information society (Demczuk, 2016). The basic technology that has contributed particularly to digitization is a computer and the ability to connect it to the Internet (Dąbrowska & Janoś-Kresło, 2010, pp. 13-15). The information society, in order to access information via the Internet, also uses portable devices such as a smartphone, tablet, smartwatch, and even devices connected to the so-called Internet of Things (IoT) apart from the computer in the traditional sense. Such modern technologies are considered to be the digital marketing components which are contemporarily used as the e-communication fundamentals (Chedda, 2019; Marie & Grybś, 2013). They also come in handy, because of its consumer behavior-shaping character in terms of online purchasing processes.

In the 21st century, people live in a digital world, the forms of which continue to change as a result of the development of information technologies and their new applications (Grybś-Kabocik, 2017). Technological changes are also followed by changes in the ways of thinking and managing, which were also present before – during the industrial revolution itself, or the existence of industrial or post-industrial society (Grybś-Kabocik, 2017; Patrzałek, 2014). Johnson et al. (2001) underline that at the beginning of the 21st century one of the most important roles in the already diversified commercial sphere is performed by e-commerce as one of the key axes of multichannel trade.

Digitization, technological development and the possibilities of the Internet significantly affect consumers and their behavior (Tarapata & Krzepicka, 2018). A particularly important phenomenon in the context of the aforementioned changes is the virtualization of modern consumer behavior (Patrzałek, 2014, pp. 263-277). Kolny (2016) suggests that virtualization of consumer behavior consists in meeting the needs through electronic means of communication, especially the Internet.

It is the process of virtualization that is a symbol of the information society and changes in buying behavior in the 21st century. Virtualization provides remote and real-time monitoring, control, planning, and optimization (Verdouw et al., 2016). Kucia (2014) stressed that although virtualization is widespread on a large scale, the multidimensional character of this term implies the strong need for further investigation, in particular scientific research and analysis in terms of the notations associated with virtualization.

More and more research focus on people who grew up in the surrounding digitization (Burgiel & Sowa, 2017). In the literature, this generation is most often referred to as Z (next after Y). In addition, there are also alternative names, such as the C generation (from the words “connected”, “communicating”, “content-centric", "computerized", "community-oriented", "always-clicking"), as well as iGeneration, Gen Tech, Gen Wii, Net Gen, Digital Natives, Gen Next, Post Gen (Bieleń & Kubiczek, 2020; Sowa & Zrałek, 2015; Żarczyńska-Dobiesz & Chomątowska, 2014). It is worth noting that the representatives of the above-mentioned generation obtain information in two ways: in real life and online (Burgiel & Sowa, 2016). This also applies to the sphere of consumer goods.

The use of information and communication technologies (ICT) by producers in adapting their market offer in retail trade has a particularly significant impact on the consumers' purchasing behavior. Adapting a website or application in such a way as to be user-friendly causes that more and more purchasing behavior of consumers is virtualized (Kucharska, 2015). One of the studies dealing more broadly with the issue of consumer virtualization is the research conducted by Kucharska and Malinowska (2019), where they identified the possibilities of customer service virtualization in retail trade, presented of selected solutions in this area and recognized of customer behavior in the field of customer service virtualization. It is vital to define the determinants shaping the purchasing process. Social factors, especially interpersonal influence, play an immensely salient issue (Burgiel, 2010). Moreover, Hoque, Ali, and Mahfuz (2015) note that consumer attitudes toward shopping in the online sphere is usually shaped by two pivotal factors: one is trust, and another is perceived benefits. Rahman et al. (2018) in the exploratory part of their study also mention further factors formatting consumer attitudes towards online purchases, i.a.: information quality, merchandise attribute, website design, customer service, payment security/privacy self-consciousness, or state of mind. In addition to traditional online stores, among modern forms of online shopping, there is also social commerce as a segment of e-commerce (i.e. online stores associated with social networks), which is characterized primarily by irrational and impulsive behavior among buyers (Chung, Song, & Lee, 2017).

Knowledge and understanding of the market behavior of consumers is the basic aspect of the company's success (Burgiel & Kieżel, 2000). At the same time, perceiving the need and managing knowledge about their clients is associated with the implementation by enterprises of more and more complex IT systems. This poses challenges in information management and advanced big data analytics (BDA), in particular in acquiring customer insight (Mach-Król & Hadasik, 2021). However, with help of such modern technologies like BDA or aforementioned Internet of Things, also in connection with artificial intelligence

(AI) approach, an enormous amount of data can be processed and therefore consumer insight can be wringed on-the-go (Kaczorowska-Spychalska, 2018).

