN}{\partial^2 N + Z^2 pq} \tag{1}$$

where: n is the required sample size; N is the general population; Z is the coefficient chosen based on the confidence level used (for CI 95%, $z = 1.96$); p is the proportion of respondents with the studied characteristic (typically, 50%); $q = 1 - p$ is the proportion of respondents without the studied characteristic; ∂ is the margin of error (typically, 5%).

The raw data from both questionnaires were then normalized so that all values were within the range of 0 and 1. The dimensionality of the reflexive personality factors (RPFs) $\{X_i^{INI_i^{1-Q}}, X_i^{CNI_i^{1-Q}}, X_i^{ANI_i^{1-Q}}, X_i^{CENI_i^{1-Q}}, X_i^{DVI_i^{1-Q}}\}$ was achieved by mapping the values for each factor into the $[x, x]$ range [46], as shown below:

$$\check{X}_i^k = \frac{X_i^k - \check{X}_i^k}{\underline{X}_i^k - \check{X}_i^k} (\underline{x} - \check{x}) + \check{x} \tag{2}$$

where \underline{X}_i^k is the maximum value of the factor X_i^k possible; \check{X}_i^k is the minimum value of the factor possible; k is the value of the reflexive personality factor (i.e., INI_i^{1-Q} , CNI_i^{1-Q} , ANI_i^{1-Q} , $CENI_i^{1-Q}$, and DVI_i^{1-Q}); i is the respondent sequence number; and $[x, \check{x}]$ is the normalization scale.

The online shopping behavior of consumers was assessed using two questionnaires. A modified version of Cattell’s Sixteen Personality Factor (16PF) Questionnaire with an additional factor of self-esteem (MD) was used to evaluate consumer’s behavior online.

The adapted questionnaire included a number of factors that were components of the variables used in the study. Their characteristics are given in Table 1.

Table 1. Characteristics of the factors used in the adapted questionnaire.

No.	Factor	Characteristics
1	A	openness to online shopping
2	B	the ability to make meaningful purchases
3	C	emotional stability
4	E	independence in purchasing decisions
5	F	impulsiveness to buy online
6	G	conscientious decision making
7	H	taking the risk when shopping online
8	I	the presence of aesthetic needs
9	L	buyer’s gullibility when buying online
10	M	practicality of online shopping
11	N	refinement of taste in choosing goods online
12	O	uncertainty when buying online
13	Q1	a tendency to experiment and innovate
14	Q2	the desire for independent decisions and actions

Table 1. Cont.

No.	Factor	Characteristics
15	Q3	self-control and discipline in online shopping
16	Q4	internal tension when shopping online
17	MD	adequacy of the assessment of one’s capabilities

Source: formed by the authors based on [47].

The questionnaire had 6–7 items per factor and a three-choice response format (a, b, or c). Each item was scored as 0, 1 or 2. The primary factor scores (Table 2) defined the overall level of reflexive personality factors and were converted to standard ten (sten) scores using Table 3.

Table 2. Scoring chart for the 16PF questionnaire.

Factor	Question/Response/Score							
MD	1. b-1 a-2	18. b-1 c-2	35. b-1 c-2	52. b-1 a-2	69. b-1 c-2	86. b-1 c-2	103. b-1 c-2	
A	2. b-1 c-2	19. b-1 a-2	36. b-1 c-2	53. b-1 a-2	70. b-1 a-2	87. b-1 c-2	104. a-1	
B	3. b-1	20. c-1	37. b-1	54. c-1	71. a-1	88. c-1	105. b-1	
C	4. b-1 a-2	21. b-1 a-2	38. b-1 c-2	55. b-1 a-2	72. b-1 c-2	89. b-1 c-2		
E	5. b-1 c-2	22. b-1 c-2	39. b-1 c-2	56. b-1 a-2	73. b-1 c-2	90. b-1 a-2		
F	6. b-1 c-2	23. b-1 a-2	40. b-1 c-2	57. b-1 a-2	74. b-1 a-2	91. b-1 c-2		
G	7. b-1 a-2	24. b-1 c-2	41. b-1 a-2	58. b-1 c-2	75. b-1 a-2	92. b-1 c-2		
H	8. b-1 a-2	25. b-1 c-2	42. b-1 c-2	59. b-1 a-2	76. b-1 a-2	93. b-1 c-2		
I	9. b-1 a-2	26. b-1 a-2	43. b-1 c-2	60. b-1 a-2	77. b-1 c-2	94. b-1 c-2		
L	10. b-1 a-2	27. b-1 c-2	44. b-1 c-2	61. b-1 c-2	78. b-1 a-2	95. b-1 a-2		
M	11. b-1 c-2	28. b-1 c-2	45. b-1 a-2	62. b-1 a-2	79. b-1 a-2	96. b-1 c-2		
N	12. b-1 c-2	29. b-1 c-2	46. b-1 a-2	63. b-1 a-2	80. b-1 c-2	97. b-1 c-2		
O	13. b-1 c-2	30. b-1 a-2	47. b-1 c-2	64. b-1 a-2	81. b-1 c-2	98. b-1 a-2		
Q ₁	14. b-1 a-2	31. b-1 a-2	48. b-1 c-2	65. b-1 c-2	82. b-1 c-2	99. b-1 a-2		
Q ₂	15. b-1 a-2	32. b-1 c-2	49. b-1 a-2	66. b-1 a-2	83. b-1 c-2	100. b-1 c-2		
Q ₃	16. b-1 a-2	33. b-1 a-2	50. b-1 a-2	67. b-1 a-2	84. b-1 c-2	101. b-1 c-2		
Q ₄	17. b-1 a-2	34. b-1 c-2	51. b-1 c-2	68. b-1 a-2	85. b-1 c-2	102. b-1 a-2		

Source: developed by the authors based on data from [48].

