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COVID-19 pandemic 'e-experiences' as accelerators of digital society

„E-doświadczenia" związane z pandemią Covid-19 jako akceleratory społeczeństwa cyfrowego

Abstract

This study aims to determine the factors that increased the likelihood of noticing the usefulness of digital solutions during the pandemic. A matrix of basic socio-demographic factors, individual experiences with digital solutions during the COVID-19 pandemic, and specific factors imposed exclusively by the pandemic (e.g., fear of human contact) are all included. The methodology comprises a survey of 1,000 adult residents of Poland. The sample was structured so as to be representative of the Polish population in terms of age, gender, and place of residence. Logit modelling was used to analyse the results. Using digital solutions for government business, education, consultations, shopping, and interpersonal communication during the COVID-19 pandemic was found to have a significant positive impact on the perception of the usefulness of digital technologies. The study posits that the pandemic accelerated and consolidated the creation of a digital society through positive and relatively new e-experiences on a mass scale.

Keywords: COVID-19 pandemic, digital society, e-experiences, usefulness of digital solutions.

JEL: 031, 033, 035

Streszczenie

Celem badania jest określenie czynników, które zwiększyły prawdopodobieństwo dostrzeżenia przydatności rozwiązań cyfrowych w czasie pandemii. W pracy uwzględniono matrycę podstawowych czynników społeczno-demograficznych, indywidualnych doświadczeń z rozwiązaniami cyfrowymi w czasie pandemii Covid-19 oraz czynników specyficznych narzuconych wyłącznie przez pandemię (strach przed kontaktem z ludźmi). W artykule wykorzystano wyniki badania przeprowadzonego na reprezentatywnej pod względem wieku, płci i miejsca zamieszkania próbie 1000 dorosłych mieszkańców Polski. Jako metodę analizy wykorzystano modelowanie logitowe. Badanie wykazało istotny pozytywny wpływ korzystania z elektronicznej administracji, edukacji, konsultacji, zakupów oraz zdalnej komunikacji interpersonalnej w czasie pandemii Covid-19 na ogólne dostrzeganie przydatności technologii cyfrowych. W artykule założono, że pandemia wzmacnia tworzenie społeczeństwa cyfrowego w wyniku masowych, pozytywnych i stosunkowo nowych e-doświadczeń.

Słowa kluczowe: pandemia COVID-19, społeczeństwo cyfrowe, e-doświadczenia, użyteczność rozwiązań cyfrowych.

JEL: 031, 033, 035

1. Introduction

Every innovative technology has social consequences. The accumulation of digital innovations collectively labelled 'the digital revolution' is not only continuing to bring about revolutionary changes in production methods and resource utilisation, but is reshaping interpersonal relations and the ways in which work is organised, often in accordance with new norms and values (Castells, 1996). Technological innovation actually triggers social innovations (McGowan & Westley, 2015), thereby fostering social development and ushering in a digital society (Mazali, 2018).

The way society views technology and innovation, i.e., how their utility is assessed, the prevailing opinion as to their necessity, and the challenges they address, is crucial for the development and maintenance of a digital society. These perceptions are fast-changing, evolving continuously with the advent of new technologies and societal shifts. This paper addresses the need to explore and better understand the connections between the pressures imposed by the COVID-19 pandemic, different experiences with digital solutions, and the overall perception of the usefulness of new technologies.

The COVID-19 pandemic and the introduction of social distancing created pressure for deeper and more widespread use of digital technologies, thereby accelerating certain aspects of the digital revolution (Hantrais et al., 2020; Kim, 2020). For example, it is estimated that in Central and Eastern Europe (CEE), almost 12 million new users of online services appeared as the result of the pandemic. In the first half of 2020, the growth of the CEE digital economy nearly doubled, achieving 78% of the 2019 increase in just 5 months (Marciniak et al., 2020). The importance of engaging the individual in the digital transformation, already signalled by Mazali (Mazali, 2018), became particularly relevant during the pandemic.

