Technological and Economic Development of Economy
ISSN: 2029-4913 / eISSN: 2029-4921
2023 Volume 29 Issue 5: 1539–1558
https://doi.org/10.3846/tede.2023.20157

THE SOCIETY'S ATTITUDE TOWARD 5G TECHNOLOGIES – A CASE STUDY OF POLAND

Joanna EJDYS[1*], Urszula SOLER[2]

[1]*Faculty of Engineering Management, Bialystok University of Technology, Bialystok, Poland*
[2]*Faculty of Social Sciences, The John Paul II Catholic University of Lublin University, Lublin, Poland*

Received 24 April 2023; accepted 31 July 2023

Abstract. The sustainable development of society depends, on the one hand, on the development of innovative technologies, on the other hand, on the positive and negative effects of this development. Social acceptance of new technological solutions seems to be also a key factor. One of the future technologies is 5G, which will undoubtedly have an unprecedented impact on socio-economic development. The scientific discussion on the risks caused by electromagnetic radiation in the context of a new wireless communication technology – the fifth generation (5G) standard – is going on around the world. The scientific aim of the study is to analyze the factors determining the social attitude of Poles towards 5G technology. Among the factors included are: general society attitudes of technology, the scale of actual Internet use, demographic characteristics and pro-health society attitudes. Data was collected using the CATI technique. The interviews were carried out among 1005 Polish citizens. The obtained results confirmed statistically significant relationships between the variables: attitudes towards technology (ATT) and attitudes towards 5G technology (ATT5G). Research has confirmed that people who use the Internet more frequently have more positive attitudes towards 5G technology. New knowledge regarding public attitudes toward 5G technology has been accumulated through research.

Keywords: some 5G technology, innovations, technological changes, sustainable development of technology, social aspects of sustainability.

JEL Classification: M21, O31, O33.

Introduction

Communication technology developments play a crucial role in the development of the economy not only at the local level but also the international one for many reasons. Communication developments, such as the Internet and mobile phones, have greatly improved connectivity between people and businesses around the world (Castels, 2009). This has led to greater trade and investment opportunities, as well as improved access to information and resources and have led to greater efficiency in the way businesses operate, from supply

*Corresponding author. E-mail: *j.ejdys@pb.edu.pl*

Copyright © 2023 The Author(s). Published by Vilnius Gediminas Technical University

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

chain management to customer service. This has increased productivity and brought cost savings, which can boost economic growth and sustainable development (Baldwin, 2019). It also have driven innovation in various industries (cloud computing, e- commerce, social media etc.). This, in turn, allows to increase the reach of the market, and thus increase the opportunities for business development. In the result it has created job opportunities and new business models (Roubini, 2022). With better access to information and improved efficiency, enterprises can increase their competitiveness in the market. This, in turn, allows for the development of the economy on a national and international level. The development of the new communication technologies has also accelerated the process of globalization. This has allowed businesses to expand their operations to new markets and compete also on a global scale. This has led to increased competition, which can drive innovation and improve consumer choice. Communication developments have also had a significant impact on governance and public services – helping to improve public service delivery and enhance citizen engagement. This can lead to more effective and transparent governance (Zuboff, 2019).

The importance of the development of communication has increased even more in the context of the COVID-19 pandemic, which has caused an even greater interest in telecommunications technologies. For example Klaus Schwab (the founder and executive chairman of the World Economic Forum) argues that the pandemic has accelerated the need for digital transformation and communication developments in order to maintain economic growth and resilience (Schwab & Malleret, 2020).

Roubini (2022) writes about the economic impact of the pandemic and the need for digital transformation. He argues that the pandemic has highlighted the importance of digital infrastructure and communication technologies for economic growth and resilience (Roubini, 2022).

Overall, the importance of communication developments in the economy cannot be overstated (Tworek, 2023). As digital transformation continues to accelerate, it is likely that communication technologies will play an even greater role in shaping the future of the global economy. In the last century many scientists emphasized the importance of communication developments and their impact on the economy, organization and society. The need for new forms of communication in society is substantial and continues to grow. Communication plays a vital role in our personal and professional lives, shaping the way we connect, collaborate, and exchange information.

In modern times the role of the communication developments in the development of the economy is also raised. For example Baldwin says about the impact of digitalization on global trade and communication. He describes how new technologies are changing the way we work and communicate, and how this is affecting the global economy (Baldwin, 2019). Zuboff explores how communication technologies are transforming the economy and society, and the implications of this transformation for democracy and individual rights (Zuboff, 2019).

According to Yeh (2017), digital technologies will be of unprecedented importance in shaping the Digital Economy all over the world. The spread of digital technologies cannot take place without access to 5G networks. Observing the pace of technological development it is difficult to imagine the future world without modern electronic devices or 5G networks. In the opinion of Halicka (2016) each new technology raises social concerns about whether

the expected benefits from its use will be higher than unforeseeable social losses (e.g. health, ecological). In particular, the expotential development of technology may be an object of fascination and a source of anxiety about an uncontrolled unpredictable course of processes in the future.

New fifth generation (5G) telecommunications systems, on the one hand determining the development of civilization, on the other hand have become the subject of much controversy and public concern. Research on the acceptance of 5G-based technologies differs from research relating to the 5G technology and infrastructure itself. Researchers addressing the issues in the first group focus on the functionality and usability of the technology, leaving aside the issues of risks and health hazards caused by the electromagnetic waves themselves. Research within the second group focuses specifically on assessing the impact of electromagnetic radiation emitted by 5G infrastructure and devices on human health.

In recent times in the world there is a growing polarization of societies due to widespread access to vast resources of knowledge and both reliable, that is, scientific, and between popular and from unreliable sources. This widespread access to knowledge resources has led most media users to believe that they have access to knowledge of the highest quality. this phenomenon causes the aforementioned polarization. Some users take advantage of the ignorance of others and try to propagate unproven and often harmful and dangerous ideas, stoking emotions and arousing threats. This results in the propagation of resources of pseudo-knowledge on the basis of which conspiracy theories are born.

Published results often support two opposing views. According to one group of researchers fears about 5G technology and its negative impact on human health are unfounded and 5G infrastructure should be further developed (Chiaraviglio et al., 2021). From the other side many researchers are of the opinion that public concerns about electromagnetic and radio frequency fields cannot be underestimated, especially in the context of increasing network density in public space and its potential impact on human health (Frank, 2021; Meese et al., 2020).

