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The Impact of Socio-economic Factors on the Diffusion of Mobile Technologies in Polish Voivodeships

Marcin Salamaga

Krakow University of Economics, Institute of Quantitative Methods in Social Sciences, Department of Statistics, Rakowicka 27, 31-510 Kraków, Poland, e-mail: salamaga@uek.krakow.pl, ORCID: https://orcid.org/0000-0003-0225-6651

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ABSTRACT

Objective: The aim of the article is to identify socio-economic factors influencing the diffusion of mobile technologies in Poland.

Research Design & Methods: The phenomenon of diffusion of mobile innovations was modelled using Gompertz functions, which were estimated separately for each voivodeship. The impact of socio-economic factors on the rate of innovation diffusion was modelled using multi-equation models. The Gauss-Newton algorithm was used to estimate the Gompertz function, and multi-equation models were estimated using three stage least square (3SLS).

Findings: The research results included in this study indicate that the highest levels of market saturation occur in voivodeships with large populations. The phase of increasing innovation diffusion usually lasts longer in more urbanised voivodeships. The level of education of society and its digitalisation are potentially important determinants of the dynamics of diffusion of mobile technology innovations. More educated populations generally had inflection points pushed back in time and therefore the waiting time for the peak of the wave of mobile technology diffusion was generally longer there.

Implications/Recommendations: Knowledge of the phase cycle of the innovation diffusion pattern can help in planning the introduction of technologically advanced products to the market in a coordinated way, so that the peak of the market penetration process occurs at the desired moment from the point of view of the company's strategy. The research approach presented here may be useful for company managers in planning strategies for introducing new products and services.

Contribution: The article presents for the first time the diffusion of mobile technologies in Poland from a spatial perspective (by voivodeships). The identification of socio-economic factors of the diffusion of mobile technologies made using multi-equation models should be considered an original approach in research on the spread of innovations.

Article type: original article.

Keywords: innovation diffusion, mobile technology, Gompertz model, multi-equation model, voivodeships.

JEL Classification: O30, C01, C22.

1. Introduction

The information revolution has led to the emergence of the information society and information economy and has become a catalyst for the development of mobile technologies. Technological progress of the last two decades and the accompanying "information revolution 4.0" have resulted in very deep and dynamic changes in the functioning of economies, industry, work organisation and of entire societies. The impact of the revolution in information and communication technology, the development of artificial intelligence, and the digitalisation of economies have resulted in the emergence of "societies 5.0." This would not be possible without the development of mobile technologies, which are currently among the fastest developing technologies, and their participation in everyday life of modern society is visible in virtually all areas. Mobile technologies can be defined as a set of technologies and solutions that enable communication, access to information, entertainment and many other functions using portable devices such as smartphones, tablets, laptops or smartwatches (Choudrie, Pheeraphuttharangkoon & Davari, 2020; Dhakal & Lim, 2020; Jha & Saha, 2020; Lartey, 2020). The terms refer to both the hardware and software that allow these devices to operate on mobile networks and stay connected to the Internet at all times. It is hard to imagine modern society without access to such technologies since they play a major role in many aspects of people's lives and in the functioning of entire economies – one can point to mobile banking and financial services, remote education, e-commerce, social media as examples of true impact (Mitra, 2019; Hew, Lee & Leong, 2023).

The features of mobile technologies centre on directness and immediacy that permit the use these technologies anywhere and at any time, the ability to quickly connect, geolocation (GPS), data portability and sharing of data and services, the ability to archive data on various media (including the cloud), the ability to personalise and adapt devices to one's needs in terms of configuration, appearance, etc. (Grantham & Tsekouras, 2005). Smartphones and tablets are a representative example of devices, which embody mobile technologies. They are multifunctional devices and highly popular. Today's smartphones and tablets are an example of extremely advanced technologies and are miniaturised computers with a versatile purpose, for which making phone calls is just one of their many functions (Hew, Lee & Leong, 2023). For this reason, the modelling of mobile innovation diffusion was carried out in this study based on the process of proliferation of such devices. In the subject literature the issue of innovation diffusion in the area of mobile technologies in Poland, which utilises a spatial approach, is rarely discussed, and it is even more difficult to find studies in which the factors influencing the geographical diversity of this phenomenon are analysed. This article attempts to fill the existing research gap in this area. The author of the study aims to build models of diffusion of mobile technologies for individual voivodeships, as well as to indicate statistically significant socio-economic factors that affect these characteristics. The research objectives were achieved using the Gompertz curve and multi-equation models.