At the beginning of the 21st century, Kisielnicki (2002) noticed that virtualization can be seen as a business strategy. Nowadays, the company's activity on the Internet is a recognized and widespread standard, and the digitization process itself implies many benefits for its active participants. However, running a business is associated with high costs, and consumers themselves are not always able to use the Internet. Hence, the significant role of the activities of public institutions, including international organizations such as the European Union, that support digitization, which in turn leads to the reduction of digital inequalities and an increase in the number of Internet users (Dziembała, 2021; Dziembała & Kłos, 2021).

The outbreak of the SARS-CoV-2 coronavirus pandemic has had many impacts on society. In addition to issues directly and indirectly related to health, the pandemic has had social, economic, and development consequences (McNeely, Schintler, & Stabile, 2020). The introduced lockdown, aimed at stopping the growth of new coronavirus infections, has significantly limited the functioning in many sectors of the economy, translating into the virtualization of the activities of many institutions (Wnukowski, 2020), like healthcare (Mishkind, Shore, & Schneck, 2021), education (Affouneh, 2021; Cicha et al., 2021; Rizun & Strzelecki, 2020), or culture (Kantor & Kubiczek, 2021).

The pandemic also uprose the perceived, i.a., by Włodarczyk (2015) the problem of consumer market behaviors in the age of globalization. Nowadays, "new consumption" becomes even more important and up-to-date subject of study, as well as requiring further investigation. Understanding how consumers buy online and what they buy, as well as the determinants of it, is still a popular area of research (Kucia, 2014). Subsequent studies fill this research gap, but due to the outbreak of the pandemic, it was naturally widened.

The aim of the study is to determine the potential impact of the pandemic on the virtualization of buying behavior. In order to achieve it, the following research questions were posed:

- Which product groups were purchased online before the pandemic, and which were bought online?
- How has the pandemic affected the form of shopping in these categories?
- Has purchasing process become virtualized in all groups?

The research conducted is exploratory in nature and constitutes a point for further research, setting its potential directions.

This work consists of the following parts. Section 2 contains a description of the research methodology, along with the characteristics of the research sample, where its structure is presented. Section 3 focuses on the results of the study, which compares consumer behavior before and after the outbreak of the pandemic. This section also includes summary tables with descriptive statistics data and the interpretation of the results. Section 4 is a summary of the whole study, with a brief discussion, limitations, and an indication of further research directions.

2. Methodology

The research tool was a survey questionnaire, which was shared in various student groups of the University of Economics in Katowice (CAWI method). Its filling was possible from May 12. to June 24., 2021. The questionnaire was completed by 120 respondents.

The respondents were asked to determine on a 7-point scale how often they buy products from a given category in the period before and after the outbreak of the pandemic, where "–3" meant more often stationary, "0" – as often stationary as online, "3" – more often online. The products were divided into 13 categories: books, CD/DVDs, computer & accessories, public transportation tickets, clothing, footwear, perfumes & cosmetics, household appliances & electronics, home furnishings, pharmaceutical products, building materials, detergents, consumer chemistry, groceries. Then, three ranges were specified: more offline (from –3 to –1), both equally (0), more online (from 1 to 3).

2.1. Characteristics of the sample

Identifying the characteristics of the sample is the first step in analyzing the collected responses. As many as 72 women and 48 men took part in the survey, which is 60% and 40% of the respondents, respectively. Moreover, 94 respondents came from Generation Z (born after 1995), the rest were representatives of the older generation – Y (born between 1980 and 1994).

Another characteristics of the respondents was the level of their studies (see Figure 1). People studying at a given degree are compared in Table 1 with the type of the respondents' studies, which gives a broader picture of the sample in terms of the type of studies. Most of the respondents studied at the first degree, of which over 68% were full-time studies. The smallest group of respondents were representatives of part-time studies on the II degree (master's).

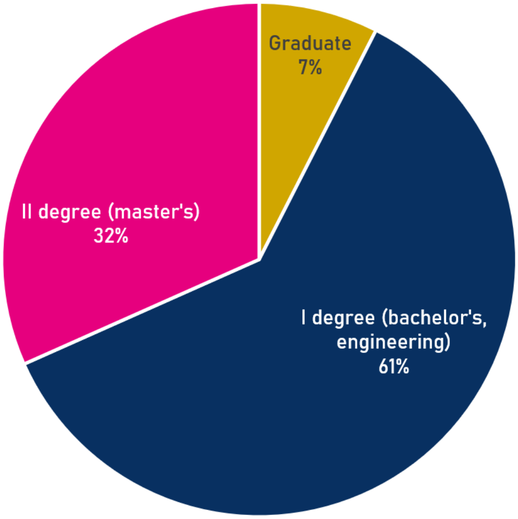

Figure 1. Sample characteristics by respondents' level of education

Source: Authors' own study.

Table 1. Level of education vs. type of the respondents' studies

	part-time		full-time		overall	
I degree (bachelor's, engineering)	23	32%	50	68%	73	100%
II degree (master's)	3	8%	35	92%	38	100%
overall	26	23%	85	77%	111	100%

Source: Authors' own study.