Also many health institutions, scientific institutes indicate that there is no conclusive evidence of harmful effects of electromagnetic radiation on human health. On the other hand, there are opinions that the high level of uncertainty about the effects caused by radio frequency electromagnetic field (RF-EMF) should determine caution in this area (Frank, 2021).

The scientific discussion on the risks caused by electromagnetic radiation in the context of a new wireless communication technology – the fifth generation (5G) standard – is going on around the world (Zmyślony et al., 2020; Koh et al., 2020). 5G technology is of interest to researchers from a privacy perspective (Cheng et al., 2021); human health (Brito, 2018; Chiaraviglio et al., 2021); the risks posed (Rydzyński, 2020; Ciaula, 2018).

Public opinion is also divided on this issue. Many people protested against 5G in Switzerland, and many have campaigned for a referendum to limit radiation from mobile communications technology (Jones, 2020; Keystone, 2019a, 2019b). Anti-5G demonstrations were organized also in the United Kingdom (Hern, 2019), Korea (June, 2019) and other countries.

Various applications of 5G technology in devices and equipment are of interest to researchers. Examples of the study of consumer attitudes towards 5G technology include smart mobiles (Yu & Jin, 2021); smart university campus (Martinez et al., 2021); smart learning

technology (Shah et al., 2021a); smart home and Internet of Things (Korneeva et al., 2021; Singh et al., 2018) and healthcare solutions (Rahman et al., 2022),

Research on new technologies appears to be particularly important and desirable in societies characterised by low levels of trust in technology, which is often conditioned by the level of knowledge about the technology. According to the results of research carried out by the Institute for Comparative Survey Research in Vienna within the World Values Survey, Poles are characterised by a relatively high level of trust in technology in the context of technology's impact on social and economic development. Over 61% of Poles rated the statement: "science and technology make our lives healthier, easier and more comfortable" at a level of 8 to comfort at a level from 8 to 10 (on a 10-point scale, where Level 1 meant "completely disagree with the statement", and level 10 meant "completely agree"). Over 73% of Poles (giving a rating of 8–10) confirmed that science and technology create more opportunities for future generations (World Values Survey Association, 2021).

The current and future development of new fifth generation (5G) telecommunications systems is dependent on two basic factors: the development of technology determined by the level of technological knowledge and on the adaptation and acceptance of the technology by society.

The level of acceptance of a technology and its wider use depends on the attitude of current and potential users towards the technology (Ramjan & Sangkaew, 2022). Many theoretical models have been developed to explain the processes involved in technology acceptance. Among the most popular are: the Technology Acceptance Model (TAM) (Davis, 1985), The Unified Theory of Acceptance and Use of Technology Model (UTAUT) (Venkatesh et al., 2003), the D&M IT Success model (DeLone & McLean, 1992) and Value adaptation model (VAM) (Kim et al., 2007). It is now recognized that the TAM models and the constructs adopted by the authors as part of their modification enable effective measurement of the factors determining attitudes and future intentions to use the technologies analysed (Yu & Jin, 2021). All these models are based on the Theory of Reasoned Action. According to the Theory of Reasoned Action (Ajzen & Fishbein, 1980), attitudes (mindsets) and subjective norms create behavioral intention, which in turn determine the final behavior. Attitudes are understood as the tendency to react with an assessing character (positive attitudes, negative attitudes).

In most of the studies relating to the technology acceptance models, a variable relating to users' attitudes towards technology appears (Sawng et al., 2011). Sharp noted that attitudes toward technology can be of considerable importance in the context of research on new, emerging technologies that are not in common use (Sharp, 2007). Williams et al. (2015) stated that attitudes are an important variable to be considered in technology adoption models (Williams et al., 2015). Also Modahl (1999) found that attitude towards technology is a key factor influencing the adoption of a wide range of digital technologies, including computers, mobile phones and digital television.

The attitude of users towards a technology influences the speed with which the technology becomes widespread on the market. This is particularly important from the point of view of a technology provider with a short life cycle and high financial investment. Such technologies include 5G technologies. The delay in user adoption of a technology can be crucial to whether or not a technology is deployed and widely used (Maeng et al., 2020). Consumers'

acceptance of 5G remains questionable because the introduction of 5G has directly increased mobile phone charges (Cheng et al., 2021). Regardless of 5G's benefits, there is crucial to empirically investigate the factors influencing a user to adopt a new 5G technology (Mustafa et al., 2022).

The study of factors determining users' attitudes towards 5G technology is an important issue from both a scientific and a practical point of view. The development of this attitude will determine the future development of 5G technology applications.

Lack of adequate technological knowledge and misinformation have led to the accumulation of negative attitudes around the launch of 5G. The consequence of disinformation and lack of support is delaying development, the effects of which will be felt by society itself (Digital Poland, 2020). As Sohaib et al., claimed, the role of the socio-psychological, economic, and personal factors in shaping consumer behavior toward 5G is still unexplored (Sohaib et al., 2022).

The scientific aim of the study is to analyse the factors determining the social attitude of Poles towards 5G technology. Among the factors included are: general society attitudes of technology, the scale of actual Internet use, demographic characteristics and pro-health society attitudes. The authors studied two pro-health attitudes: smoking and drinking alcohol habits. The demographic characteristics studied included: age, gender and education level. The main research problem was formulated in the form of a question: What is the attitude of Poles to the development of technology 5G?

The first part of the article provides a review of the existing literature on the models for accepting 5G technology and social attitudes towards it. The subsequent section presents the hypotheses derived from the literature review. The research methodology and analysis are then presented, followed by a discussion of the findings. The last part of the article discusses the practical implications and conclusions, identifies any limitations, and suggests future research opportunities.

1. Literature review

Technology 5G is of scientific interest from many perspectives. One area of research involves 5G technology acceptance models and user attitudes towards 5G technology. The models built by the authors to determine the factors of acceptance and attitude towards 5G technology take into account various factors of technological, social, economic nature.

Using the initial TAM model to investigate user acceptance or attitudes towards 5G technology, allowed the researchers to include additional variables in their models. Shah et al. (2021a) explain that the intention of consumers cannot be fully explained because 5G adopters should be considered not only as technology users but also as service consumers. Other authors also point out that the TAM model ignores many important variables, which is often an object of criticism and at the same time a reason for extending the model (Shah et al., 2021b).