Table 3. Standard score conversion table.

Factor	Sten											M	s
	1	2	3	4	5	6	7	8	9	10			
A	0–4	5	6	-	7	8	9	10	11	12	8.06	1.7	
B	0–2	-	3	-	4	-	5	-	6	7–8	4.5	0.99	
C	0–3	4	5	6	7	8	9	10	11	12	7.5	1.77	
E	0–1	2	3	4	5	6	7	8	9	10–12	5.5	1.66	
F	0–2	-	3	4	5	6	7	-	8	9–12	5.6	1.68	
G	0–3	4	5	6	7	8	9	10	11	12	7.8	1.92	
H	0–3	4	5	6	7	8	9	10	11	12	7.7	1.89	
I	0–3	4	5	6	7	8	9	10	11	12	7.6	1.68	

Table 3. Cont.

Factor	Sten											M	δ
	1	2	3	4	5	6	7	8	9	10			
L	0–1	2	-	3	4	-	5	6	7	8–12	4.3	1.54	
M	0–3	-	4	5	6	7	8	9	10	11–12	5.5	1.63	
N	0–1	2	3	4	5	6	7	8	9	10–12	5.5	1.63	
O	0–1	2–3	4	5	6	7	8	9	10	11–12	6.6	2.14	
Q1	0–4	5	6	-	7	8	9	10	11	12	8.1	1.33	
Q2	0–2	3	-	4	5	6	7	8	9	10–12	5.8	1.69	
Q3	0–2	3	4	5	6	7	8	9	10	11–12	6.3	1.66	
Q4	0–1	2	3	4	5	6–7	8	9	10	11–12	6.0	1.86	
MD	0–2	3	4	5	6	7	8	9	10	11–12	6.7	1.74	

Source: developed by the authors based on data from [46].

This table shows the number of questions and the number of points that counted toward a particular answer, with the exception of answers that corresponded to “0” points. For example, factor A is followed by the following answer scores: a—0; b—1; c—2.

The algorithm for interpreting the results of the survey to determine the evaluation of external factors of a particular surveyed online consumer H_i^{1-Q} corresponded to the survey on the definition of external factors:

1. Decision-making speed $CENI_i^{1-Q}$ was calculated from the scores of answers to questions 1–2 and normalized to the value $CENI_i^{1-Q}$.
2. Level of consumer awareness/experience DVI_i^{1-Q} was calculated from the scores of the answers to questions 3–4 and normalized to the value DVI_i^{1-Q} .

An External Influence Questionnaire was used to determine factors behind the feeling of mispurchase (Table 4). The approval answer choice (Yes) was ranked as a 1 and the anti-approval answer choice (No) was ranked as a 0. Hence, each factor could score within the range of 0 and 2.

Table 4. Scoring chart for the External Influence Questionnaire.

Question	Answer Options
1. Do you need to think quickly and decide whether you need to buy a particular product or service?	(a) Yes (b) No
2. Do you need anything to be purchased immediately?	(a) Yes (b) No
3. Do you have any experience in purchasing this type of product online?	(a) Yes (b) No
4. Do you think you have enough information to decide on purchasing a particular product or service?	(a) Yes (b) No

Source: developed by the authors.

The value of the Constancy of Online Purchasing Behavior (INI_i^{1-Q}) depended on Factor C (Emotional Stability) from the conversion table (Table 2). The level of *Introversion* (CNI_i^{1-Q}) was associated with Factor F1, expressed below:

$$F1 = \{(2A + 3E + 4F + 5H) - (2Q2 + 11)\}:10. \tag{3}$$

Adaptiveness (ANI_i^{1-Q}) was defined by Factor F4, which can be determined using the following formula:

$$F4 = \{(4E + 3M + 4Q1 + 4Q4) - (3A + 2G)\}:10. \quad (4)$$

The scores on factors C, F1 and F4 were normalized by Formula (2) to obtain these reflexive personality factors: INI_i^{1-Q} , CNI_i^{1-Q} and ANI_i^{1-Q} , respectively.

Promptness in Decision making ($CENI_i^{1-Q}$) was defined by responses to questions 1 and 2 in the External Influence survey (Table 3). Finally, the Consumer Awareness and Experience (DVI_i^{1-Q}) was defined by responses to questions 3 and 4 in the External Influence survey. These two factors were then normalized using Formula (2). The computation and compilation of data can be performed manually or by using software applications. In this study, data processing was conducted in MS Excel.