Intensified digitalisation of business models has also been observed in practically all areas of the global economy, from new sources of creating customer value (wider availability, improved efficiency, lower costs), through distribution channels (online sales), building customer relationships (co-creation through social media, automation of back-office processes), to resources and methods of utilising them (e.g., remote work) (Gregurec et al., 2021; Meenakshi, 2021). The digitalisation of public institutions has also been visibly intensified, notably in those responsible for education and health (Keesara et al., 2020). At the same time, these changes have exacerbated the digital divide in some dimensions (Lai & Widmar, 2020). Indeed, as studies in different EU countries have shown, demographic factors (age, ethnicity), income, and related pre-existing exclusion from digital solutions in education, work, or consumption were compounded during periods of national and regional lockdowns (Hantrais et al., 2020).

The analysis presented in this article starts from the premise that the pandemic, as a new macroeconomic factor influencing mass changes in social behaviour, can shed new light on the key factors that create mass support for the development of a digital society. It is important to emphasise that the COVID-19 pandemic, while intensifying both the quantity and quality of digital experiences worldwide, resulted in uneven access and varied user experiences. Some users were already

experienced with digital solutions, while others were unprepared to use them. At the same time, it should be noted that most digital applications during the pandemic involved relatively familiar technologies. Online shopping, e-government and e-education are (technologically) based on established solutions. What was new to many people, however, was the need to use these digital solutions on a daily basis. This paper therefore has more to say about new 'e-experiences' (in the sense of broadly defined experiences with digital technologies, see Semeijn et al., 2005) than new e-technologies.

It should be stressed that the pandemic not only resulted in statistically significant changes in the use of certain digital services (e.g., an increase in the number of users), but altered people's perception of services mediated by digital solutions (Agrawal & Schuster, 2022). The interplay between the impact of the pandemic, the adoption of specific digital solutions, and the many and varied cultural backgrounds involved is extremely complicated (Geber & Ho, 2022). More studies that explore these areas are therefore in order. In the initial stage of the pandemic, there was a lack of empirical research on the adoption of digital solutions that included the impact of new digital experiences. This study aims to determine the factors that increased the likelihood of noticing the usefulness of digital solutions during the pandemic. A matrix of basic socio-demographic factors, individual experiences with digital solutions during the COVID-19 pandemic, and specific factors imposed exclusively by the pandemic (e.g., fear of human contact) are all included.

This article therefore addresses the following three research questions:
RQ1: Which socio-demographic factors significantly increased the likelihood that the usefulness of digital solutions would be noticed during the pandemic?
RQ2: Which experiences of using digital solutions during the pandemic had a significant impact on increasing the likelihood that the overall usefulness of new technologies would be realised?
RQ3: Is social influence relevant to making the usefulness of new digital solutions apparent in a state of enforced social distance?

The responses to these questions will reduce the research gap regarding the way in which digital user experiences during the COVID-19 pandemic impacted the general perception of the usefulness of digital technologies. It is contended that the pandemic accelerated and consolidated the creation of a digital society through the large-scale positive and relatively new experiences in the use of digital technologies.

2. Literature review

Studies on the acceptance of information and communication technologies (ICTs) frequently identify socio-demographic characteristics as factors that significantly influence the use and perceived usefulness of a solution (Huang & Renb, 2020). Research conducted by Zeithaml and Gilly (Zeithaml & Gilly, 1987) indicated that consumers with a high level of educational attainment showed a greater tendency to adopt innovations. These observations have been confirmed by subsequent studies. Studies by Lin et al. (2011) and Huang and Renb (2020) show a positive correlation

between educational attainment and the propensity to adopt new technological solutions. Studies by Meuter et al. (2005) and Nilsson (2007) also found that those who adopt self-service technologies adopters tend to be well-educated, young, open to technological innovation, and predominantly male. These correlations have long been observed. For example, Wu (2003) showed that consumers between the ages of 36 and 40 were the most open to making use of an innovation. And Teo (2021) noted that one such innovation, viz. the Internet, was predominantly used by younger people. This is supported by a study by Pirhonen et al. (2020), which indicates that aging is a crucial factor in limiting the propensity to accept new technologies.

Previous studies further indicate that the take-up of digital technologies is linked to factors such as the digital competence of the user, his/her attitude towards technologically advanced products and services (Kim et al., 2019), and his/her experience (Hino, 2015). The literature also emphasizes the importance of social influence on the adoption of various types of digital solutions (Hino, 2015; Liu, Ben, Zhang, 2019). Moreover, Sleiman et al. (2023), as well as Zhao and Bacao (2021), found that friends and family had an even greater influence on individual decisions concerning mobile technologies during the pandemic.