A summary of the examined variables relating to user attitudes towards 5G technology is presented in the Table 1.

Table 1. Examined variables relating to user attitudes towards 5G technology

Examined variables	Authors
privacy, speed, ubiquity, subjective norms, attitude toward 5G, willingness to pay and word of mouth willingness	Cheng et al. (2021)
perceived performance, perceived functional value, perceived value, perceived satisfaction, hedonic motivation, curiosity, environmental awareness, habit, and facilitating condition	Mustafa et al. (2022)
perceived benefits, perceived sacrifices, perceived value and usage intentions, environmental awareness, environmental knowledge, health consciousness attitude to pay for 5G services	Shah et al. (2021b)
attitudes, perceived usefulness, perceived ease of use, consumer innovation, social influence, perceive risk, behavioral intention	Yu and Jin (2021)
material, competence, and meanings factors, perceived usefulness, perceived ease of use, behavioral intention	Shah et al. (2021a)

According to Modahl (1999) technology is something which polarize the society. He characterizes people who have a passion for technology as "technological optimists" and those who are averse to technology as "technological pessimists". In modern times Digital Poland Found (Digital Poland, 2020) in the research about Poles' attitude to technology divided Poles on four groups: techno-enthusiasts, technosceptics, picky users technology, rejecters technologies. They also claim that that a general attitude to technology and science determines as well the attitude to a particular technology.

Hypothesis 1: General attitudes towards technology users have a positive impact on attitudes towards 5G technology.

A number of research findings confirm that the functionality of 5G technology often reflected by the scale of Internet use is positively correlated with user attitudes towards 5G technology. Research conducted by Shah et al. confirmed a statistically significant relationship between benefits and value and intentions to use 5G technology (Shah et al., 2021a). Societies, especially during the pandemic, became convinced of the importance of access to fast and reliable Internet, which allows remote work and learning and makes people's lives easier in many aspects. People which use the Internet know that 5G technology makes it very easy to use and improves its quality. The positive attitude towards 5G technology of people using the Internet is related to the awareness of the benefits that this technology brings, which was also confirmed in the research by Shah et al. and in the positively verified hypothesis 2.

Hypothesis 2: The scale of Internet use has a statistically important positive impact on user attitudes towards 5G technology.

Edison and Geissler (2003) noted that studies regarding age and attitude towards computers are mixed. Results of research conducted by Cheng et al. (2021) confirmed that demographic characteristics such as gender and age have no statistically significant effect on attitudes towards 5G technology (Cheng et al., 2021). Yu and Jin, findings confirmed that moderating effects of gender and education on attitude and behavioral intention were not statistically significant (Yu & Jin, 2021). From the other hand, the research, conducted by Frey, confirmed a statistically significant effect of gender on respondents' perceived risk of

5G technology (Frey, 2021). The research conducted by Mustafa et al. (2022) confirmed that gender has a significant negative effect on the use of 5G technology, while education and age have no discernible effect on how 5G technology is used. Also Koh et al. (2020) reported that female gender, a higher level of educatin were associated with increased risk perception of mobile phone base stations. At the same time the risk perception score, caused by EM waves from 5G network base stations was lower among the 20–29 age group (Koh et al., 2020). The below hypotheses were developed to examine the connection between attitudes towards 5G technology and socio-demographic characteristics.

Hypothesis 3: Sociodemographic characteristics (*gender*, *age and education*) *determine users' attitudes towards 5G technology.*

Hypothesis H.3.1. Gender has a significant impact on attitudes towards 5G technology.

Hypothesis H.3.2. Age has a significant impact on on attitudes towards 5G technology.

Hypothesis H.3.3. Education level has a significant impact on on attitudes towards 5G technology.

One of the factors investigated to determine the perceived risks caused by 5G technology is people's pro-health attitudes and the impact of pro-health behaviours on the perception of other risks. The most commonly studied pro-health behaviours include alcohol consumption and smoking addiction. In formulating their hypotheses, the researchers hypothesise that respondents' exposure to the risks caused by their alcohol drinking and smoking habits result in lower perceived risks caused by other technologies (e.g. 5G). The results of the study conducted by Koh et al., confirm that the risk perception scores, caused by EM waves from 5G network base stations were lower among current smokers, and never-drinker (Koh et al., 2020). Also the results of the study undertaken by Kowall et al. (2012) confirmed that people who perceive risks caused by smoking addiction have a higher perception of the health risks caused by mobile phone base stations. Considering the importance of pro-health attitudes and their role in building attitudes towards 5G technology the following hypotheses were formulated:

Hypothesis 4: Pro-health attitudes has a statistically important positive impact on attitude towards 5G technology.

Hypothesis H.4.1. Smoking habits have a statistically significant effect on attitudes towards 5G technology.

Hypothesis H.4.2. Drinking alcohol habits significant effect on attitudes towards 5G technology.

2. Research methods

2.1. Research data and sample

The research data was obtained through the use of the CATI (Computer Assisted Telephone Interviewing) technique. The interviews were conducted by a research company in 2021 among residents of Poland using a structured questionnaire. The research pilot study was conducted with a sample of 20 respondents to verify and assess the research questionnaire. After completing the questionnaire, respondents had the opportunity to answer an open-ended question indicating any aspects that they found unclear or difficult to understand.

A total of 1005 Polish citizens were interviewed, and the sample was balanced in terms of gender, age, and education level. Table 2 presents the distribution of respondents by gender, age, and education level in the research sample.

Table 2. The differentiation of respondents by gender, age and education

Characteristics	Frequency	Percentage
Gender		
Man	479	47.7%
Woman	526	52.3%
Total	1005	100.0%
Age		
18-29 years old	163	16.2%
30-39 years old	190	18.9%
40-49 years old	176	17.5%
50-59 years old	145	14.4%
over 60 years old	310	30.8%
Systemic data gaps	21	2.1%
Total	1005	100.0%
Education level		
Primary or lower secondary education	124	12.3%
Basic vocational education	292	29.1%
Secondary (high school/ post-secondary	442	44.0%
Higher education (University level)	147	14. 6%
Total	1005	100.0%

2.2. Measurements

The theoretical model included two constructs, namely, general attitudes towards technology (ATT) and attitudes towards 5G technology (ATT5G), which could not be directly observed. To analyze the relationships between these constructs, a set of variables was used. Three items were identified to measure each construct based on the literature study. A five-point Likert scale was used to assess the degree to which respondents agreed or disagreed with each item (1 = totally disagree; 5 = totally agree). The variables within the ATT and ATT5G constructs were subjected to confirmatory factor analysis (CFA) based on the literature review. The parameter values were estimated using the generalized least squares (GLS) estimator, which is less sensitive to normal-distribution assumptions. Variables with standardized residual covariances greater than 2 were removed from the original set of observable variables (Table 3).