4. Results

The COVID-19-induced economic crisis has become a powerful trigger event that fueled business digitalization. Tight quarantine restrictions prioritized the primary benefits of e-commerce, such as contactlessness, better pricing, portability, and scalability. The high penetration of social media and digital marketing provided companies with additional advantages when finding and attracting new customers at global, national, and local levels. At the same time, they offered clear opportunities for significant reduction of operational costs by removing the need to invest in real estate or hire many employees. The current trends in e-commerce revolve around convenience and security.

Globally, the COVID-19 pandemic has driven consumers to digitalization and reshaped their shopping habits. The massive shift online of people's shopping behaviors has affected all e-commerce subsectors. Figure 2 shows estimates of the effect COVID-19 had on e-commerce traffic by industry. The travel industry was the hardest hit. Travel service companies encountered a 43.7% decrease in traffic, while other industries suffered smaller losses. Media companies experienced an estimated loss of 13.2%, and the fashion industry faced a 10.3% drop in traffic. Even retailers of jewelry and watch brands, luxury goods, and household items saw a better traffic situation, with losses of 8.2, 3.2, and 3.1%, respectively. Supermarkets, on the other hand, enjoyed a 34.4% rise in web traffic. At the same time, Internet users became more interested in sports equipment, retail services, beauty products and cosmetics, and financial services, with an estimated per cent change of 23.6, 7, 3.7 and 1.8, respectively.

In 2019, most consumers chose to use mobile devices to search online for a product or service (Figure 3), mostly luxury goods, clothing, beauty products, travel services, food, auto parts and accessories, and household items [51]. Desktop computers and laptops were the preferred choices when searching for energy and financial services. Note that the website traffic that tablets account for was low regardless of the product category.

January 2021 saw a substantial rise in online transactions (Figure 4). In general, Internet users became more confident when shopping online and more interested in buying high-quality products at lower prices. At the same time, shoppers tended to prefer online stores with a broad range of items. The number of transactions on supermarket and retail sites surged by 73.4 and 49.9%, respectively. Increases were seen for household products (28.7%), jewelry and watches (26.4%), sporting goods (26.2%), etc. Meantime, online transactions involving travel services, fashion products, and luxury goods experienced a decrease, by 33, 5.2 and 2.8%, respectively. The growing activity of Internet users, including consumers in e-commerce, required a high level of security and a flexible payment system that would support cross-currency payments.

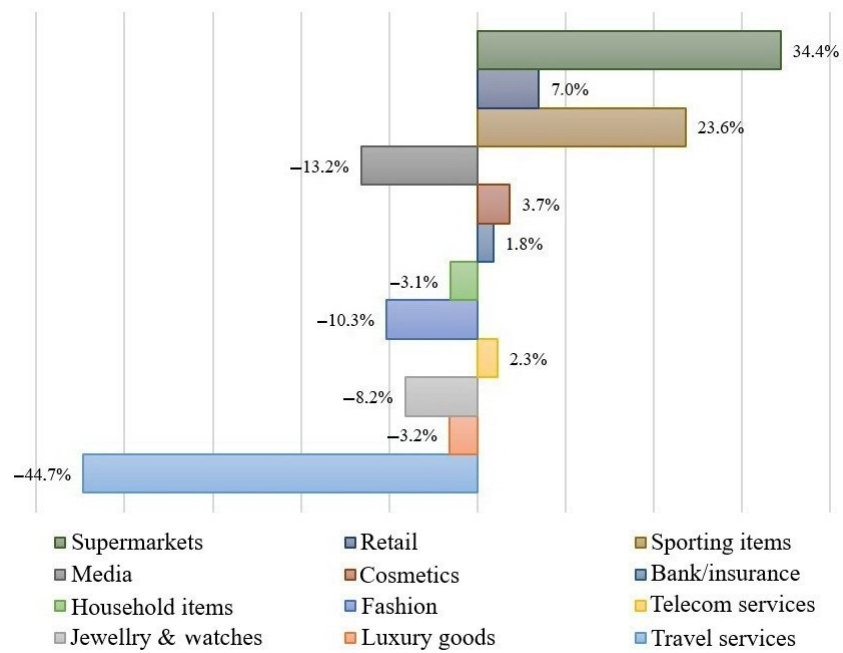


Figure 2. Effects of COVID-19 on global e-commerce by industry. Estimated average per cent change in web traffic from October 2020 to January 2020. Source: adapted from [49,50].