Other studies also point out that whether a given technology is adopted also depends on government policy (Zysman & Kenney, 2016). The expansion of new technological solutions is therefore dependent on individual factors (skills, readiness, socio-demographic factors, and user experience), material factors (infrastructure), social factors (influence of social groups) (Venkatesh et al., 2003), and policy solutions that support new technologies (government programmes, subsidies, etc.). Many European countries exhibited new combinations of these factors during the pandemic. New digital solutions were implemented in public administration, education, and health care institutions, and a raft of government policies to support digital technologies came into effect. Additionally, national lockdowns that imposed severe restrictions on social interactions changed patterns of social relations and increased the use of digital solutions in the commercial and service sectors by several factors.

3. Materials and methods

This paper identifies the determinants of the noticeability of the usefulness of digital solutions during the COVID-19 pandemic. For this purpose, a logit model was estimated, which has the following form:

$$logit\ (p_i) = Z_i = x_i'\beta = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_n X_{ni} \tag{1}$$

where $logit\ (p_i)$ is $ln\frac{p_i}{1-p_i}$ (Maddala, 1992, p. 331). The parameters $\beta_0, \beta_1, \ldots \beta_n$,

which are elements of the vector β, were estimated using the maximum likelihood method.

The data used in the model were derived from an empirical study designed by the authors. It was conducted in Poland using the CATI (Computer Assisted Telephone Interview) method between July and August 2020 by a professional research agency – Interactive Research Center Sp. z o.o. CATI was the optimal method in that it ensured that the results were representative and could be implemented during the pandemic. Given the widespread access of Polish citizens to telephones (of all types), the CATI method was sufficient to achieve representative results (Kagerbauer, 2013). The sample comprised 1000 adult respondents (18 years and over) and was representative in terms of age, gender, and place of residence. Before commencing, the participants were informed of the purpose of the study. Every one of them consciously consented to participate. The study ensured anonymity: the participants were informed that the survey would be anonymous and that the data would be analyzed anonymously. Due to the fact that the research was non-interventional and not of a clinical nature, the Research Ethics Committee waived the requirement for ethical approval.

A description of the variables used in the analysis is provided in Table 1.

Table 1.
Variables used in the empirical analysis

Variable	Description
Y	The COVID-19 pandemic caused the respondent to start seeing the usefulness of digital solutions: 1 – yes, 0 – no
Gender	Gender: 1 – female, 0 – male
Age	Age of the respondent in ranges: 18–24; 25–34; 35–44; 45–54; 55–64; 65+
Education	Educational attainment of the respondent: 1 – primary and lower secondary education; 2 – basic vocational education; 3 – general or technical secondary education; 4 – bachelor's degree and incomplete master's degree; 5 – master's and higher education
Residence	The size of the respondent's place of residence is an ordinal variable with six categories: 1 – village; 2 –village – suburban area; 3 – city with population not greater than 20,000; 4 – city with population greater than 20,000 but not greater than 100,000; 5 – city with population greater than 100,000 but not greater than 500,000; 6 – city with population over 500,000
Remote work	The respondent has experience of working remotely during the pandemic: 1 – yes, 0 – no
E-government	The respondent has experience of using e-government services during the pandemic: 1 – yes, 0 – no
Instant messaging services	The respondent has experience of using instant messaging services like WhatsApp or Skype during the pandemic: 1 – yes, 0 – no
E-education	The respondent has experience of using remote learning during the pandemic: 1 – yes, 0 – no
E-consultations	The respondent has experience of using remote consultations during the pandemic: 1 – yes, 0 – no
Online shopping	The respondent has experience of purchasing goods or services online during the pandemic: 1 – yes, 0 – no
Test new technology	The respondent likes to test new technologies: 1 – definitely not; 2 – probably not; 3 – I don›t know / it's difficult to say; 4 – probably yes; 5 – definitely yes
Friends' influence	The respondent will use new technological solutions if his/her friends do: 1 – definitely not; 2 – probably not; 3 – I don›t know / it's difficult to say; 4 – probably yes; 5 – definitely yes
Fear of contact	The COVID-19 pandemic caused the respondent to fear human contact: 1 – yes, 0 – no

Source: own elaboration based on the survey results.