The final scale reliability was reflected by Cronbach's alpha ranging from 0.801 to 0.829. It is assumed that Cronbach's alpha coefficient above 0.7 is acceptable.

Descriptive statistics and Cronbach's alpha for the constructs and items are presented in Table 4.

Table 3. Standardized regression weights before and after CFA

Constructs and items	Standardized regression weights before and after CFA		Variable symbol
	Before	After	
Attitude toward technology (ATT)			
Science and technology make the world a better place	0.778		Removed*
Science and technology make our lives easier and more comfortable	0.830	0.829	ATT1
Science and technology provide more opportunities for society	0.812	0.853	ATT2
Attitude toward technology 5G (ATT5G)			
5G technology is essential to the development of our economy	0.837	0.829	ATT5G1
I intend to use 5G technology in the future	0.835	0.853	ATT5G2
I'm going to encourage others to use 5G technology	0.728		Removed*

Note: * Variable removed due to absolute value of covariance for standardized residuals being greater than 2.

Table 4. Descriptive statistics and Cronbach's α for ATT and ATT5G constructs

Constructs and items	Mean (M)	Factor Loading	Cronbach's α
Attitude toward technology (ATT)			
ATT1: Science and technology make our lives easier and more comfortable	3.59	0.829	0.829
ATT2: Science and technology provide more opportunities for society	3.60	0.853	
Attitude toward technology 5G (ATT5G)			
ATT5G1: 5G technology is essential to the development of our economy	3.20	0.829	0.801
ATT5G2: I intend to use 5G technology in the future	3.13	0.853	

To measure scale of Internet use following answer were used: daily (1), 4–5 times a week (2), 2–3 times a week (3), once a week (4), several times a month (5), once a month (6), less than once a month (7) and hard to say (8).

To measure smoking habit following question was used: Do you smoke cigarettes? If yes, how many? Respondents could choose one of the following answers: Yes, I smoke up to 10 cigarettes a day (1), Yes, I smoke 11 to 20 cigarettes a day (2), Yes, I smoke more than 20 cigarettes a day (3), I have smoked in the past, currently I do not smoke (4), I don't smoke and never have (5).

To measure drinking alcohol habit following question was used: How often do you drink alcohol/alcoholic beverages. Respondents could choose one of the following answers: I do

not drink alcohol/alcoholic beverages at all (1), occasionally – not more than once a month (2), more than once a month, but not more than once a week (3), more than once a week (4).

The authors used Generalized Least Squares (GLS) to verify the hypothesis H1. The non-parametric Kruskal-Wallis and Mann-Whitney U statistical tests were used for hypothesis H2-H3 verification.

3. Results

3.1. Attitude toward technology

The obtained results confirmed statistically significant relationships between the variables: attitudes towards technology (ATT) and attitudes towards 5G technology (ATT5G). Result of the hypothesis H1 verification is presented in Table 5.

Table 5. Results of the verification of hypothesis H1

Hypothesis	Estimate	S.E.	C.R.	P	Test results
Hypothesis H1: General attitudes towards technology (ATT) users have a positive impact on attitudes towards 5G technology (ATT5G)	0. 730	0.041	17.896	***	Supported

Note: *** the adopted level of statistical significance was 0.001.

The research confirmed that those characterised by a more positive attitude towards technology and technological development in general, have a more positive attitude towards 5G technology.

3.2. Internet use

For the statistical verification of hypothesis H2, which reflects the relationship between Internet use and attitudes towards 5G technology, the non-parametric Kruskal-Wallis test was applied. Result of the hypothesis H2 verification is presented in Table 6.

Table 6. Results of the verification of hypothesis H2

Hypothesis	H statistics	DF	P	Test results
Hypothesis H2: The scale of Internet use has a statistically important positive impact on user attitudes towards 5G technology	27.912	5	***	Supported

In order to search for an answer to the question of which group of respondents, by frequency of Internet use, has the most positive attitude towards 5G technology a rank sum analysis was used. The mean rank refers to the mean value of the rankings assigned to all the observations in each sample. If a group's mean rank is greater than the overall mean rank, it suggests that the values of the observations in that group are generally higher than those of the other groups. Results are presented in Table 7.

Table 7. Mean rank of grouping variable – Internet use

Internet use frequency	Mean rank
Daily	410.94
4–5 times a week	353.84
2–3 times a week	280.93
once a week	246.79
several times a month	195.75

Research has confirmed that people who use the internet more frequently have more positive attitudes towards 5G technology.

3.3. Demographic characteristics

Results of the Kruskal-Wallis (age and education level) and Mann–Whitney U (gender) test verification are presented in Table 8.

Table 8. Results of the verification of hypothesis H3

Hypothesis	H statistics Z statistics	DF	p-value	Test results
Hypothesis H.3.1. Gender has a statistically significant effect on attitudes towards 5G technology	–0.815	n.a.	0.41	Rejected
Hypothesis H.3.2. Age has a statistically significant effect on attitudes towards 5G technology	69.519	4	***	Supported
Hypothesis H.3.3. Education level has a statistically significant effect on attitudes towards 5G technology	37.512	3	***	Supported

Note: *** the adopted level of statistical significance was 0.001.

The findings did not confirm a statistically significant relationship between respondents' gender and their attitudes towards 5G technology therefore rejecting hypothesis 3.1. Both surveyed groups have similar levels of attitude towards 5G technology.

The findings confirmed a statistically significant relationship between respondents' age, education level and their attitudes towards 5G technology thus supported hypothesis 3.2 and 3.3. Results of analysis of mean rank of grouping variable – age and education level are presented in Table 9.

The results presented in Table 9 confirm that younger people have a more positive attitude towards 5G technology. Also, in general people with higher education have more positive attitudes towards 5G technology than those with lower education.

