Human Technology

ISSN: 1795-6889

https://ht.csr-pub.eu Volume 21(1), May 2025, 35-50

SOCIAL PERCEPTION OF MOBILE NETWORK DEVELOPMENT IN POLAND: THE ROLE OF TRUST, BENEFITS AND RISKS

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Abstract: *This paper aims to explore the intricate relationships between general trust in technology, perceived benefits, perceived threats, and future intentions to use wireless technology. The study employs Structural Equation Modelling (SEM) to analyse data collected from a representative sample of 1010 Polish respondents. The methodology is rooted in the Technology Acceptance Model (TAM), incorporating modifications to accommodate the specifics of wireless technology acceptance. The results affirm significant positive relationships between general trust in technology and perceived benefits, as well as a negative association between general trust and perceived threats. Interestingly, while perceived threats were expected to negatively impact future usage intentions, this study finds that the positive perceptions of benefits substantially outweigh the concerns related to threats, leading to a strong intention to use future technologies. This study extends the TAM by incorporating trust and perceived threats into the model, providing a more comprehensive understanding of the factors that drive technology acceptance, particularly in the context of next-generation wireless networks. This highlights the pivotal role of trust in moderating the perceived risks associated with new technologies. Demonstrating the importance of enhancing public trust and accurately communicating the benefits of new technologies, this research suggests strategies that could mitigate public apprehension and enhance the adoption rates of new technological systems.*

Keywords: *5G, wireless technology, social acceptance, trust in technology, TAM model*

DOI: https://doi.org/10.14254/1795-6889.2025.21-1.2

INTRODUCTION

5G is neither the first nor the last generation of mobile networks. It is merely an update of the technological solutions from the early 1980s, when it was analogue mobile telephony (1G), transformed in 1991 into digital mobile telephony (2G) with an additional short message service (SMS) function. In the early 21st century, the third-generation mobile telephony (3G) emerged, offering (by the standards of that time) fast data transmission and internet access (from 14 to 28 Mbps). In 2009, the 4G version emerged and allowed data transmission at speeds up to 300 Mbps. Many countries are currently implementing 5G, which will not only accelerate data transmission up to 60 times (up to 20 Gbps) but also support more devices per square kilometre (up to 1 million compared to 100,000 for 4G) and reduce transmission delays in the radio network (from 50 ms in 4G to 1 ms in 5G) (ITU, 2015). 5G represents regular technological evolution, but it is referred to as a breakthrough technology. The reason for that is both the qualitative change 5G brings and the role it can play in the ecosystem of connected devices. The strategic nature of the 5G network is likely one of the reasons why this technology has become the cause of the so-called technology cold war (Segal, 2019). For the first time in the history of the telecommunications sector, communication technology has become the subject of trade wars and geopolitical games conducted on such a wide scale (Soler, 2021).

The "fifth generation" (5G) of telecommunication systems, currently being implemented, and the development of the "sixth generation" is expected to become one of the main drivers of the development of the global economy and the digital society of the next decade. When presenting them, attention is often focused on technological and business benefits, while the benefits from other perspectives (such as social benefits) are rarely presented clearly. This could contribute to arousing wider interest among citizens, increasing social awareness, and mitigating the effects of distrust (Soler, 2022). In particular, the development and implementation of 5G technology have brought about many social discussions, leading even to nationwide protests against its implementation, inspired by misinformation (La, 2020; Destiny 2020; Eliassen & Pena 2020). Protesters demand a full ban on 5G technology. Their actions are not limited to verbal objections, but extend to destroying critical infrastructure, e.g. setting fire to cellular masts.

Despite social concerns, in 2017, 93% of European citizens had a personal mobile phone (European Commission, 2018) and in 2019, 73% of European citizens used a mobile device to connect to the Internet (Eurostat, 2020) and this number is constantly growing - close to 90% in 2023 (Eurostat, 2023). These data contradict the observed concerns expressed by users of wireless technology.