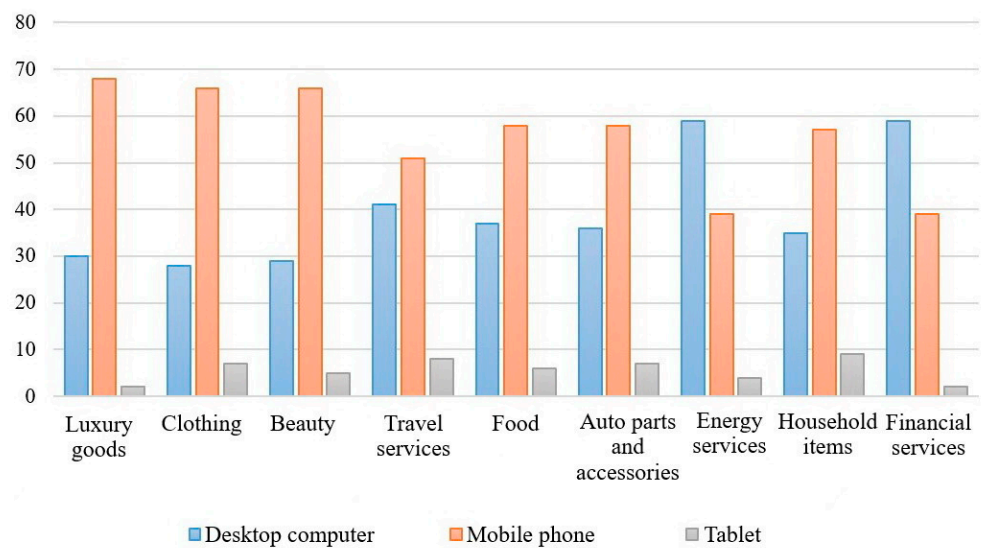


Figure 3. Percentage of web traffic from desktop computers, mobile devices, and tablets in 2019 by industry. Source: adapted from [49,50].

According to the analysis of survey results, a tendency of consumers to not complete the purchase was $\partial = 0.27$. Hence, the likelihood of a consumer purchasing a product or a service was $p(Q2) = 1 - 0.27 = 0.73$. A summary of raw and normalized RPF factor scores is presented in Table 5.

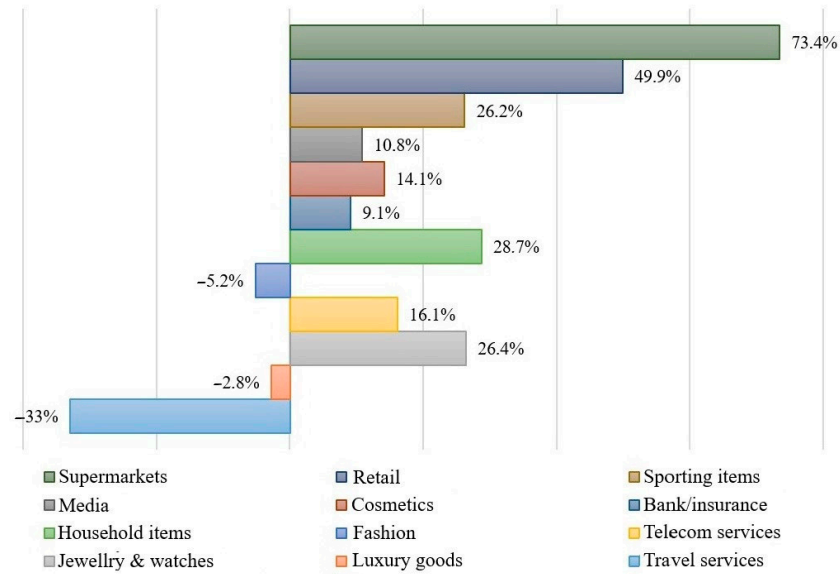


Figure 4. Change in e-commerce transactions by industry. Source: adapted from [49,50].

Table 5. Survey findings: raw and normalized factors of a reflexive consumer personality and the Composite Index of Online Purchasing Behavior.

No.	INI^{1-Q}	INI^{1-Q}_{norm}	CNI^{1-Q}	CNI^{1-Q}_{norm}	ANI^{1-Q}	ANI^{1-Q}_{norm}	$CENI^{1-Q}$	$CENI^{1-Q}_{norm}$	DVI^{1-Q}	DVI^{1-Q}_{norm}	K_i^{1-Q}	∂_i^{1-Q}
1	8.00	0.67	8.00	0.67	9.00	0.75	0.00	0.00	2.00	1.00	0.60	0.40
2	9.00	0.75	9.00	0.75	9.00	0.75	2.00	1.00	2.00	1.00	0.88	0.13
3	10.00	0.83	10.00	0.83	10.00	0.83	2.00	1.00	1.00	0.50	0.79	0.21
4	5.00	0.41	3.2	0.25	8.3	0.66	1.00	0.50	0.00	0.00	0.34	0.66
5	12.00	1.00	8.00	0.67	8.00	0.67	1.00	0.50	1.00	0.50	0.64	0.36
6	11.00	0.92	5.00	0.42	6.00	0.50	1.00	0.50	0.00	0.00	0.43	0.57
7	6.00	0.50	6.00	0.50	10.00	0.83	1.00	0.50	2.00	1.00	0.68	0.32
8	10.00	0.83	10.00	0.83	10.00	0.83	2.00	1.00	0.00	0.00	0.67	0.33
9	11.00	0.92	11.00	0.92	11.00	0.92	2.00	1.00	1.00	0.50	0.83	0.17
10	9.00	0.75	9.00	0.75	9.00	0.75	1.00	0.50	2.00	1.00	0.75	0.25
11	10.00	0.83	12.00	1.00	10.00	0.83	0.00	0.00	2.00	1.00	0.69	0.31
12	11.00	0.92	11.00	0.92	11.00	0.92	0.00	0.00	2.00	1.00	0.71	0.29
13	12.00	1.00	5.00	0.42	10.00	0.83	0.00	0.00	2.00	1.00	0.63	0.38
14	8.00	0.67	8.00	0.67	8.00	0.67	0.00	0.00	2.00	1.00	0.58	0.42
15	9.00	0.75	9.00	0.75	9.00	0.75	2.00	1.00	2.00	1.00	0.88	0.13
16	10.00	0.83	10.00	0.83	10.00	0.83	1.00	0.50	2.00	1.00	0.79	0.21
17	11.00	0.92	11.00	0.92	11.00	0.92	1.00	0.50	2.00	1.00	0.83	0.17
18	12.00	1.00	7.00	0.58	8.00	0.67	1.00	0.50	2.00	1.00	0.75	0.25