Table 2 presents the distribution of answers given by respondents to the questions formulated in Table 1, and Table 3 contains a statistical description of the variables used in the analysis. The table of correlations between variables is provided Appendix 1.

Table 2.
Distribution of variables used in the analysis

Variable	Answer	Percentage of responses
Y	1 – yes	68.50
	0 – no	31.50
Gender	1 – female	50.20
	0 – male	49.80
Age	1: 18–24	9.70
	2: 25–34	19.00
	3: 35–44	18.90
	4: 45–54	15.00
	5: 55–64	17.40
	6: 65+	20.00
Education	1 – primary and lower secondary	4.40
	2 – basic vocational education	19.10
	3 – general or technical secondary education	39.00
	4 – bachelor's degree and incomplete master's degree	7.60
	5 – master's and higher education	29.90
Residence	1 – village	31.80
	2 – village – suburban area	8.20
	3 – city with population not greater than 20,000	14.20
	4 – city with population greater than 20,000 but not greater than 100,000	17.90
	5 – city with population greater than 100,000 but not greater than 500,000	16.70
	6 – city with population greater than 500,000	11.20
Remote work	1 – yes	27.80
	0 – no	72.20
E-administration	1 – yes	50.30
	0 – no	49.70
Instant message services	1 – yes	79.50
	0 – no	20.50
E-education	1 – yes	27.00
	0 – no	73.00
E-consultation	1 – yes	56.60
	0 – no	43.40
Online shopping	1 – yes	72.20
	0 – no	27.80

Variable	Answer	Percentage of responses
Test new technology	1 – definitely not	6.90
	2 – probably not	17.10
	3 – I do not know / it is difficult to say	13.80
	4 – probably yes	40.40
	5 – definitely yes	21.80
Friend's influence	1 – definitely not	8.90
	2 – probably not	17.20
	3 – I do not know / it is difficult to say	16.80
	4 – probably yes	39.20
	5 – definitely yes	17.90
Fear contact	1 – yes	37.50
	0 – no	62.50

Source: own elaboration based on the survey results.

Table 3.
Statistical description of variables

	X	V	Q1	Me	Q3	Min	Max	D	Q	VQ
Y	0.69	0.216	0	1	1	0	1	1	0.5	0.5
Gender	0.50	0.250	0	1	1	0	1	1	0.5	0.5
Age	3.71	2.717	2	4	5	1	6	6	1.5	0.375
Education	3.40	1.484	3	3	5	1	5	3	1	0.333
Residence	3.13	3.195	1	3	5	1	6	1	2	0.667
Remote work	0.28	0.201	0	0	1	0	1	0	–	–
E-administration	0.50	0.250	0	1	1	0	1	1	0.5	0.5
Instant messaging services	0.80	0.163	1	1	1	0	1	1	0	0
E-education	0.27	0.197	0	0	1	0	1	0	–	–
E-consultations	0.57	0.246	0	1	1	0	1	1	0.5	0.5
Online shopping	0.72	0.201	0	1	1	0	1	1	0.5	0.5
Test new technology	2.47	1.442	2	2	3	1	5	2	0.5	0.25
Friend's influence	2.60	1.477	2	2	4	1	5	2	1	0.5
Fear contact	0.38	0.235	0	0	1	0	1	0	–	–

Source: own elaboration based on the survey results.

4. Results

Table 4 depicts the results of the estimated logit model.

Table 4.
Results of the estimated logit model (n = 1000)

	Dependent variable Y					
	Coefficient	Std. Error	Z statistic	Marginal effect	p-value	Significance [a)]
Const	-0.1661	0.4092	-0.4059		0.6848	
Gender	0.1544	0.1563	0.9881	0.0319	0.3231	
Age	0.1372	0.0557	2.4610	0.0283	0.0139	**
Education	0.0045	0.0694	0.0647	0.0009	0.9484	
Residence	-0.0178	0.0442	-0.4027	-0.0037	0.6872	
Remote work	0.0479	0.1898	0.2522	0.0098	0.8009	
E-administration	0.3551	0.1688	2.1030	0.0732	0.0354	**
Instant message services	0.3436	0.1965	1.7480	0.0737	0.0804	*
E-education	0.4139	0.1973	2.0980	0.0818	0.0359	**
E-consultations	0.2905	0.1537	1.8900	0.0604	0.0587	*
Online shopping	0.8681	0.2090	4.1530	0.1906	<0.0001	***
Test new technology	0.1011	0.0702	1.4390	0.0209	0.1502	
Friend's influence	0.3012	0.0656	4.5930	0.0621	<0.0001	***
Fear contact	0.4655	0.1623	2.8680	0.0935	0.0041	***