Based on current reports and literature, it is possible to determine what is the approach to this technology of adopted by government agencies and what practices they apply in implementing the proposed strategies for regulation of wireless connectivity in the context of the 5G technology. However the majority of existing literature predominantly delves into technical aspects, such as network deployment, compatibility, and related technical considerations of 5G technology (Asif, 2018; Rao et al., 2020; David & Berndt, 2018)

Transition from 4G LTE to 5G is an archetypal example of technological change (Oughton, et al. 2018). Many countries have already developed strategies for the growth of mobile traffic and the potential development of the Internet of Things (IoT), Smart Cities, or other technological achievements (services) based on digital connectivity infrastructure, leveraging 5G technology (Weerakkody & Dhillon 2008; Oughton et al., 2018).

According to Fettweis and Alamouti (2014) the 5G technology is a critical step in the development of the wireless sphere. The authors argue that 5G cellular communication will be another paradigm shift that will redefine our future, impacting out societies in ways which cannot be foreseen, A Qualcomm report describes the benefits of 5G and focuses on the commercial benefits achieved by implementing this technology (Qualcomm, 2020). As noted by the authors of the report, this network will significantly extend the capabilities of various spectra, and its high band indicators will help to increase capacity in various spheres.

Deeper research on the adaptation of mobile networks and mobile Internet has been intensively conducted since the second decade of the 21st century. Researchers have examined the adoption of mobile internet in the context of the transition from 3G to 4G (D'Alessandro & Winzar 2014) and 4G to 5G (Čaušević & Medić, 2021). This transition has also been examined from a business perspective, addressing issues like industry (Tilson & Lyytinen 2006; Attaran 2023), banking (Luyao et al., 2022; Mukong & Nanziri, 2021), Internet of Things (IoT) (Rosa et al., 2021) or societies' development (Cumiskey & Humphreys, 2023), as well as their application in clinical research (Jurek-Matusiak et al., 2021; Steć et al., 2022). Governments of individual countries have also attempted to familiarize their societies with wireless technologies by publishing educational materials dedicated to 5G technology (Ajmone et al., 2018; Żurek, 2018).

Taking the above into consideration, the aim of the research was to explore the relationships between four research construct: general trust to technology, perceived benefits, perceived threats and future intention to use of wireless technology.

The first part of the article provides a review of the existing literature on the factors determining acceptance wireless technology. The conducted literature reviews formed the basis for the development of research hypotheses and a theoretical model. In the subsequent section of the article, the research methodology was presented, defining the research sample, research tool, data collection methods, and data analysis techniques. Subsequently, the results of the conducted studies were discussed, which were further subjected to discussion in the following section. The final part of the article includes conclusions, research limitations, and directions for future research.

LITERATURE REVIEW AND THEORETICAL MODEL

The development and adoption of wireless technologies are influenced by a variety of factors, including technological, economic, social, and regulatory considerations. On one hand, the dynamics of the development of wireless technologies and their applications must align with market demand and stem from consumer expectations (Plohl & Čuš Babič, 2024).

Socio-psychological, economic, and personal factors have a substantial influence on human behaviour. However, their impact on shaping consumer behaviour with respect to 5G remains largely uncharted (Mustafa et al., 2022).

When analysing the issues posed in the topic of this article, it is worth referring to the Technology Acceptance Model by Davis (1985). His concept was based on the assumption that the decision to use a new information technology by the user is a reaction that can be explained or even predicted based on the user's motivation, which in turn is directly influenced by external stimuli resulting from the current features and capabilities of the technology. Davis deduced that the user's attitude is influenced by two main beliefs: perceived usability and perceived ease of use, the latter having a direct impact on the former. During further experiments, Davis refined his model by introducing other variables and modifying the originally formulated relations. The model was also applied by other researchers who introduced their modifications (usually new variables), making the TAM the primary model used for explaining and predicting the use of information technology systems. Recent studies have extended TAM applications to telecommunications contexts, examining how technology acceptance varies across different geographic and socio-economic contexts (Aderibigbe, 2023). It has gained immense popularity - it is quoted by the majority of authors examining the issues of acceptance of information technologies, despite the fact that it is sometimes criticized (Chen et al., 2012). In numerous technology acceptance models, trust plays a pivotal role. The notion of trust has been extensively examined in online studies (Kim & Peterson, 2017; Kunst et al., 2024; Leonov et al., 2024).