Table 9. Mean rank of grouping variable – age group and education level

Age of the respondents	Mean rank
18–29 year	606.28
30–39 year	551.95
40–49 year	495.77
50–59 year	476.61
over 60	401.81
Education level	Mean rank
Primary or lower secondary education	479.98
Basic vocational education	424.27
Secondary (high school/ post-secondary)	549.58
Higher education (University level)	538.74

3.4. Pro-health behavior

Results of the Kruskal-Wallis test verification of H.4.1 and H.4.2 are presented in Table 10. Hypothesis H.4.2 indicating statistically significant relationships between drinking alcohol habits and attitudes towards 5G technology was supported as opposed to the hypothesis H.4.1 indicating statistically significant relationships between smoking habits and attitudes towards 5G technology.

Table 10. Results of the verification of hypothesis H4

Hypothesis	H statistics	DF	p-value	Test results
Hypothesis H.4.1. Smoking habits have a statistically significant effect on attitudes towards 5G technology	14.942	4	0.01	Rejected
Hypothesis H.4.2. Drinking alcohol habits significant effect on attitudes towards 5G technology	16.397	3	***	Supported

Notes: ** the adopted level of statistical significance was 0.01; *** the adopted level of statistical significance was 0.001.

The results presented in Table 10 confirm that people who drink alcohol more often have more positive attitudes towards 5G technology (Table 11).

Table 11. Mean rank of grouping variable – pro-health behaviors

Drinking alcohol habits	Mean rank
I do not drink alcohol/alcoholic beverages at all	448.30
Occasionally – not more than once a month	506.35
More than once a month, but not more than once a week	548.08
More than once a week	525.36

4. Discussion

In human history technology was always the thing which polarized societies and showed the differences between people. We always had an inventors who created new things, people who knew how to use inventions which others have created, those who knew how to manipulate societies using technologies and those who were afraid of it. The XXI century is not much different than the past. Still we have people who create modern technologies, those who earn the money (creators and businessman are not always the same), those who use technologies to rule societies with human fear. One thing that has changed is the speed which with both technologies and societies change. In XX and XXI century researchers have started to wonder why some people have a positive attitude toward technologies and other not. And they found many explanations. One of the examples of it is our research.

The fact that a positive attitude to technology has an impact on a positive attitude to 5G technology is due to the evolution and the social understanding that technological change brings progress and makes life easier for individuals. People adapt to changes faster or slower, and the acceptance of a given (particular) change, e.g. a very dynamic technological development that we observe in the 21st century, means that we also accept what this change brings. Acceptance and willingness to use new technologies resulting from the understanding that new technologies make life much easier, which causes greater openness to new, emerging technologies. This thesis is confirmed by early research conducted in the United States in the twentieth century (Lee, 1970), which proved that the main factor leading to the use of technology was "the use of a beneficial tool", more broadly – "all forms of technology" (Ray et al., 1999). This thesis is also confirmed by contemporary research (Parasuraman, 2000; Shah et al., 2021a; Digital Poland, 2020).

The fact that a positive attitude to technology as such determines a positive attitude to 5G technology can also be justified by the theory of symbolic interactionism in the William James trend (James, 1890). He recognized that people have the ability to perceive themselves as objects and the ability to generate feelings and attitudes directed towards themselves. He distinguished three types of self: material, social and spiritual. In the material self, physical objects are viewed by people as part of their existence. It manifests itself when we combine the process of our self-determination with the material and/or bodily beings that surround us. Clothes, the place where we live, the car - they also build our identity. The choice of one option or another affects our self-esteem and self-definition. Social self is how you feel about yourself based on your interactions with others. It is formed in the act of communication and is related to our judgments articulated by others, but only those judgments and opinions that we know. Each opinion about us has some influence on us and shapes our relationship with the person who gives the opinion and assessor. Social nature forces us to shape our self-awareness in such a way that it corresponds with social expectations. The spiritual self is a general cognitive organization - the ability to understand oneself as a thinking and cognizer, and a set of psychic faculties that enable thinking and knowing. It manifests itself in the very fact of "thinking of oneself as a thinker." So if, in the course of interaction with others, we have developed certain types of self that have created our identity as one that accepts technologies and appreciates their value, then we adopt the same attitude towards 5G technology.

In the same way we could explain the positive attitude towards 5G technology of people using the Internet. It was also was also confirmed in the research by Shah et al. and in the positively verified by us hypothesis 2. Without any doubts also the pandemic closure influenced the appreciation of Internet use and necessity of fast development of new technologies, but some studies showed that during the pandemic people assessed technologies worse than before (Digital Poland, 2020). The reason of that was probably the necessity to the very fast adoption of new technologies to the new difficult social situation of lock-down. The situation became better after one year of pandemic when we adopt to the new situation and we learnt and improved our capability of the use new technologies (Digital Poland, 2021).

Although the results of our research did not confirm the hypothesis that gender has a significant impact on the perception of 5G technology, the results of other studies (Frey, 2021; Koh with team indicate that women have a higher perception of perceiving potential risks (also on the part of base stations) than men (Koh et al., 2020). According to some psychological studies, it results from differences in the raising of boys and girls, from the natural tendency of women to experience certain emotions more intensely and from a biologically conditioned, different way of responding to stress. Interestingly, the perception of increased risk in women appears in adolescence (McGee et al., 1992), but is also high in middle-aged women, especially between the ages of forty-five and sixty-four (Offord et al., 1996). Some researchers indicate (Arcus & Kagan, 1995) that in women the risk of anxiety disorders and depression is greater because they are more neurotic, that is, they are more prone to negative emotions such as fear, anxiety or sadness.

On the other hand, as found in Foote's research on gender and motivation (Foote, 2000), women have lower expectations for success, underestimating their own abilities in ambiguous contexts. Consequently, men are disproportionately represented in fields such as science and engineering, possibly due to their self-confidence in their own abilities. Hence, their attitude to modern technologies, including 5G, may be more positive.

Also the correlation between age and positive attitude towards technology was not very often researched. While it is generally believed that older people are more reluctant to new technology than younger people, published studies on age and overall technology are mostly negligible (Cheng et al., 2021). However, to gain an insight into this relationship, one can refer to older studies and look at the attitudes of people in different age groups towards IT. Research on age and attitudes towards computers is mixed. Brosnan (1998) reports that a study comparing people aged 30 and younger to those aged 55 and older showed less computer aversion among older adults. On the other hand, significant effects were noted by Mier and Lambert (1991) and Rosen et al., (1993) pointing out that older people are more negative about computers than younger people. Also in the Koh's research the risk perception score, caused by EM waves from 5G network base stations was lower among the 20–29 age group (Koh et al., 2020).