Note: McFadden R-squared = 0.107184

Number of cases 'correctly predicted' = 724 (72.4%)

[a)]*** The statistically significant variable at the level of 1%; ** at the level of 5%; * at the level of 10%.

Source: own calculations based on the survey results.

The present study primarily focused on the individual factors of the respondents, as diagnosed in the literature, and the typical use of digital services during the pandemic. The first group of variables used in the logit estimation referred to socio-demographic characteristics. Age was the only statistically significant variable in this group. The results of the estimated model indicate that the likelihood of noticing the usefulness of digital technologies increased with age. The probability that respondents in older age groups would notice the usefulness of new technologies was on average 0.03 greater it was for younger age groups. The respondents in the 18–24 age group were least likely to start to recognise the usefulness of digital solutions during the pandemic. For them, social distancing did not bring about any significant change in using and understanding the benefits of digital solutions. By contrast, the 65+ group paid greater attention to new technologies and possibly became more aware of their advantages (Table 4). It should also be noted that neither gender, place of residence, nor education significantly influenced the perceived usefulness of digital solutions during the pandemic.

The second group of factors was related to the respondents' practical use of modern digital technologies. The present study only considers digital solutions that took on a special meaning during the pandemic. They have either become more widely used on account of social distancing rules or even introduced on a national scale since March 2020. Although certain technologies were available in Poland before the pandemic, digital solutions that enable remote work, e-consultation, e-government or e-learning have only been used on a mass since the spring of 2020. The present study shows that the perceived usefulness of digital technologies during the pandemic was significantly positively influenced by the use of remote learning, e-government, e-consultations, online shopping, and instant messaging. The probability that online shoppers would see the usefulness of digital solutions was on average 0.19 higher than it was for those who did not use such services, remote learners 0.08, e-government users 0.07, and e-consultation users 0.06.

As for the remaining variables, the influence of friends was statistically significant. Pandemic-induced perceptions of the usefulness of digital solutions were on average 0.06 higher for respondents who used new technological solutions in the event that a friend did so. Fear of human contact, a natural consequence of the pandemic, is another important socio-emotional factor observed in the study. On average, those who experienced that fear were 0.09 more likely to notice the usefulness of new technologies than those who did not experience it. The present study shows that the fear imposed by pandemic restrictions and social distancing rules was a completely new kind of experience or feeling and impacted the perception of the usefulness of digital solutions. Interestingly, a predilection for testing new technological products proved to be insignificant.

5. Discussion

The category 'digital solutions' is broad in scope. It covers virtually any problem-solving application of digital technologies in which both the issue and its resolution are digitised. The present paper proceeds from this broad understanding of the term. Accordingly, this category comprises the digital technologies that are used in e-governance, e-education, and online shopping, and which can be installed on various devices, run on several platforms, and embedded in different applications. What they all have in common is a digital solution for a specific kind of issue.

As indicated in the literature review, socio-demographic factors often play an important role in the adoption of digital solutions. However, these studies were conducted under socially stable conditions and this has to be considered when analysing their results. So far, the social perception of and experience with new technologies has mainly been assessed with reference to individual characteristics, such as the social status of the individuals and populations under examination. By contrast, the present study was conducted during the pandemic, i.e., a situation which strongly affects the behaviour and attitudes of societies. The social distancing rules introduced during the pandemic resulted in social pressure to use technologies that enabled professional and private needs to be satisfied without personal contact. The

lack of significant influence of such socio-demographic characteristics as education, place of residence, or gender on noticing the usefulness of digital solutions, as revealed in the study, can be explained by the universal impact of the pandemic and the fear of human contact, which was strongly felt at the time (Huterska et al., 2021). Every social group, regardless of gender, education, or place of residence, functioned in long-term social isolation, had limited access to conventional services, felt threatened, and feared contracting COVID-19.