On one hand, trust can act as a determinant of technology usage; on the other hand, experiences associated with using technology can enhance trust levels toward it. Two categories of trust in technology can be distinguished: a) general trust in technology, reflecting a societal belief and confidence that technological development generally has a positive impact on society, which is expressed in openness to new solutions; b) trust in specific technologies, stemming from the experience of using them, the benefits experienced, or the threats posed by the technology (Figure 1).

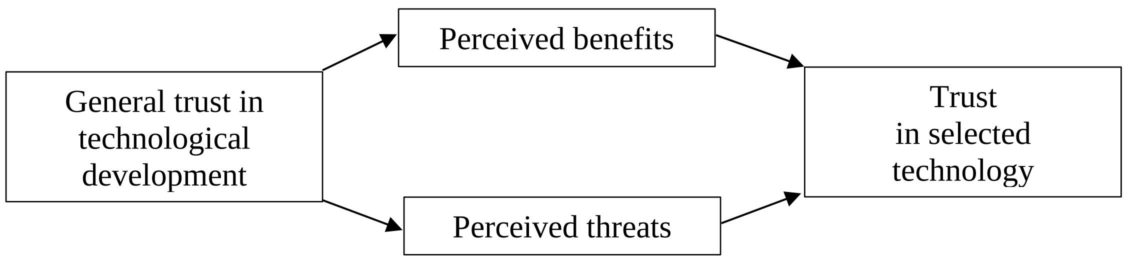


Figure 1. Two types of trust in technology [Source: Own study]

The issue of trust in wireless technologies has traditionally been approached from a research perspective related to technical aspects, both in terms of internal and external network attacks leading to information theft and network destruction (Zhu, 2018). Currently, there is an increasing concern about ensuring the security of telecommunications networks and, consequently, building trust in them (ITU, 2020; Haque et al., 2024).

The benefits of technology are often discussed in the literature primarily from the perspective of the usefulness of a particular technology and its impact on usage intentions (Shin, 2010). In the case of telecommunications technologies, the importance of social impact, users' environmental awareness, and ensuring the safety of its usage are also emphasized (Shahzad et al., 2023; Soler, 2022).

Interesting studies concerning trust and intention to use 5G were conducted by researchers from China (Shahzad et al., 2023). Their results confirm that trust and intention to use 5G significantly mediate the relationship between social influence, environmental awareness, and security availability in actual use of 5G among Chinese students. Moreover, they also discovered that supportive facilitating conditions strengthen the relationship between trust and intention to use 5G. In earlier studies as well (Lee & Song, 2013), trust and perceived risk have been demonstrated as direct predictors of intention to use wireless technologies, with trust also playing an indirect role. Nuntasunti and Bernold (2006) confirmed that success of wireless technology in the long run depends on trust. Also research conducted by Lu et al., (2003) confirmed that wireless trust environment wireless trust environment influenced long-term and near term usefulness, perceived as benefits perceived. Thus, authors propose the following hypothesis 1.

H1: General trust to technology determine the perceived benefits of wireless technology development

In the process of technology adoption, the relationship between trust and perceived risk is especially significant because trust can diminish perceptions of risk. Research on organizational technology adoption has shown that resistance to technological change often stems from factors such as skepticism about the need for change, fear of the unknown, and mistrust of change initiators (Kuzhda, 2016). The crucial role of trust in online research stems from its capacity to mitigate associated risks during initial and subsequent interactions (Gefen et al., 2003). Factors influencing technological acceptance, especially within the health context, underscore the importance of two psychological factors in the adoption process: trust and perceived risk (Kuen, Westmattelmann et al., 2023; Walter et al., 2024). According to Lu, Yao and Yu (2005) trust has significant negative effects on risk perception. Trust serves as a mechanism to manage uncertainties. Trust in technology aids in overcoming perceived uncertainties, thereby enhancing the intention to use it (Kuen, Westmattelmann et al., 2023). The importance of trust is grounded in situations marked by uncertainty, as it assists in overcoming these challenges (Lewicki et al., 2006). Sousa and Beltrão (2021) also risk perception identified as the most problematic construct in the context of trust. The aforementioned assumptions have facilitated the formulation of a hypothesis 2:

H2: General trust in technology is related to the perceived threats connected with wireless technology applications

In many technology acceptance models, benefits are an element of a construct called usefulness. Numerous studies confirm a significant correlation between the perceived usefulness of technological solutions and the inclination to adopt them in the future. Regardless of the type and area of application, such relationships are significant and positive.

Our third and fourth hypothesis are confirmed by the previous research of Setterstrom et al. (2013). The conclusions they made suggest that regardless of whether individuals decided to adopt or continue using a mobile phone with internet access, perceived usefulness, enjoyment, and perceived cost influenced perceived value. And from the other side, perceived value influenced the decision to adopt or continue usage. Their results also suggest a shift in the significance of benefits in shaping perceived value.

Examples of studies examining the relationship between usefulness (perceived through the lens of expected benefits) and future intentions to use solutions related with using wireless technology from various areas include: virtual assistant with children (Wald et al., 2023);

mobility technology (Altay & Okumus, 2022; Lopez-Carreiro et al., 2024); virtual communication (Gupta & Mathur, 2023); digital wallets (Shetu et al., 2022); energy-saving appliances (Karunarathna et al., 2023).

The conducted studies allowed for the formulation of a hypothesis.

H3: The level of perceived benefits of wireless technology influences future intention to use of new advanced wireless technology

Past studies on perceived risk (threats) have emphasized its multidimensional nature and the impact of various perceived risks on the intention to use (Kuen, Schuermann et al., 2023). For example various studies in the telemedicine context have confirmed the negative relationship between perceived risk and the intention to use (Yang et al., 2022). In relation to medical technologies based on IT solutions, Kuen and his team confirmed the hypothesis that performance risk is negatively related to intention to use (Kuen, Westmattelmann, et al., 2023). Also, in the context of IT technology applications based on wireless technology in the mobility sector (autonomous cars, buses) (Cai et al., 2023; de Blanes Sebastian et al., 2023), the issue of the impact of perceived risks on user intentions plays a crucial role. Considering the importance of perceived risk (threats) in future intention to use of new advanced wireless technology the following hypotheses were formulated:

H4: The level of perceived threats connected with wireless technology development and adaptation influences the future intention to use of new advanced wireless technology

The conducted literature reviews relating to the four analyzed constructs: trust in technology, perceived benefits and risks, and intentions regarding the use of wireless technology, allowed for the proposal of the theoretical model presented in Figure 2.

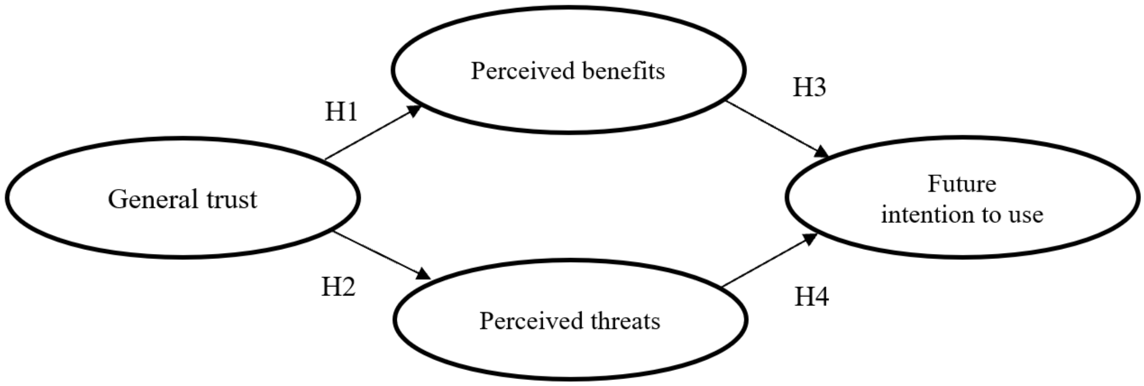


Figure 2. Theoretical model [Source: Own study]