2. Literature Review

The issue of innovation diffusion can be analysed from different perspectives, depending on the research objective. Diffusion is thus analysed in terms of consumer behavior and marketing (Hew, Lee & Leong, 2023). A particularly frequent subject of research on mobile innovations is the study of the diffusion of telecommunication technology, mobile telephony (Gündüc, 2019; Honoré, 2019; Morya & Shankar, 2019; Spaho & Kraja, 2019; Sujatha & Sekkizhar, 2019, Toğa & Toğa, 2019; Choudrie, Pheeraphuttharangkoon & Davari, 2020; Jha & Saha, 2020; Lartey, 2020; Kalem *et al*., 2021; Chandrasekaran, Tellis & James, 2022). The technological progress that has taken place in this area is unprecedented in the history of technological thought development. The multifunctionality of constantly improved mobile devices, rapid development of telecommunication infrastructure, increasing affordability, and the appropriate marketing policy of corporations producing and selling such devices that creates specific needs among customers, all cause the emergence of a market suction effect.

However, the proliferation of technological novelties in this area takes place at different rates and in different ways, depending on many socio-economic, demographic, cultural and other factors. In innovation diffusion studies, S-shaped curves are of course used (Rogers, 1995). In order to gain a more in-depth understanding of diffusion processes, some of the characteristics of such models as inflection point and saturation level need to be investigated. In innovation diffusion models, quite popular models are the Bass and logistic models (Gündüc, 2019; Jha & Saha, 2020;

Lartey, 2020). However, many researchers indicate the advantage of the Gompertz model over other models (Liu *et al.*, 2014; Spaho & Kraja, 2019; Dhakal & Lim, 2020; Jha & Saha, 2020; Lartey, 2020) and therefore this model will be the basis for the analysis in this research. The dynamics and causes of mobile technology innovation are studied from a global, cross-country perspective (Gündüc, 2019; Morya & Shankar, 2019; Roy, Dutta & Das, 2019; Sujatha & Sekkizhar, 2019; Choudrie, Pheeraphuttharangkoon & Davari, 2020). They examined the dynamics and causes of innovation in mobile technologies from a global, cross-country perspective. Perkins and Neumayer (2005) studied the rate of diffusion of telecommunications technologies using event history analysis. They found that the pace among those who later adopted such technologies was the fastest in the field of mobile digital technology. In developing countries, such technologies spread faster than in developed countries. Choudrie, Pheeraphuttharangkoon and Davari (2020) in modelling the diffusion of innovations successfully applied the structural equation modelling (PLS-SEM) technique. They investigated, among others: the impact of demographic factors and functional features of smartphones on the diffusion of innovations. Marketing analyses check what factors may influence the diffusion of mobile innovations. Researchers argue that the spread of Internet technologies in many countries is mainly influenced by GDP *per capita* and the average age of the population (Kiiski & Pohjola, 2002). Mukhopadhyay, Bagchi and Udo (2024) studied the impact of population income, human development, and urbanisation on the rate of mobile telephony diffusion. There may, of course, be more potential factors that may influence the diffusion of mobile innovations and they may be economic, demographic, social and cultural in nature (Liu *et al.*, 2014; Gündüc, 2019; Morya & Shankar, 2019; Choudrie, Pheeraphuttharangkoon & Davari, 2020). This study combined the estimation of the Gompertz S-shaped curve with a cause-and-effect analysis, which checked what factors determined the dynamics of diffusion, the inflection point of the curve and its saturation level in relation to mobile technologies in Poland. Such a study was carried out by voivodeship, which allowed for an analysis of the diffusion of the discussed innovations in spatial terms. Research from this perspective should be considered pioneering on the Polish mobile technology market. It should be assumed that the results obtained will be helpful in understanding the course of the innovation diffusion process, and it will help decision-makers responsible for establishing the marketing strategy of companies providing mobile technologies to build forecasts and make appropriate decisions.

3. Research Methodology

Modelling of mobile innovation diffusion was carried out based on the process of proliferation of smartphones and tablets with Internet access. Two groups of statistical data from the Local Data Bank of the Polish Central Statistical Office (GUS) from 2022 were used, which may potentially affect the diffusion of mobile technologies, in the cross-section of voivodeships:

– number of companies equipping employees with mobile devices enabling mobile access to the Internet (portable computers, smartphones),

– selected socio-demographic features of the society.