Age proved to be the only statistically significant socio-demographic factor. The likelihood of noticing the usefulness of digital solutions, which increased with age, confirms research indicating the relevance of age to behavioural responses and changes during the pandemic (Kim & Crimmins, 2020), as well as studies indicating that in CEE, the strongest growth in users of online services was observed among consumers aged over 65 (Marciniak et al. 2020). As Daoust (2020) notes, the oldest group was most at risk of hospitalisation and death due to COVID-19. At the same time, this demographic is more cautious towards ICTs, which translates into shallower use of digital solutions, and often lower digital competences, which in stable conditions, require institutional support (training, assistance from younger people) (Klimova et al., 2016). The risk of contracting COVID-19, and the lack of alternative means of meeting specific needs due to social distancing rules and lockdowns most likely forced seniors to turn to digital solutions. This in turn could have highlighted the advantages of digitisation, which were particularly strongly felt by those who had not yet used modern technological solutions or had only used them to a limited extent. Thus, it can be concluded that the pandemic created a need for, and sometimes even necessitated, digital solutions. This is evidenced by the respondents, in the present study, especially the older ones, stating that they noticed the usefulness of such solutions. This was not apparent in the younger age groups. It should be noted, however, that young people in Poland were already very experienced in using digital solutions (Tomczyk & Solecki, 2019). The younger age groups were therefore well aware of the usefulness of digital solutions before the outbreak of the pandemic. This helps explain why young people were least affected by the pandemic when it came to noticing the usefulness of digital technologies.

Socio-economic variables that affected the use of digital solutions were also included in the study. Research by De Mello and Ter-Minassia (2020) indicates that an increasing trend towards digitised services had already been observed in all OECD countries prior to the outbreak of the COVID-19 pandemic. However, the pandemic was a significant factor in accelerating the expansion of online services, including online government services, e-education and e-health (OECD, 2020). This improved the quality of life at a difficult time for most societies (García del Castillo-Rodríguez et al., 2020), and may also have helped alleviate fear.

The present study shows that e-consultations had a positive impact on how the usefulness of digital technologies was perceived during the pandemic. Of all the remote advisory services, medical e-consultations were especially important. These were not considered feasible on a large scale, but have become common in many countries around the world. Rotker and Velez (2020) note that the pandemic

accelerated the adoption of telemedicine internationally, having proven that it is a safe method of patient care.

The present study shows that using online public administration services made the usefulness of digital solutions more noticeable. Similarly, Yasir et al. (2020) reveal that people spent much of their time when confined to their homes during lockdowns using social media and e-government services.

As Singh et al. (2021) point out, e-government services were introduced on account of their cost-effectiveness prior to the outbreak of the pandemic. During the pandemic, by contrast, the use of these services was motivated by health concerns, as well as recommendations from family, friends, and others (Singh et al., 2021). These findings are consistent with the results of the present study, which identified social influence and fear of human contact (motivated by health concerns) as factors that made the usefulness of digital solutions more noticeable. The results of another study conducted in Poland by Wnuk et al. (2020) indicate that fear of contracting COVID-19 may even have fostered the adoption of such new technological solutions as tracking applications or other surveillance systems.

Avoiding direct human contact due to fear of infection is a natural human reaction to an unknown and dangerous phenomenon, as earlier works analysing selected aspects of the pandemic have shown (Islam et al., 2020; Galoni et al., 2020). In order to interpret the statistical significance of the influence of friends on noticing the usefulness of digital solutions as a result of the COVID-19 pandemic, as yielded by the logit model, the specific situations of the respondents have to be taken into account. Prolonged social isolation, resulting from social distancing regulations, and fear of infection, may have adversely affected their physical and mental health. The negative impact of this aspect of the pandemic may have been mitigated by maintaining social relationships. In these difficult conditions, ICTs may have served as a communication tool for maintaining interpersonal ties, and may have encouraged people to adopt new technologies more readily. It is therefore safe to say that the present study, having been conducted during an extreme pandemic situation, complements the theory of acceptance and use of technology (Venkatesh et al., 2003) and extends previous empirical studies by showing the positive impact of the social environment on the use or intention to use new technology (Kulviwat et al., 2009; Martins et al., 2014; Zhu & Chang, 2014; Hino, 2015; Kranthi & Asraar Ahmed, 2018; Yang et al., 2009).