The correlation regarding age and attitude to 5G technology was also confirmed by our study. The greater, growing with age, fear in relation to 5G technology may result from the significant acceleration of technological development in recent years, which is difficult for the elderly to keep up with, which causes understandable concerns.

Also, the level of education has an impact on the attitude of respondents to 5G technology. People with a lower level of education are more afraid of the studied technology. As

education increases, knowledge about this technology grows, thus increasing trust in it and awareness of how important and necessary it is in development. The correlation of the level of education in relation to new technologies in general was also confirmed in the Digital Poland study (Digital Poland, 2020, 2021).

Research on the relation between pro-health behavior and the attitude to 5G technology (including electromagnetic radiation) has not been undertaken too often so far. The most frequently studied health-promoting behaviors include alcohol consumption and addiction to smoking. Researchers such as (Koh et al., 2020; Kowall et al., 2012), similarly to us, hypothesized that exposure of respondents to the risks caused by their drinking and smoking habits causes a lower perception of risks caused by other technologies (e.g. interestingly, according to the results of a study by Koh et al. (2020), risk perceptions of EM waves from 5G base stations were lower among current smokers and never-drinkers (Koh et al., 2020). Also, the results of a study by Kowall et al. (2012) confirmed that people who perceive the dangers of smoking addiction have a better perception of the health risks posed by mobile phone base stations. These results are again in line with the theory of symbolic interactionism, where the fact, that we developed certain types of self that have created our identity as one that accepts anti-health behavior force us to the adoption of the same attitude towards 5G technology.

This has not been entirely confirmed in our research, where the hypothesis H.4.1. smoking habits have a statistically significant effect on attitudes towards 5G technology has not been confirmed. On the other hand, the hypothesis H.4.2. regarding the influence of drinking alcohol on the attitude to 5G technology has been positively verified. It is hard to explain this difference. We could suppose that smoking habits it is not recognized as an anti-health behavior anymore by the decreasing in last years group of Poles but like as ordinary habit. But according to the research made by polish Centrum Badania Opinii Społecznej (Public Opinion Research Center) Poles smoke the least in the whole history of the research on the subject. Moreover people with primary or lower secondary education (34%) and basic vocational education (33%) smoke most often. It is much more difficult to find a smoker among people with higher education – only 17% of respondents declare smoking regularly. In the socio-professional groups, the highest number of smokers is among unskilled workers (49%) and the unemployed (45%). The lowest number of smokers is recorded among pupils and students (14%) and among management staff and specialists (15%). People with low per capita income who smoke and assess their material conditions as poor smoke most often – the percentage of smokers decreases along with the increase in wealth (CBOS, 2019). In the light of this research the result which we have achieved is even more interesting and should be deepened in further research.

Conclusions

The purpose of the study was to assess the influence of socio-demographic factors of potential users on their willingness to use 5G technology. The research conducted among the Polish citizens are pioneering in nature and may serve as a preliminary to more in-depth research into the extent to which other factors (e.g. related to the technology's usability, functionality, environmental impact) determine its adaptation.

Among the characteristics studied, the objects of interest were: general attitudes towards technology, the scale of Internet use, age and education level, smoking and drinking alcohol habits. People's propensity to alcohol consumption results in a more positive attitude toward 5G technology.

The novelty of the results obtained is manifested in the indication of how much bad health-promoting habits such as smoking and drinking alcohol determine users' attitudes toward 5G technology.

The results obtained, confirming a higher level acceptance of 5G technology by users with a generally positive attitude towards the technology, younger people with higher education and more frequent Internet users, allows building the right strategies for entering markets and building cost-intensive infrastructure in markets where the indicated social groups are prevalent. The diversity of the world's population in terms of general attitudes towards the technology, from the perspective of investors in 5G infrastructure, is important in terms of choosing investment locations where they can expect a faster return on investment once they are deployed due to the greater number of users of 5G technology.

The research conducted and the results obtained have practical implications and could help prepare for 5G technology implementation. Knowledge of the socio-demographic factors of 5G technology acceptance and social structure will allow service providers to tailor their offerings to specific demographically and pro-health behaviors diverse customer groups. Regional variations in the demographic characteristics of 5G technology users can provide guidance on market segmentation, the speed of technology diffusion and the required investment by investors.

The study provides novel knowledge yet has limitations. The main research limitation is the national scope of the study focused on Poland. Conducting similar studies in countries with diverse socio-economic development levels and cultural diversity could potentially be a future research direction.

Future research directions are related to seeking answers to the following research questions: How the development of 5G and 6G technologies impacts the level of digitization in society? How to undertake educational initiatives aimed at raising public awareness about 5G and 6G technologies?

Funding

This work was supported by the Bialystok University of Technology under project No. WZ/WIZ-INZ/2/2022, The John Paul II Catholic University of Lublin University, Lublin, Poland and Polish Chamber of Information Technology and Telecommunications.

Author contributions

The authors equally contributed to the elaboration of this study. All authors read and approved the published version of manuscript.

Disclosure statement

The authors declare no conflict of interest.

References

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Prentice-Hall.

Arcus, D., & Kagan, J. (1995). Temperament and craniofacial variation in the first two years. *Child Development*, *66*(5), 1529–1540. https://doi.org/10.2307/1131662

Baldwin, R. (2019). *The globotics upheaval: Globalization, robotics, and the future of work.* Oxford University Press.

Brito, J. M. (2018). Technological trends for 5G networks influence of e-health and IoT applications. *International Journal of E-Health and Medical Communications* (*IJEHMC*), *9*(1), 1–22. https://doi.org/10.4018/IJEHMC.2018010101

Brosnan, M. J. (1998). *Technophobia: Computer anxiety and personality traits.* Routledge.