The Gompertz model was used to model the diffusion process of mobile technologies, the effectiveness of which in similar analyses has been confirmed in many papers (Desiraju, Nair & Chintagunta, 2004; Lei & Zhang, 2004; Liu *et al.*, 2014; Spaho & Kraja, 2019; Dhakal & Lim, 2020; Jha & Saha, 2020). This model reflects the dynamics of the diffusion of innovative technologies, the course of which corresponds to the shape of the letter S.

The function used in this analysis is as follows:

$$f(t) = A\exp(-\exp(-B(t-C))), \tag{1}$$

where:

A, B, C – parameters of the Gompertz function.

The rate of change in the Gompertz function is given by the formula:

$$GRG = \frac{dy}{dt}\frac{1}{y} = B\exp(-B(t-C)). \tag{2}$$

In the Gompertz function, it is possible to indicate an area where it has a clearly increasing growth rate and a range where it is characterised by a decreasing growth rate, ultimately progressing to the level of saturation expressed by the asymptote $y = A$. The point that separates the rapid growth rate of the curve from the decreasing rate of growth is called the inflection point. It can be shown that its abscissa in the coordinate system has a value corresponding to the value of the parameter C, and the elevation takes the value of Ae^{-1}. The rate of change of the Gompertz function at the inflection point is given by:

$$\frac{dy}{dt}\frac{1}{y}(C) = B. \tag{3}$$

Thus, each of the parameters of the Gompertz function (1) has its own interpretation in the analysis of the process of innovation diffusion. Parameter A expresses the potential size of the market, parameter B expresses the diffusion rate, and parameter C expresses the inflection point. On their basis, it is possible to trace in depth the diffusion of innovations in terms of the pace of this process, the duration of the dynamic growth phase of the process, as well as its level of saturation. Therefore, it is justified to investigate what the elements depend on and what determinants shape them. Since the recipients of devices that are carriers of mobile technologies are primarily populations of state residents, it is justified to look for determinants of diffusion processes among socio-demographic characteristics. It should be expected that the size of the market for electronic devices such as smartphones and tablets (parameter *A*) may depend on the size of the population in a given country (region), the degree of its urbanisation, the level of wealth of the society, the level of education in the society and the openness of the society to digital technologies. The impact of such variables in similar analyses was examined by authors such as Liu *et al*. (2014), Prince and Simon (2009), Katona, Zubcsek and Sarvary (2011). In addition, it can be expected that the size of the market may also be affected by the length of the period during which the diffusion processes intensify. The duration of this period can be determined based on the inflection point, and given that it takes time for the relevant market period to occur, it is advisable to include a lagging variable in the model to represent the inflection point. Some of these variables may also determine the rate of mobile technology diffusion. This applies, for example, to the urbanisation rate, the level of education of the population and the extent of the society's digital competences. It should also be assumed that the dynamics of diffusion of digital technologies is a result of the level of market saturation with such technologies (market size) and the length of the period of intensive diffusion of innovation (measured by the inflection point). It can be expected that the length of the period of intensive growth of diffusion dynamics is also due to the level of urbanisation, the education of the society, its digital competences, as well as the level of economic development of the country or region (Liu *et al*., 2014). The Gompertz curve inflection point can also be affected by the diffusion rate and market size. Potential feedbacks that may occur between variables are a premise for using a multi-equation model with interdependent variables in the study:

$$\ln A_i = \delta_0^{(1)} + \alpha_1^{(1)} \ln C_i + \beta_1^{(1)} \ln X_{1i} + \beta_2^{(1)} X_{2i} + \beta_3^{(1)} \ln X_{3i} + \beta_4^{(1)} \ln X_{4i} + \beta_5^{(1)} X_{5i} + \varepsilon_i^{(1)} \quad (4)$$

$$\ln B_i = \delta_0^{(2)} + \alpha_1^{(2)} \ln A_i + \alpha_2^{(2)} \ln C_i + \beta_2^{(2)} X_{2i} + \beta_4^{(2)} \ln X_{4i} + \beta_5^{(2)} X_{5i} + \varepsilon_i^{(2)} \quad (5)$$

$$\ln C_i = \delta_0^{(3)} + \alpha_1^{(3)} \ln A_i + \alpha_2^{(3)} \ln B_i + \beta_2^{(3)} X_{2i} + \beta_4^{(3)} \ln X_{4i} + \beta_5^{(3)} X_{5i} + \beta_6^{(3)} \ln X_{6i} + \varepsilon_i^{(3)} \quad (6)$$

where:

A_i – the level of market saturation,
B_i – dynamics of growth of the Gompertz curve at the inflection point,
C_i – inflection point of the Gompertz curve,
X_{1i} – population (in 10,000),
X_{2i} – urbanisation index,
X_{3i} – average salary in PLN,
X_{4i} – the number of university graduates per 10,000 population,
X_{5i} – percentage of the population with a PC with Internet access,
X_{6i} – voivodeship *per capita* income in PLN.

By logging the variables (except for the indicators expressed as a percentage – X_{2i} and X_{5i}) in equations (4)–(5), a better fit of the model to the data is obtained, and the parameters can be interpreted as elasticities. Three stage least square (3SLS) was used to estimate the parameters in this multi-equation model (Greene, 2007; Liu *et al*., 2014). This method is more efficient than the two stage least square (2SLS) method and permits better associations between the error components in each model equation, reducing their potential impact (Zellner, 1962; Greene, 2007). The multi-equation model uses cross-sectional data, with the values of the variables A_i, B_i, C_i for each voivodeship coming from the Gomertz model, and the values of the remaining variables X_{1i}–X_{6i} were adopted from 2022. Model estimations were carried out using Statistica and Gretl computer programmes.

4. Empirical Results and Discussion

The results of the estimation of the parameters of the Gompertz model describing the diffusion of mobile technologies in individual Polish voivodeships are presented in Table 1. They show that the time needed to reach the highest point of market penetration differs between voivodeships. It is much longer in voivodeships with a large number of inhabitants and ones that are quite highly urbanised, such as Mazowieckie (approx. 4 years and 6 months) and Śląskie (approx. 3 years and 6 months). On the other hand, the shortest waiting time for the maximum market penetration point was recorded in the following voivodeships: Warmińsko-mazurskie (approx. 1 year and 3 months) and Świętokrzyskie (approx. 1 year and 8 months), i.e., in voivodeships with a smaller population and less urbanisation. On the other hand, the highest diffusion dynamics at the inflection point were recorded in voivodeships with a short waiting time for the maximum diffusion growth rate (Warmińsko-mazurskie and Świętokrzyskie), while the lowest diffusion growth dynamics were recorded in Śląskie and Małopolskie. A clear negative relationship can be observed between the inflection point value and the diffusion dynamics: The longer the waiting time needed to reach the highest point of market penetration, the weaker the diffusion dynamics in general, and vice versa.

The level of market saturation (parameter *A*) is strongly related to the number of voivodeship inhabitants, which seems natural – a larger number of inhabitants means potentially more consumers and users of smartphones and tablets. The largest size was recorded in the market of the Mazowieckie and Wielkopolskie voivodeships, while the smallest was recorded in the market of smartphones and tablets in the Opolskie and Świętokrzyskie voivodeships.

Table 1. Results of Estimates of the Gompertz Function for Polish Voivodeships

Voivodeship	*A*	*B*	*C*	R^2
Dolnośląskie	3,640.439**	0.376**	2.496	0.958
Kujawsko-pomorskie	2,782.084**	0.465	1.938**	0.791
Lubelskie	2,129.665	0.437**	1.684	0.748

Table 1 cnt'd

Voivodeship	*A*	*B*	*C*	R^2
Lubuskie	1,527.669**	0.314	2.319**	0.815
Łódzkie	3,098.298**	0.328	2.368	0.733
Małopolskie	5,496.270**	0.246**	3.481**	0.719
Mazowieckie	6,613.780	0.519	4.490	0.875
Opolskie	1,008.371	0.461**	1.743	0.887
Podkarpackie	2,714.680*	0.333**	2.891*	0.816
Podlaskie	1,656.184**	0.350**	2.448	0.771
Pomorskie	3,958.404	0.269**	3.180	0.799
Śląskie	5,443.453	0.270*	3.529	0.730
Świętokrzyskie	1,194.812	0.569**	1.670	0.715
Warmińsko-mazurskie	1,327.075**	0.596*	1.237**	0.956
Wielkopolskie	5,667.875**	0.340**	2.372	0.791
Zachodniopomorskie	1,838.693**	0.462**	2.403**	0.967

The significance levels of 0.01, 0.05 and 0.1 are marked respectively with ***, ** and *.
Source: the author's own calculations.