The next questions concerned the respondents' place of residence and their financial situation. The results are presented in Figure 2 and Figure 3, respectively.

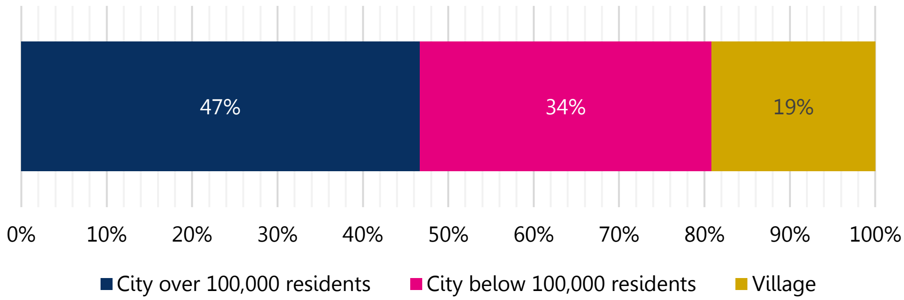

Figure 2. Place of residence of respondents

Source: Authors' own study.

Almost half of the respondents live in large cities with over 100.000 residents. In turn, 34% of the respondents are people living in the cities below 100.000 residents. The remaining 19% live in the villages.

The respondents' financial situation varies. As many as 7.5% of respondents assess their situation below the average, while 87.4% say that their financial situation is at least average. 5% of the respondents refused to answer this question.

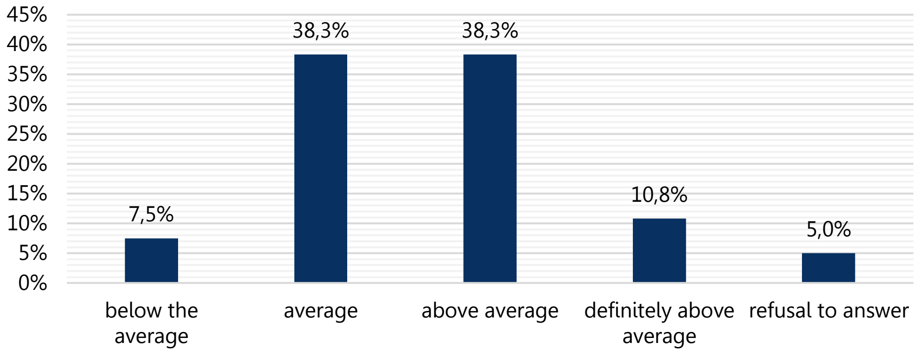

Figure 3. The financial situation of the respondents

Source: Authors' own study.

3. Results

The proportion of replies in individual form of purchasing (more offline, both equally, more online) was calculated based on participants' responses, both before and after the pandemic's emergence. The results are presented in Table 2.

Table 2. The form of shopping before and after the outbreak of a pandemic in a given product category [in %]

		more offline	both equally	more online
books, CD/DVDs	before	41.9	20.5	37.6
	after	24.3	18.3	57.4
computer & accessories	before	42.0	21.4	36.6
	after	32.1	19.6	48.2
public transportation tickets	before	51.4	21.1	27.5
	after	40.0	12.0	48.0
clothing	before	62.5	15.8	21.7
	after	34.7	17.8	47.5
footwear	before	63.9	16.0	20.2
	after	39.1	19.1	41.7

Table 2 cont.

		more offline	both equally	more online
perfumes & cosmetics	before	66.1	19.5	14.4
	after	45.2	16.5	38.3
household appliances & electronics	before	59.3	13.0	27.8
	after	46.2	19.2	34.6
home furnishings	before	70.5	17.0	12.5
	after	53.6	13.6	32.7
pharmaceutical products	before	84.7	11.0	4.2
	after	75.2	12.0	12.8
building materials	before	82.4	13.9	3.7
	after	70.2	21.2	8.7
detergents	before	87.4	9.2	3.4
	after	83.6	7.8	8.6
consumer chemistry	before	85.8	8.0	6.2
	after	80.4	12.5	7.1
groceries	before	91.7	7.5	0.8
	after	87.4	7.6	5.0

Source: Authors' own study.

Before the pandemic over 90% of respondents stated that they purchase of groceries in brick-and-mortar stores. After the outbreak of the COVID-19 pandemic this fraction decrease to 87.4%. Before pandemic 0.8% of respondents preferred to shop groceries in the Internet, while in the pandemic it is 5%.

Respondents still make purchases of consumer chemistry, detergents, building materials and pharmaceutical in stationary stores. 85.1% on average of respondents purchased from these categories in stationary stores before the COVID-19 pandemic, while 4.4% (on average) of respondents made purchases in these categories on the Internet. After the outbreak of the COVID-19 pandemic 77.4% on average of the respondents made purchases from these categories in stationary stores, what means 7.7 pp less than before.