Castels, M. (2009). *The rise of the network society.* John Wiley & Sons Inc. https://doi.org/10.1002/9781444319514

CBOS. (2019). *Palenie papierosów. Komunikat z badań* [Smoking. Research announcement] (No. 104/2019). https://cbos.pl/SPISKOM.POL/2019/K_104_19.PDF

Cheng, L.-K., Huang, H.-L., & Yang, S.-Y. (2021). Attitude toward 5G: The moderating effect of regulatory focus. *Technology in Society*, *67*, Article 101795. https://doi.org/10.1016/j.techsoc.2021.101795

Chiaraviglio, L., Elzanaty, A., & Alouini, M. S. (2021). Health risks associated with 5G exposure: A view from the communications engineering perspective. *IEEE Open Journal of the Communications Society*, *2*, 2131–2179. https://doi.org/10.1109/OJCOMS.2021.3106052

Ciaula, A. D. (2018). Towards 5G communication systems: Are there health implications? *International Journal of Hygiene and Environmental Health*, *221*(3), 367–375. https://doi.org/10.1016/j.ijheh.2018.01.011

Davis, F. D. (1985). *A technology Acceptance model for empirically testing new and-user information systems: Theory and results* [Unpublished Doctoral dissertation]. MIT Sloan School of Management, Cambridge, MA.

DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information System Research*, *3*(1), 60–95. https://doi.org/10.1287/isre.3.1.60

Digital Poland. (2020). *Technology in the service of society. Will Poles become a 5.0 society?* Foundation Digital Poland, Warszawa.

Digital Poland. (2021). *Technology in the service of society. Will Poles become society 5.0?*. Foundation Digital Poland, Warszawa.

Edison, S. W., & Geissler, G. L. (2003). Measuring attitudes towards general technology: Antecedents, hypotheses and scale development. *Journal of Targeting, Measurement and Analysis for Marketing*, *12*(2), 1479–1862. https://doi.org/10.1057/palgrave.jt.5740104

Foote, M. (2000). Origination and extinction components of taxonomic diversity: General problems. *Paleobiology*, *26*, 578–605. https://doi.org/10.1666/0094-8373(2000)026<0578:OAECOT>2.0.CO;2

Frank, J. W. (2021). Electromagnetic fields, 5G and health: What about the precautionary principle? *Journal of Epidemiology and Community Health*, *75*, 562–566. https://doi.org/10.1136/jech-2019-213595

Frey, R. (2021). Psychological drivers of individual differences in risk perception: A systematic case study focusing on 5G. *Psychological Science*, *32*(10), 1592–1604. https://doi.org/10.1177/0956797621998312

Halicka, K. (2016) Innovative classification of methods of the future-oriented technology analysis. *Technological and Economic Development of Economy*, *22*(4), 574–597. https://doi.org/10.3846/20294913.2016.1197164

Hern, A. (2019). How baseless fears over 5G rollout created a healths care. *The Guardian*. Retrieved February 1, 2023, from https://www.theguardian.com/technology/2019/jul/26/how-baseless-fears-over-5g-rollout-created-a-health-scare

James, W. (1890). *The principles of psychology* (vol. 1, pp. 292–299). Holt. https://doi.org/10.1037/10538-000

Jones, S. (2020). Switzerland halts rollout of 5G over healthconcerns. *Financial Times*. Retrieved February 15, 2023, from https://www.ft.com/content/848c5b44-4d7a-11ea-95a0-43d18ec715f5

Jun, J. (2019). Mobile carriers grapple with'NIMBY'syndrome. *The Korea Times*. Retrieved January 26, 2023, from https://www.koreatimes.co.kr/www/tech/2019/01/133_261270.html

Keystone. (2019a). *Several thousand protest against 5G in Swiss capital*. Retrieved February 15, 2023, from https://www.swissinfo.ch/eng/society/radiation-fears_several-thousand-protest-against-5g-in-swiss-capital/45246224

Keystone. (2019b). *Opponents of 5G start campaign to force nationwide vote*. Retrieved February 15, 2023, from https://www.swissinfo.ch/eng/politics/direct-democracy_opponents-of-5g-start-campaign-to-force-nationwide-vote/45299102

Kim, H. W., Chan, H. C., & Gupta, S. (2007). Value-based adoption of mobile Internet: An empirical investigation. *Decision Support Systems*, *43*, 111–126. https://doi.org/10.1016/j.dss.2005.05.009

Koh, T. H., Choi, J. W., Seo, M., Choi, H. D., & Kim, K. (2020). Factors affecting risk perception of electromagnetic waves rrom 5G network base stations. *Bioelectromagnetics*, *41*(7), 491–499. https://doi.org/10.1002/bem.22290

Korneeva, E., Olinder, N., & Strielkowski, W. (2021). Consumer attitudes to the smart home technologies and the internet of things (IoT). *Energies*, *14*, Article 7913. https://doi.org/10.3390/en14237913

Kowall, B., Breckenkamp, J., Blettner, M., Schlehofer, B., Schüz, J., & Berg-Beckhoff, G. (2012). Determinants and stability over time of perception of health risks related to mobile phone base stations. *International Journal of Public Health*, *57*(4), 735–743. https://doi.org/10.1007/s00038-011-0310-4

Maeng, K., Kim, J., & Shin, J. (2020). Demand forecasting for the 5G service market considering consumer preference and purchase delay behavior. *Telematics and Informatics*, *47*. https://doi.org/10.1016/j.tele.2019.101327

Lee, R. S. (1970). Social attitudes and the computer revolution, *Public Opinion Quarterly*, *34*(1), 53–59. https://doi.org/10.1086/267772

McGee, R., Feehan, M., Williams, S., & Anderson, J. (1992). DSM-III disorders from age 11 to age 15 years. *Journal of the American Academy of Child & Adolescent Psychiatry*, *31*(1), 50–59. https://doi.org/10.1097/00004583-199201000-00009

Martinez, L., Lozano, F., Soto, I., Palominos, P., De Tarso Neves Junior, P., & Laplagne, C. (2021). Acceptance of the implementation of a smart campus based on 5G technology by the University's constituents. In *2021 Third South American Colloquium on Visible Light Communications* (*SACVLC*) (pp. 1–6). https://doi.org/10.1109/SACVLC53127.2021.9652255

Meese, J., Frith, J., & Wilken, R. (2020). COVID-19, 5G conspiracies and infrastructural futures. *Media International Australia*, *177*(1), 30–46. https://doi.org/10.1177/1329878X20952165

Mier, S. T., & Lambert, M. E. (1991). Psychometric properties and correlates of three computer aversion scales. *Behavior Research Methods*, *Instruments and Computers*, *23*(1), 9–15. https://doi.org/10.3758/BF03203329