RESEARCH METHODOLOGY

Research sample

The research was conducted in 2023 on a representative sample of 1010 Poles in the age group above 15 years old. Data was collected using the CATI (Computer-Assisted Telephone

Interviewing) technique. The research sample was diverse in terms of age, education, and gender of the respondents and corresponded to the structure of the general population. The respondents' demographic structure based on gender, age, and education is presented in Table 1.

Table 1. Respondents' demographic structure based on gender, age, and education [Source: Own study]

	Frequency	Percentage
Gender		
Female	485	48.0
Male	525	52.0
Total	1010	100.0
Age		
15-24 years old	111	11.0
25-34 years old	162	16.0
35-44 years old	202	20.0
45-54 years old	192	19.0
55-64 years old	161	15.9
over 65 years	182	18.0
Education level		
Primary or lower secondary education	172	17.0
Basic vocational education	232	23.0
Secondary (high school/ post-secondary	333	33.0
Higher education (University level)	273	27.0

Research measurements

The developed theoretical model considered relationships between four constructs: General trust (GT), Perceived benefits (PB), Perceived threats (PT) and Future intention to use (FI). To investigate the relationships between the unobservable constructs, measurement scales were proposed for each of the constructs based on a literature review. A 5-point Likert scale was used to assess the measurement variables, where: 1 - indicated "strongly agree," and 5 - indicated "strongly disagree."

To verify the developed measurement scales for the three constructs: General trust (GT), Perceived benefits (PB), Perceived threats (PT) a confirmatory Factor Analysis (CFA) was conducted. Subsequently, the validity of the CFA measurement model was assessed. The model estimation was conducted using GLS (Generalized Least Squares) method. In the process of assessing individual measurement models, modifications were made related to the standardized residual covariances and regression coefficients. From the original set of observable variables, variables were removed if their regression coefficient value was less than 0.6 and if the absolute values of the covariances for standardized residuals were greater than 2 (Table 2).

Table 2. Standardized regression weights before and after CFA [Source: Own study]

Constructs and items	Standardized regression weights before and after CFA		Variable symbol
	Before	After	
General trust (GT)			
Due to science and technology, the world is a better place	0.735	0.686	GT1
Science and technology make our lives easier and more comfortable	0.755	0.759	GT2
Science and technology make our lives healthier	0.519		Removed
Science and technology create more opportunities for the development of future generations	0.796	0.799	GT3
Perceived benefits (PB)			
The development of mobile networks is an essential component of socio-economic development	0.771	0.747	PB1
Due to the mobile network coverage, I feel safer	0.695	0.698	PB2
Wireless communication improves the quality of my life.	0.749	0.775	PB3
Perceived threats (PT)			
Using wireless communication is a source of risk	0.328		Removed
The development of technologies utilizing mobile networks makes us increasingly dependent on them	0.827	0.839	PT1
Wireless technologies are causing our lives to change too quickly	0.599	0.575	PT2

* Variable removed due to regression coefficient value was less than 0.6 and if the absolute values of the covariances for standardized residuals were greater than 2.

The reliability of the developed measurement scales for all constructs was assessed using the Cronbach's alpha coefficient ranging from 0.648 to 0.784. It is assumed that Cronbach's alpha coefficient above 0.6 is acceptable. Table 3 displays the descriptive statistics and Cronbach's alpha values for both the constructs and individual items.