Figure 1 presents Gompertz curves fitted to individual voivodeships.

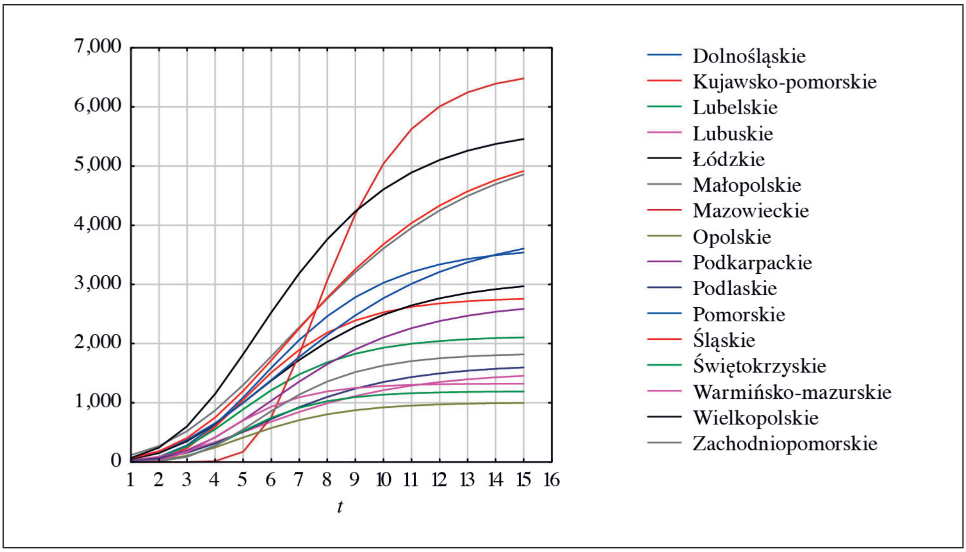

Fig. 1. Gompertz Curve for Polish Voivodeships
Source: the author, based on research results.

Descriptive statistics of socio-demographic variables X_{1i}–X_{6i} used in multi--equation are presented in Table 2.

Table 2. Descriptive Statistics of Socio-demographic Variables for Polish Voivodeships

Variable	Mean	Std. Dev.	Median	Max	Min
Population (in 10,000)	236.04	125.48	205.19	551.06	94.24
Urbanisation index	58.06	9.33	59.95	75.90	41.10
Average salary in PLN	6,286.70	576.22	6,076.93	7,913.14	5,662.53
Number of university graduates per 10,000 population	69.06	21.89	65.00	108.00	29.00
Percentage of the population with a PC with Internet access	73.49	3.57	73.85	78.60	66.60
Voivodeship *per capita* income in PLN	656.92	90.18	641.44	815.48	488.07

Source: the author's own calculations.

The results of the estimation of the model (1) presented in Table 3 were the basis for the estimation of the parameters of the equations of the multi-equation model with interdependent variables (4)–(6). The results of this estimate are presented in Table 3.

Table 3. Multi-equation Model Estimation Results (4–6) for Cross-sectional Data

Explanatory Variables	Dependent Variable		
	$\ln A_i$ (market saturation level)	$\ln B_i$ (diffusion growth rate)	$\ln C_i$ (inflection point)
const	–1.0099*	3.4927*	1.6636
$\ln A_i$	–	–0.3247*	–0.1736**
$\ln B_i$	–	–	–0.2749**
$\ln C_i$	0.2424**	–1.1297	–
$\ln X_{1i}$	0.7339***	–	–
X_{2i}	0.0060***	0.0051**	0.0038**
$\ln X_{3i}$	0.3231**	–	–
$\ln X_{4i}$	0.5170**	0.4433**	0.6803**
X_{5i}	0.0028*	–0.0045***	–0.0024***
$\ln X_{6i}$	–	–	–0.8793**

The significance levels of 0.01, 0.05 and 0.1 are marked respectively with ***, ** and *.

Source: the author's own calculations.

Table 3 shows the positive impact of population on the level of market saturation: 1% increase in population results in an increase in the level of market saturation with smartphones and tablets by about 7.4%, *ceteris paribus*.