Source: developed by the authors.

In the given example of the results of evaluating the reflective characteristics of potential consumers (a fragment—18 respondents), based on the survey, one can trace the process of the obtained indicators’ normalization, which was carried out for the answers of each respondent.

The strength of the relationship between RPF factors and online purchasing behavior was determined through correlation analysis. The results are given in Figures 5–8.

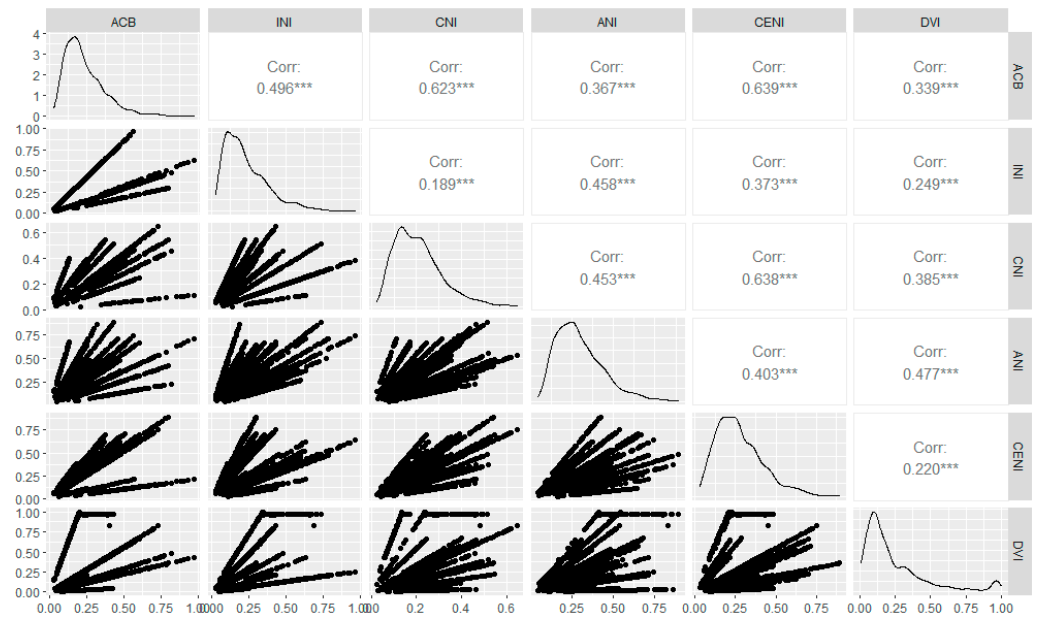


Figure 5. Correlation matrix between RPF factors and Composite Index of Online Purchasing Behavior as of June 2020. Source: developed by the authors. *** $p \leq 0.001$.