The present study also shows the positive impact of remote learning on noticing the usefulness of digital solutions. This is worth emphasising, as remote learning for children and young people, especially in the initial phase of national lockdown, faced serious obstacles in Poland, e.g., a lack of IT equipment in pupils' homes, inadequate communication with pupils and their parents, and lack of motivation among pupils. Many teachers were also not prepared to work with learning platforms and were largely left to their own devices to prepare an effective and efficient workshop based on distance learning methods and techniques (Kruszewska et al., 2022). However, the present study was conducted several months after the introduction of a universal remote education system. By this time, a number of schools and teachers had developed effective systems of work, which many parents

and pupils must have recognised and appreciated. Any positive experience in this area may therefore reflect on the positive perception of digital solutions (Rizun & Strzelecki, 2020).

The use of instant messaging, such as WhatsApp and Skype, during the pandemic significantly mitigated some of the negative effects of government restrictions. Not only did it help with maintaining social distancing and upholding strained interpersonal relationships; it was used in remote learning (Ng et al., 2021) and remotely provided medical advice (Bokolo, 2020). The logit modelling results in the present study clearly indicate that the widespread use instant messaging (including using apart from contacting family or friends) increases the likelihood of noticing the usefulness of digital solutions.

The logit modelling results indicate that remote work did not significantly affect the usefulness of digital solutions during the pandemic. For one thing, it is often impossible to use new digital technologies for remote working. The best that many workplaces could do was to increase the distance between staff and customers. The fact that some respondents had previously used digital technologies to work remotely may also have influenced this result.

As Kirk and Rifkin (2020) note, as with other crises, the COVID-19 pandemic crisis has brought about major transformations in society. Consumers have changed their behaviour, including their shopping behaviour. They have become more cautious when shopping at conventional sales outlets, online shopping has increased significantly in many countries (Netcomm Suisse Observatory, & UNCTAD, 2020), and the range of goods or services purchased online has expanded considerably. Many consumers recognised the importance of e-commerce immediately after the onset of the pandemic, and as survey results indicate, people who had already recognised the convenience of online shopping were likely to continue using it (Kawasaki et al., 2022; Guthrie et al., 2021). In this context, the present study found that the experience of online shopping was a significant factor in the usefulness of digital solutions being increasingly noticeable during the pandemic. Consumer adaptation to the new norm during the pandemic and the resulting e-experience could therefore have a long-lasting positive impact.

6. Conclusions

The research conducted in this paper shows that the COVID-19 pandemic fast-tracked and consolidated the creation of a digital society, as a result of mass, positive, and relatively new experiences in the use of digital technologies. The transition to digital solutions was not only driven by new emotional factors, such as fear of human contact, but also by the experience of using digital solutions and being swayed by the experiences of friends and family. The impact of the pandemic in accelerating the digitisation of society is therefore due to the generation of mass e-experiences that have continued over an extended period. Previous research indicates that user experiences derived from using similar products and/or similar technologies play an important role in the perceived usefulness of new solutions,

regardless of industry (Kim et al., 2008; Chang et al., 2009; Alshamaila et al., 2013), and influence behavioural intentions and social perceptions (Peiran et al., 2018). The extent to which an innovation is perceived to be congruent with the existing values, experiences, and needs of its potential adopters (i.e., its compatibility) is the key feature that influences its diffusion (Lee et al., 2011).

Social influence played a pivotal role in the adoption of digital solutions during the pandemic. The fact that collegial interaction and discussion can facilitate the process of diffusion of innovations had previously been highlighted in the case of, e.g., healthcare innovation (Scott et al., 2008). The present survey and analysis suggest that referrals from other users might have accelerated the use of digital solutions during the pandemic. The present study additionally shows that emotions, anxiety caused by the virus, and aversion to direct human contact were positively correlated with perceiving the usefulness of digital technology. It is therefore safe to say that fear reinforced the aspect of usefulness and added new qualities and positive aspects to the digital solutions that were already available.