Table 3. Descriptive statistics and Cronbach's α for all constructs [Source: Own study]

Constructs and items	**Factor Loading**	**Cronbach's α**
General trust (GT)		
GT1. Due to science and technology, the world is a better place	0.686	0.784
GT2. Science and technology make our lives easier and more comfortable	0.759	
GT3. Science and technology create more opportunities for the development of future generations	0.799	
Perceived benefits (PB)		
PB1. The development of mobile networks is an essential component of socio-economic development	0.747	0.779
PB2. Due to the mobile network coverage, I feel safer	0.698	
PB3. Wireless communication improves the quality of my life.	0.775	
Perceived threats (PT)		
PT1.The development of technologies utilizing mobile networks makes us increasingly dependent on them	0.839	0.648
PT2. Wireless technologies are causing our lives to change too quickly	0.575	
Future intention to use (FI)		
FI1. I intent to use next-generation mobile networks [5G, 6G, etc.].	0.863	0.682
FI2. I intent to encourage others to use mobile networks [5G, 6G, etc.].	0.595	

The exclusion of selected variables led to an enhancement in the fit measures of the CFA model. The fit indices of the CFA model after variable reduction are presented in table 4.

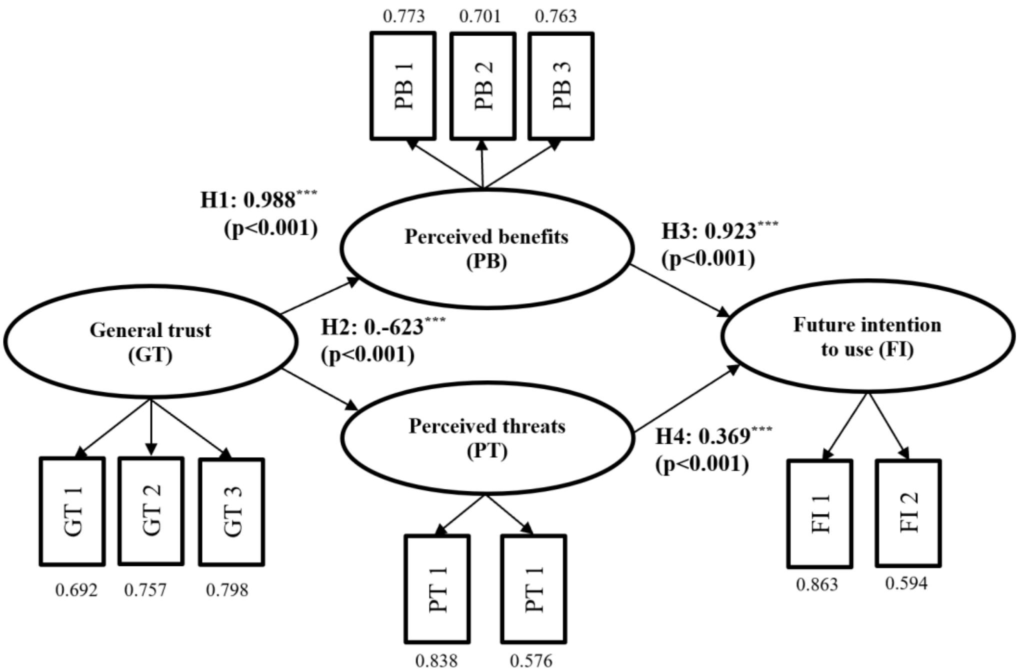
Table 4. The fit indices of the CFA model [Source: Own study]

Model	**NPAR**	**CMIN Chi-kwadrat**		**DF**	**P**	**CMIN/DF**
Default model	26		62.247	29	0.000	2.146
	RMR	**GFI**	**AGFI**	**PGFI**		
Default model	0.022	0.988	0.977	0.521		
	NFI Delta1	**RFI rho1**	**IFI Delta2**	**TLI rho2**	**CFI**	
Default model	0.903	0.849	0.945	0.913	0.944	
	RMSEA	**LO 90**	**HI 90**	**PCLOSE**		
Default model	0.034	0.022	0.045	0.991		
	HOELTER 05	**HOELTER 01**				
Default model	690	804				

The developed measurement scales and the assessment of their reliability facilitated the examination of relationships between constructs.