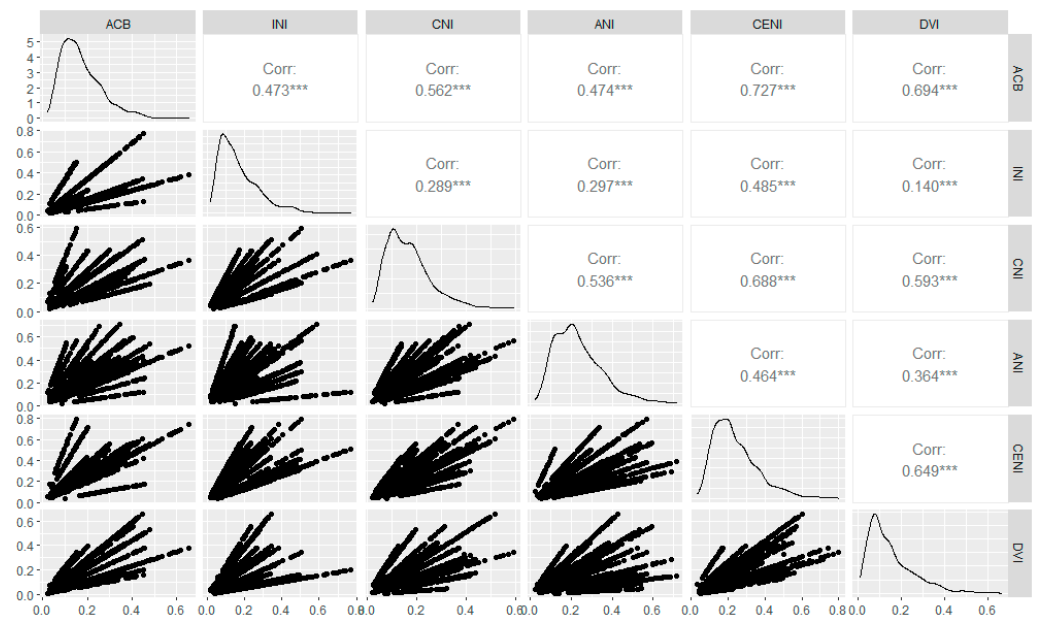


Figure 6. Correlation matrix between RPF factors and Composite Index of Online Purchasing Behavior as of August 2020. Source: developed by the authors. *** $p \leq 0.001$.

In June 2020, with the pandemic in full swing, online purchasing behavior was strongly influenced by a change in Consumer Awareness and Experience and Introversion (propensity to buy a particular product). The said contributory factors were directly related.

In August 2020, the loading of Consumer Awareness and Experience became higher than it was in June, as was the loading of promptness in decision making, and this difference was substantial. The relationship between online purchasing behavior and Introversion became less strong as compared with the stage 1 survey. Although the values of correlation with Constancy of Online Purchasing Behavior and adaptiveness were relatively high, these factors did not have significant loadings. Introversion closely correlated with Consumer Awareness and Experience. Promptness in Decision Making closely related to Adaptiveness. In general, one can argue that even though *Introversion* affected the purchas-

ing behavior of online shoppers to a lesser extent than in June, its association with other factors became stronger.

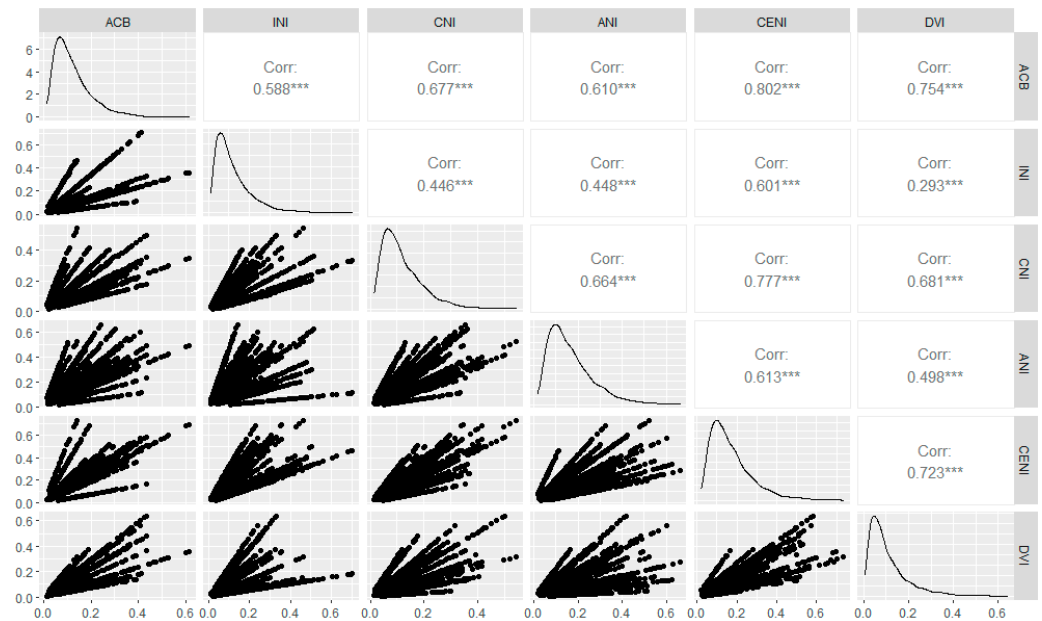


Figure 7. Correlation matrix between RPF factors and Composite Index of Online Purchasing Behavior as of October 2020. Source: developed by the authors. *** $p \leq 0.001$.