In summary, the trend towards a digital society in the view of many new technology researchers and practitioners is a staggered process, accelerated periodically by new inventions. However, the present study shows that disruptive events, e.g., pandemics, may also accelerate this process when combined with fear, a willingness to share information about technologies, and recount positive e-experiences. The pandemic thus influenced the diffusion curve of digital solutions (Yamamoto & Karakose, 2020), by shortening the decision-making process in all groups of potential adopters, but especially among the elderly, who are normally laggards., The pandemic even made demographics that had little or no experience of digital solutions (especially the elderly) appreciate the usefulness of new technologies more than they otherwise would have. Not only that, but those e-experiences that were induced by fear and fostered by social influence during the pandemic augmented the overall positive perception of digital solutions. Therefore, it can be assumed that, irrespective of the pandemic and the concomitant social distancing, this perception will continue to advance the digital revolution and encourage the adoption of new e-standards. This, however, requires further in-depth research.

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Appendix 1.
Kendall Tau-b correlation matrix

	Y	Gender	Age	Education	Residence	Remote work	E- administra-tion	Instant message services	E-educa-tion	E-con-sultation	Online shopping	Test new technology	Friend's influence	Fear contact
Y	1.000													
Gender	0.005	1.000												
Age	-0.026	0.054	1.000											
Education	0.082**	0.050	-0.033	1.000										
Residence	0.034	-0.029	0.123**	0.250**	1.000									
Remote work	0.099**	0.015	-0.155**	0.298**	0.121**	1.000								
E-administration	0.191**	-0.042	-0.200**	0.253**	0.101**	0.242**	1.000							
Instant message services	0.162**	0.005	-0.298**	0.141**	0.062*	0.182**	0.263**	1.000						
E-education	0.136**	0.038	-0.287**	0.161**	0.001	0.326**	0.222**	0.236**	1.000					
E-consultations	0.132**	0.165**	0.104**	0.057	0.030	0.079*	0.138**	0.040	0.105**	1.000				
On line shoping	0.218**	-0.163**	-0.390**	0.263**	0.056*	0.251**	0.432**	0.420**	0.277**	0.002	1.000			
Test new technology	-0.156**	0.202**	0.147**	-0.042	-0.054*	-0.116**	-0.228**	-0.199**	-0.121**	-0.035	-0.257**	1.000		
Friend's influence	-0.175**	0.085**	-0.030	0.034	-0.030	-0.017	-0.055	-0.051	-0.003	-0.077**	-0.007	0.356**	1.000	
Fear contact	0.125**	0.086**	0.156**	0.051	0.026	-0.006	0.039	-0.047	0,017	0.199**	-0.054	-0.011	-0.112**	1.000

Note: **Significant correlation at the level of 0.01.
*Significant correlation at the level of 0.05.
Source: authors' own calculation based on the survey results.

Appendix 2.
Questions from the Survey Questionnaire used in the paper

1. Specify your gender:
   – female
   – male

2. What is your age?

3. Specify the level of education you have already completed:
   – primary and lower secondary education
   – basic vocational education
   – general or technical secondary education
   – bachelor's degree or incomplete master's degree
   – master's or higher education

4. Specify the size of your place of residence:
   – village
   – village–suburban area
   – city with population not greater than 20,000
   – city with population greater than 20,000 but not greater than 100,000
   – city with population greater than 100,000 but not greater than 500,000
   – city with population greater than 500,000

5. Do you have an experience of working remotely during the pandemic?
   – yes
   – no

6. Do you have an experience of using e-government services during the pandemic?
   – yes
   – no

7. Do you have an experience of using instant messaging services (such as WhatsApp and/or Skype) during the pandemic?
   – yes
   – no

8. Do you have an experience of using remote learning during the pandemic?
   – yes
   – no

9. Do you have an experience of using remote consultations during the pandemic?
   – yes
   – no

10. Do you have an experience of purchasing goods or services online during the pandemic?
    - yes
    - no

11. The coronavirus pandemic caused me to see the general usefulness of new technologies
    - definitely not
    - probably not
    - I don't know/it is difficult to say
    - probably yes
    - definitely yes

12. Do you like to test new technologies?
    - definitely not
    - probably not
    - I do not know/it is difficult to say
    - probably yes
    - definitely yes

13. Will you use new technological solutions if your friends use them?
    - definitely not
    - probably not
    - I do not know/it is difficult to say
    - probably yes
    - definitely yes

14. The coronavirus pandemic caused me to fear contact with people
    - yes
    - no