Based on the presented results, it can be seen that there is a significant difference between the changes before and after the outbreak, depending on the product category. The smallest increase in online purchases was recorded in the "consumer chemistry" category (0.9 pp), while the largest in the "clothing" category (25.8 pp). This leads to the aspect of varied sensitivity of products to the form of sale, i.e. in particular to the increase in online sales after the outbreak of the pandemic.

It is worth noting that the categories of books, films, CDs/DVDs, computer & accessories, and public transportation tickets show three distinct types of individuals: those who prefer stationary shopping, those who prefer online shopping, and those who are ambivalent. Furthermore, more than one-fifth of respondents buys products from these categories in a stationary store as well as online.

There is also a noteworthy change in respondents' preferences for shopping locations in the following categories during the pandemic: footwear, clothing, public transportation tickets, computer & accessories and books, CD/DVDs. The majority of people intended to buy at brick-and-mortar stores before the pandemic, but now, during the COVID-19 pandemic, they prefer to shop online.

The observed changes were then examined for statistical significance using non-traditional data analysis approaches. The results of a bootstrap test with N = 1000 replicates are provided in Table 3.

Table 3. The form of shopping before and after the outbreak of a COVID-19 pandemic in a given product category (tests)

	The COVID-19 pandemic		**Difference in means**		**t**	**df**	**p-value**
	before	after	actual	bootstrap			
groceries	–2.68	–2.38	–0.297	–0.265	–3.406	118	0.021
detergents	–2.48	–2.06	–0.419	–0.434	–3.677	115	0.026
clothing	–0.97	0.29	–1.255	–1.193	–6.271	117	<0.001
footwear	–1.20	–0.07	–1.132	–0.976	–6.496	114	<0.001
computer and accessories	–0.28	0.38	–0.661	–0.590	–4.512	108	<0.001
household appliances and electronics	–0.93	–0.42	–0.503	–0.578	–3.517	102	0.004
home furnishings	–1.59	–0.68	–0.907	–0.880	–5.156	108	<0.001
building materials	–2.24	–1.69	–0.548	–0.518	–3.781	103	0.002
pharmaceutical products	–2.27	–1.77	–0.502	–0.434	–3.703	116	0.009
perfumes and cosmetics	–1.36	–0.19	–1.165	–1.012	–5.721	114	<0.001
books, films, CDs	–0.07	0.83	–0.903	–0.892	–4.981	113	<0.001
consumer chemistry	–2.22	–1.90	–0.319	–0.325	–3.055	111	0.015
tickets for public transport	–0.42	0.28	–0.702	–0.843	–4.260	98	<0.001

Source: Authors' own study.

Changes in the mean scores are significant at the significance level of 0.01 for the following categories: clothing, perfumes and cosmetics, footwear, books, films, CDs, home furnishings, public transportation tickets, computer and accessories. All changes are statistically significant at the significance level of 0.05.

As a result, it can be argued that the location where the products in all categories are purchased has changed significantly.

The most significant alterations were observed in terms of purchasing products related to personal appearance. Following the outbreak of the COVID-19 pandemic, respondents were more likely to shop for clothes, shoes, perfumes, and cosmetics online. The smallest changes were noticed in the case of purchases from areas such as consumer chemistry, groceries, and detergents goods.

4. Conclusions

The SARS-CoV-2 coronavirus pandemic has caused changes in the functioning of societies, also in the area of the form of making purchases. The government restrictions introduced had a significant impact on the dynamization of the progressing process of virtualization. Companies must understand buying behavior in order to successfully match their offer and enable the purchase of their products and services.

The results of this study showed that deepening the topic of the impact of the pandemic on buying behavior in the area of consumption virtualization is justified, because in all the analyzed product categories there was a statistically significant change in the form of purchases. It has been shown that consumers had to change their habits due to the emergence of a new and unpredictable pandemic situation, causing purchasing uncertainty. Due to the ubiquitous and severe lockdown, consumers had to move their activity to the Internet sphere, because many industries had to close their brick-and-mortar stores. In connection with the fact that stores with basic necessities ensuring subsistence (such as grocery stores, household chemicals stores, or pharmacies) had to remain open, the smallest fluctuations in purchasing habits are also noticeable in these industries.

The limitation of the study is that the conducted research cannot be generalized to the entire population, as the sample was selected non-randomly. Nonetheless, this is the starting point for future research that could focus on the impact of the pandemic on Poles' buying behavior.

The direction of future research may be the comparison of the results presented in this paper with the newly conducted survey in the near future. Full economic lockdown is not expected to occur as severely as it does right after the outbreak of the pandemic, so it can be explored whether consumers will revert to pre-coronavirus habits or whether the change of habits will remain sustained.

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