Modahl, M. (1999). *Now or never: How companies must change today to win the battle for internet consumers*. Harper Business. https://doi.org/10.3390/ijerph16122237

Mustafa, S., Zhang, W., Shehzad, M. U., Anwar, A., & Rubakula, G. (2022). Does health consciousness matter to adopt new technology? An integrated model of UTAUT2 with SEM-fsQCA approach. *Frontiers in Psychology*, *13*, Article 836194. https://doi.org/10.3389/fpsyg.2022.836194

Offord, D. R., Boyle, M. H., Campbell, D., Goering, P., Lin, E., Wong, M., & Racine, Y. A. (1996). One-year prevalence of psychiatric disorder in Ontarians 15 to 64 years of age. Canadian journal of psychiatry. *Revue canadienne de psychiatrie*, *41*(9), 559–563. https://doi.org/10.1177/070674379604100904

Parasuraman, A. (2000). Technology readiness index (TRI): A multiple item scale to measure readiness to embrace new technologies. *Journal of Services Research*, *2*(4), 307–320. https://doi.org/10.1177/109467050024001

Rahman, M. M., Khatun, F., Sami, S. I., & Uzzaman, A. (2022). The evolving roles and impacts of 5G enabled technologies in healthcare: Tet world epidemic COVID-19 issues. *Array*, *14*, Article 100178. https://doi.org/10.1016/j.array.2022.100178

Ramjan, S., & Sangkaew, P. (2022). Understanding the adoption of autonomous vehicles in Thailand: An extended TAM approach. *Engineering Management in Production and Services*, *14*(1), 49–62. https://doi.org/10.2478/emj-2022-0005

Ray, C. M., Sormunen, C., & Harris, T. M. (1999). Men's and women's attitudes toward computer technology: A comparison. *Office Systems Research Journal*, *1*(1), 1–8.

Rosen, L. D., Sears, D. C., & Weil, M. M. (1993). Treating technophobia: A longitudinal evaluation of the computerphobia reduction program. *Computers in Human Behavior*, *9*, 27–50. https://doi.org/10.1016/0747-5632(93)90019-O

Roubini, N. (2022). *The unavoidable crash*. Retrieved February 20, 2023, from https://www.project-syndicate.org/commentary/stagflationary-economic-financial-and-debt-crisis-by-nouriel-roubini-2022-12

Rydzyński, K. (Ed.). (2020). *Effect of electromagnetic millimeter waves on the health of employees in the in the designed 5G networks and the general population*. Łódź.

Sawng, W.-W., Kim, S.-H., Lee, J., & Oh, Y. S. (2011). Mobile service usage behavior in Korea: An empirical study on consumer acceptance of innovative technologies. *Technological and Economic Development of Economy*, *17*(1), 151–173. https://doi.org/10.3846/13928619.2011.557859

Schwab, K., & Malleret, T. (2020). *COVID-19: The great reset*. World Economic Forum.

Shah, S. K., Tang, Z., Sharif, S. M. F., & Tanveer, A. (2021a). An empirical study of Chinese students' behavioral intentions to adopt 5G for smart-learning in Covid-19. *Smart Learning Environment*, *8*, Article 25. https://doi.org/10.1186/s40561-021-00172-9

Shah, S. K., Zhongjun, T., Sattar, A., & Xinhao, Z. (2021b). Consumer's intention to purchase 5G: Do environmental awareness, environmental knowledge and health consciousness attitude matter? *Technology in Society*, *65*, Article 101563. https://doi.org/10.1016/j.techsoc.2021.101563

Sharp, J. H. (2007). Development, extension, and application: A review of the technology acceptance model. *Computer Information Systems*, *5*(9), 1–11.

Singh, D., Psychoula, I., Kropf, J., Hanke, S., & Holzinger, A. (2018). Users' perceptions and attitudes towards smart home technologies. In M. Mokhtari, B. Abdulrazak, & H. Aloulou (Eds.), *Lecture notes in computer science: Vol. 10898. Smart homes and health telematics, designing a better future: Urban assisted living. ICOST 2018*. Springer, Cham. https://doi.org/10.1007/978-3-319-94523-1_18

Sohaib, M. Wen, Z., Shahzad, A., Khalid, J., & Sehrish, R. (2022). An integrated model of UTAUT2 to understand consumers' 5G technology acceptance using SEM-ANN approach. *Scientific Reports*, *12*, Article 20056. https://doi.org/10.1038/s41598-022-24532-8

Tworek, K. (2023). IT reliability as a source of sustainability for organisations operating during the COVID-19 pandemic. *Engineering Management in Production and Services*, *15*(1), 29–40. https://doi.org/10.2478/emj-2023-0003

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425–478. https://doi.org/10.2307/30036540

Williams, M. D., Rana, N. P., & Dwivedi, Y. K. (2015). The unified theory of acceptance and use of technology (UTAUT): A literature review. *Journal of Enterprise Information Management*, *28*(3), 443–488. https://doi.org/10.1108/JEIM-09-2014-0088

World Values Survey Association. (2021). *WVS*. Retrieved January 10, 2023, from http://www.worldvaluessurvey.org/wvs.jsp

Yeh, C.-C. (2017) Using a hybrid model to evaluate development strategies for digital content. *Technological and Economic Development of Economy*, *23*(6), 795–809. https://doi.org/10.3846/20294913.2015.1071293

Yu, Z., & Jin, D. (2021). Determinants of users' attitude and intention to intelligent connected vehicle infotainment in the 5G-V2X mobile ecosystem. *International Journal of Environmental Research and Public Health*, *18*, Article 10069. https://doi.org/10.3390/ijerph181910069

Zmyślony, M., Bieńkowski, P., Bortkiewicz, A., Karpowicz, J., Kieliszek, J., Politański, P., & Rydzyński, K. (2020). Ochrona zdrowia ludności przed zagrożeniami elektromagnetycznymi – wyzwania wynikające z planowanego w Polsce wdrożenia systemu radiokomunikacji standardu 5G [Protection of the population health from electromagnetic hazards – challenges resulting from the implementation of the 5G network planned in Poland]. *Medycyna pracy*, *71*(1), 105–113. https://doi.org/10.13075/mp.5893.00867

Zuboff, S. (2019). *The age of surveillance capitalism: The fight for a human future at the new frontier of power*. Ingram Publisher Services.