RESEARCH RESULTS

To test research hypotheses, Structural Equation Modelling (SEM) was employed, allowing for the analysis of causal relationships between variables. The verification of the four hypotheses was conducted based on the structural path coefficients. The figure 3 presents structural path estimates between constructs and variables.



Values on paths between latent variables are standardised regression coefficients and values at observable variable are factor loads.

Figure 3. Measurement model [Source: Own study]

The analysis of factor loadings of paths and the p-value indicate that all four hypotheses have been confirmed (table 5). The obtained model fit indices confirm that the model fits well. Among researchers, there is a consensus on the fundamental model fit measures. According to Iacobucci(Iacobucci 2010), the Chi-square test (CMIN) should be indicated first, along with degrees of freedom and p-value. An ideal model fit is confirmed by a Chi-square statistic indicating no statistically significant relationship ($p>0.05$). However, the Chi-square statistic has significant limitations as it is sensitive to sample size. With large samples, the Chi-square statistic will almost always indicate poor model fit ($p<0.05$). A solution used in such situations is the Chi-square statistic divided by degrees of freedom (CMIN/DF), and its value should not exceed 3, with an acceptable level being 5. Commonly used model fit measures include RMSEA, CFI, GFI, AGFI. The measurement model exhibits a high level of fit, as confirmed by the RMSEA (Root Mean Square Error of Approximation) with a value of 0.033. For the RMSEA, values within the range <0; 0.05> indicate good model quality, with 0.08 being the upper limit for satisfactory estimation and 0.1 as the threshold for model rejection. Regarding the GFI (Goodness of Fit Index) and AGFI (Adjusted Goodness of Fit Index), values above 0.9 indicate acceptable model fit.

Table 5. The results of hypothesis statistical verification

Relationship between Constructs	Estimate	Standard Error	Capability Ratio	p	Hypothesis Testing
H1: GT→PB	0.988	0.041	23.972	***	Support
H2: GT→PT	-0.623	0.044	-14,262	***	Support
H3: PB→FI	0.923	0.083	11.187	***	Support
H4: PT→FI	0.369	0.088	4.177	***	Support

$\chi^2 = 63.13$; degrees of freedom (df) = 30; $\chi^2/df = 2.104$; $p < 0.001$; RMSEA = 0.033; GFI = 0.988; CFI=0.944; AGFI=0.977; *** the adopted level of statistical significance was 0.001

DISCUSSION

Throughout human history, technology has consistently propelled civilization forward. This phenomenon extends beyond telecommunications to other emerging technologies such as autonomous vehicles, where similar patterns of social acceptance and resistance are observed (Razavi & Sierpinski, 2024). However, this development has also been accompanied by apprehension and fear due to its novelty and the potential unknown consequences it may bring. The conviction that technological progress can enhance human life on one hand, but may pose dangers, especially when the long-term consequences are unknown, has led to the division of societies and highlighted differences among people. This phenomenon has been observed in the past, such as when people were wary of inventions by figures like Leonardo Da Vinci, and it persists in the 21st century. An evident change is the accelerated pace at which both technologies and societies undergo transformations. In the 20th and 21st centuries, researchers have sought to understand what factors influence people to adopt technologies, exemplified by this research.

The connection between a positive attitude toward technology and a favourable stance towards 5G technology is rooted in the evolution and societal understanding that technological advancements signify progress and enhance individuals' lives. The pace at which people adapt to changes varies, and the acceptance of a specific change, like the dynamic technological developments observed in the 21st century, indicates an acknowledgment of the benefits it brings. The willingness to embrace and utilize new technologies is driven by the recognition that these innovations significantly improve life, fostering greater openness to emerging technologies. Contemporary research affirms this thesis (Parasuraman, 2000; Shah et al., 2021; DigitalPoland, 2020).