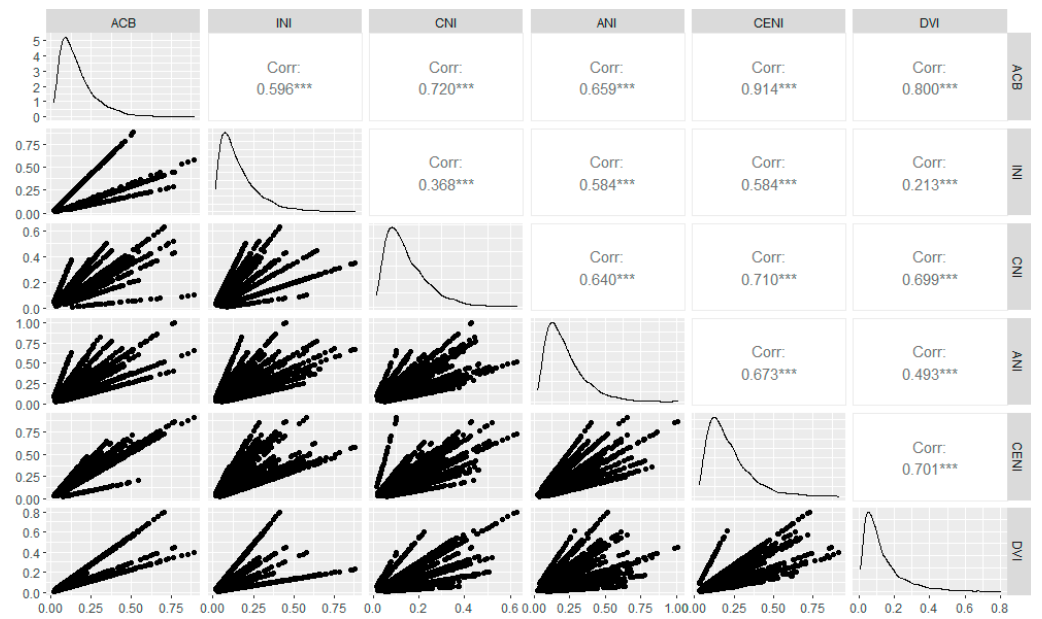


Figure 8. Correlation matrix between RPF factors and Composite Index of Online Purchasing Behavior as of December 2020. Source: developed by the authors. *** $p \leq 0.001$.

During the second wave of the pandemic in October 2020, online purchasing behavior had a strong correlation with all the examined factors. The strongest relationships were observed with Consumer Awareness and Experience and Promptness in Decision Making. The greatest changes in online purchasing behavior detected over the said period were associated with the speed of decision making. Consumer Awareness and Experience appeared to play a central role in the transformation of consumer behavior during the third observation period. This finding aligned with the first two surveys, which also emphasized the importance of this factor. It should also be noted that the strength of the relationship

between the studied factors seems to be growing. This indicated their increasing role in boosting online purchases during the pandemic.

The fourth survey, which was conducted in December 2020, portrayed a picture similar to what was found at stage 3. However, a significant increase occurred in the loading of Consumer Awareness and Experience. Promptness in Decision Making also showed a sound correlation with online purchasing behavior. Generally, the contributory factors were more strongly associated with each other as compared with previous surveys. Two exceptions were these factor pairs: Introversion and Constancy of Online Purchasing Behavior, as well as Promptness in Decision Making and Constancy of Online Purchasing Behavior. These pairs of factors had a weak connection. This can be explained by the fact that being in lockdown made online shoppers speed up decision making and stop avoiding e-commerce during the pandemic period. The majority of surveyed consumers acquired a great deal of experience in shopping online, which affected their purchasing behavior.

The results of the correlation analysis for the period under study are presented in Table 6.

Table 6. Correlation of the studied indicators during 2020.

Dependent Variable	Period	INI	CNI	ANI	CENI	DVI
Composite Index of Online Purchasing Behavior	June	0.496	0.623	0.367	0.639	0.339
	August	0.473	0.562	0.474	0.727	0.694
	October	0.588	0.677	0.610	0.802	0.754
	December	0.596	0.720	0.659	0.914	0.800

Source: developed by the authors.

Thus, considering the results obtained for the studied period of the COVID-19 pandemic spread, we can state that the first hypothesis must be rejected. In summary, the leading factor influencing the purchasing behavior of online shoppers shifted over the second half of 2020 from Introversion toward Consumer Awareness and Experience. The second hypothesis is accepted because it was proven that the behavior of online consumers against the background of the pandemic became dependent on their experience and speed of decision making. As customers' experience grew, the role of Promptness in Decision Making increased, and online shoppers became more active and faster when deciding what to buy.

In the economic context, the results obtained can contribute to the formation of an effective strategy for the development of e-commerce, both at the level of individual companies and at the state level. Based on these results companies can transform the forms of marketing activities, use new channels of communication with consumers, and apply appropriate online marketing tools to promote products. From a financial point of view, the results indicated an increase in online consumer activity and consequently the cash flow from online sales. Considering the experience of their regular customers, the opportunities of potential customers, as well as the peculiarities of their behavior transformation based on the results of this study, e-commerce representatives can adapt the management mechanism of their customers' behavior and optimize marketing costs. In the social context, the results of the study proved the shift in consumers' priorities when making online purchases during the pandemic.

The results of the study indicate that with the advent of the pandemic, online shopping has become an integral part of people's consumer culture.

5. Discussion

The methodology proposed in this paper allows determining the propensity of consumers to imitate the actions of others amid a pandemic [52]. At the same time, the normalized parameters obtained through the survey are specific to online shoppers who did not make their purchases (yet) and may not fit other types of consumers [53]. The selected factors reflect the intensification of online purchasing behavior in general, but the results cannot be extrapolated to consumers who just purchased something online [54].

The present study showed that the likelihood of increasing online purchases depends on whether a person is a reflexive buyer or not [55]. The contributory factors can be classified into external and internal factors. The external factors are circumstances that urge an individual to make a decision fast. A low level of consumer awareness and/or experience also counts as an external factor. The internal factors include the constancy of one's shopping behavior, the level of introversion, and the customer's ability to adapt to online shopping. Both can be determined through multi-factor personality analysis [56,57]. Changes in the loading of reflexive personality factors can influence the result of decision making [58], even in the virtual space [59]. Normalization made it possible to present such a result as a dependent function [60].

The study, on the one hand, had findings similar to those of other scientists that a consumer in the new COVID reality is characterized by increasing online orders of goods and services, reducing discretionary spending, and focusing on his/her own security [20,61]. On the other hand, the study proved a decrease in the commitment of buyers to introversion [19]. At the same time, these results were indirectly a consequence of the fact that the main criteria for most consumers when buying in a pandemic remain price, availability, convenience, and hygiene [26]. Despite the fact that there are scientific works demonstrating an increase in selectivity and caution among online consumers [5], this study pointed to a decrease in its level as the pandemic spreads and the time to shop online decreases. Therefore, the results were similar to the work confirming that the percentage of impulse purchases decreased, and the percentage of planned purchases increased [28].

The study has its limitations. One limitation is that the present findings came from the analysis of subjective opinions. The higher the number of respondents, the more accurate the result can be [62,63], but it may become difficult to process large data sets [64]. This limitation can be alleviated with the appropriate software. Other constraints are associated with the studied category of consumers.

This study can serve as a framework for creating an approach to assessing the economic efficiency of reflexive management practices integrated to manipulate consumers' purchasing behaviors. In this case, future research can focus on estimating the income received after integrating the said practices, their integration costs, and the actual income received before the said integration. The current proposal can find application at the state level. It can help identify the key trends in purchasing behavior that can later be used to develop policies or strategies for e-commerce development and deliver public services online.

6. Conclusions

The analysis of web traffic amid the coronavirus pandemic showed a jump in visits to online supermarkets. This finding indicated the commitment of online shoppers to daily shopping. The pandemic thus stimulated online shoppers to show a constancy of buying behavior. The correlation analysis revealed an increasingly strong association between online shopping activity and factors of a reflexive consumer. The relationship between the investigated factors also showed a tendency to grow stronger.

Initially, online purchasing behavior was influenced by Consumer Awareness and Experience and Introversion, and other factors had little impact. The situations changed, however, as the COVID-19 pandemic continued to spread. Consumer Awareness and Experience increased its influence, as did the Promptness in Decision Making. Introversion, on the other hand, lost its impact.

A weak relationship was observed between Introversion and the following two factors: Promptness in Decision Making and Constancy of Online Purchasing Behavior. The connection between these factors weakened because consumers became less e-commerce-avoidant and more uneasy when making decisions. Online consumers also became more experienced. This study highlighted a shift in factors influencing the purchasing behavior of online consumers during the COVID-19 period. Overall, Promptness in Decision Making appeared to play an increasingly important role in online buying.

The scientific contribution of this study is the proposed methodological toolkit for assessing the purchasing behavior of online consumers, which includes an improved Cattell's approach and correlation analysis. It allows identifying the most influential factors that impact the purchasing behavior of online consumers. These are the constancy of online purchasing behavior, introversion, adaptiveness, consumer awareness and experience, and promptness in decision making. The proposed approach enables the assessment of online purchasing behavior in dynamics so that investigators can identify the key trends at global, regional, and country levels. In the context of a pandemic, it will provide companies in the e-commerce sector with an opportunity to adjust their policies and strategies to increase sales.

It is important to remember that the amount of time spent by consumers in the digital environment increases significantly in self-isolation mode, and this leads to a decrease in the cost of attracting customers, so innovative entrepreneurs need to take advantage of this and improve their own websites, update their social network accounts, actively maintain their profiles, and reasonably spend their marketing budget on this. This study indicated that businesses using quarantine time to build online relationships with users and increase the personalization of electronic marketing tools, thereby creating a loyal customer base and sustained reputational capital, will win in the long term.

A limitation of this study is that the results are based on the opinions of surveyed online consumers over a period of time. In a rapidly changing environment, consumer behavior and priorities also tend to change. The more respondents participate, the more accurate the results are. However, there is a difficulty in processing the survey data. Therefore, in order to minimize this limitation, it is necessary to develop appropriate software that automates this process, reduces the time, and allows a regular diagnosis of consumer behavior.

In the future, this study can be the basis for a methodical approach to assessing the economic efficiency of introducing conceptual provisions of reflexive management of consumers' purchasing behavior in the marketing activities of enterprises. This is possible given the difference between the income actually received after the implementation of the mechanism, the cost of its implementation, and the income actually received for the same period before the implementation of the mechanism. At the state level, it can be a positive phenomenon to identify key trends in purchasing behavior that can be used to develop specialized policies or e-commerce strategies for certain industries, as well as for the provision of public services online.

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