The conducted research and obtained results have confirmed that statistically significant relationships exist between the examined constructs. The hypotheses 1 and 2 reflected the relationships between general societal trust (GT) in technology and the perceived benefits (H1) of accessing wireless networks, as well as the perceived threats (H2) associated with unrestricted access to wired networks. Both hypotheses have been supported ($p<0.001$).

A higher level of general trust in technology, manifested by society recognizing the positive impact of technology on socio-economic development, making life easier and more comfortable, leads to society rating the perceived benefits of wireless network access higher. At the same time, it results in a lower perception of associated risks. Belief in the positive impact of technology on society (GT) leads to a lower perception of the risks (mark minus) associated with becoming increasingly dependent on technology and with the fact, that life is changing too quickly. The obtained results are consistent with the findings of other authors concerning various technologies that utilize wireless networks (Kuen, Schuermann et al., 2023).

Hypotheses 3 and 4 pertained to the relationships between the perceived benefits (H3) and threats (H4) associated with using wireless networks and society's future intentions regarding the use of 5G, 6G networks. Hypothesis H3 has been supported ($p<0.001$). A higher level of perceived benefits (PB) contributes to a higher declared intention to use 5G and 6G networks in the future (FI) (Hypothesis 3). The results also align with those of other researchers (Gupta & Mathur, 2023; Lopez-Carreiro et al., 2024).

Surprising results were related to the fact that a higher level of perceived threats associated with wireless network access does not limit the level of declared future use of 5G and 6G networks (Hypothesis 4). Despite the perceived threats (PT), respondents declare future intentions to use wireless networks, which can be explained only by the expected higher net benefits. This alignment is also mirrored in other social studies, like those conducted by the Digital Poland Foundation. They found that the benefits arising from the convenience of wireless internet access outweigh concerns about its impact on health (DigitalPoland, 2020; PIIT, 2024).

Conditions that maintain a balance between trust in technology and reasonable skepticism are still considered important (Melberg & Gressgard, 2023)

In reference to the residents of Poland, one can observe a relatively high level of trust in technology in general. This is also confirmed by international studies. Research conducted as part of the Global Value Survey confirmed that despite the general low propensity of Poles to trust (social trust), their faith and belief in the positive impact of technology on life are very high. This is confirmed by the percentage of responses between 8-10 to the aforementioned question. Over 61% of respondents agree with the statement that "science and technology make our world healthier, life easier, and more comfortable," indicating responses between 8-10 (WVS, 2018).

CONCLUSIONS

The study examined the relationships between general trust in technology, perceived benefits, perceived threats, and future intentions to use wireless technology. Our findings validate the hypotheses suggesting a strong positive correlation between general trust in technology and perceived benefits, and a significant inverse relationship between general trust and perceived threats. This reflects broader societal attitudes that technological advancement is fundamentally beneficial, enhancing socio-economic development and improving quality of life. Moreover, despite the presence of perceived threats, a high level of perceived benefits strongly influences future intentions to adopt advanced wireless technologies like 5G and 6G.

The research has several limitations that should be considered. Firstly, the study was geographically confined to Poland, which might limit the generalizability of the findings to other contexts with different cultural, economic, and technological backgrounds. Additionally, the study's reliance on self-reported data may introduce response biases, potentially affecting the accuracy of the findings. Finally, the dynamic nature of technology and societal values may mean that the perceptions and intentions captured are subject to change as new information and technologies emerge.

Future research could expand on this study by incorporating a more diverse international sample to enhance the generalizability of the findings across different cultural and technological contexts. Longitudinal studies could also be conducted to observe how perceptions and intentions evolve with the ongoing advancements in wireless technology. Furthermore, qualitative studies could provide deeper insights into the reasons behind trust enhancing the understanding of underlying psychological and socio-cultural factors. Finally, exploring the role of educational interventions in shaping perceptions and mitigating perceived threats could offer practical implications for policy and communication strategies in technology adoption.

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Human Technology
ISSN 1795-6889
https://ht.csr-pub.eu