Similarly, the urbanisation index has a positive and statistically significant impact on the size of the market (an increase in market size by approx. 0.6%, *ceteris paribus*, respectively, with an increase in the urbanisation index by 1).

The level of remuneration has also the positive impact on the size of the market. A 1% increase in wages implies an average increase in the size of the market by approx. 0.32%, *ceteris paribus*. The impact of the number of university graduates per 10,000 population on the size of the market is positive and statistically significant: an increase in market size by approx. 0.52%, *ceteris paribus*, respectively, with an increase in the number of graduates per 10,000 population by 1 percentage point). Also, the percentage of people with PCs is positively correlated with the level of market saturation, but this relationship is not statistically significant. Let's notice, that the time needed to reach the highest market penetration point (C_t) has a positive and significant impact on the size of the market.

The impact of the urbanisation index on the diffusion rate of mobile devices is positive and statistically significant. An increase in the urbanisation rate by 1, the diffusion rate increases by approx. 0.51%, *ceteris paribus*.

The education level also has a positive impact on the rate of changes in the diffusion of mobile technologies, with this relationship being significant at the level of 0.05: An increase in the number of university graduates per 10,000 population by 1 percentage point results in an increase in the diffusion rate by approx. 0.44%, *ceteris paribus*.

The variable *Percentage of people with a PC* has the negative impact on the dynamics of diffusion growth: The increasing share of people with their own computer slows down the diffusion rate. An increase in the percentage of people with a PC by 1 percentage point results in a decrease in the diffusion rate by 0.45%, *ceteris paribus*.

Market saturation (variable A_t) in the current period is the destimulant of the growth rate of diffusion of mobile technologies. An increase in market size by 1% results in a decrease in the diffusion rate of mobile technologies by approx. 0.32%, *ceteris paribus*. The *Inflection point* (C_t) variable had a negative and statistically insignificant effect on the rate of diffusion dynamics.

The degree of voivodeship urbanisation has a positive impact on the waiting time for the maximum market penetration point at the significance level of 0.05. An increase in the urbanisation rate by 1 results in an increase in the waiting time for the maximum market penetration point by approx. 0.24%, *ceteris paribus*. The level of education also has a positive effect on the inflection point of the Gompertz curve. The number of university graduates per 10,000 population increased by 1% causes an increase in the waiting time for the maximum market penetration point by approx. 0.68%, *ceteris paribus*.

The percentage of people who have their own PC is a determinant of the waiting time for the maximum point of market penetration. Thus, the effect of strong market suction related to the desire to own a smartphone or tablet is shortened by a correspondingly high saturation of the market with computer equipment. An increase in the share of people with a PC by 1 percentage point results in a reduction of the waiting time for the highest market penetration point by an average of approx. 0.24%. The affluence of voivodeships turned out to be a destimulant of the inflection point of the Gompertz curve, i.e., it contributed to shortening the waiting time for the peak of the diffusion wave. An increase in the level of voivodeship income by 1% implies a reduction in the waiting time for the peak of diffusion by approx. 0.88%, *ceteris paribus*.

The influence of the level of market saturation (variable A_t) and the rate of increase in diffusion (variable B_t) have a negative effect on the inflection point of the Gompertz curve.

A 1% increase in the level of market saturation results in a reduction in the time required for the peak of the diffusion wave by approx. 0.17%, and the same growth of the diffusion rate results in a reduction of this time by approx. 0.27%, *ceteris paribus*, respectively.

5. Conclusions

The results presented in this article allow for the conclusion that Gompertz growth curve models are effective tools in mapping the rate and magnitude of diffusion of mobile technologies. This is also confirmed by the results obtained by various authors, in which the Gompertz model was compared with other models in the context of describing the process of innovation diffusion (Liu *et al*., 2014; Spaho & Kraja, 2019; Dhakal & Lim, 2020; Jha & Saha, 2020; Lartey, 2020; Singh & Singh, 2023).

Multi-equation models, on the other hand, made it possible to determine the directions and strength of the impact of various socio-demographic variables (taking into account their feedback loops) on the characteristics of the diffusion process of mobile innovations. Thanks to these models, it was possible to identify important determinants of the parameters of the Gompertz model, such as population size, degree of urbanisation of regions, level of education of residents, households equipped with computer equipment, and others.

The research has shown that the faster mobile technologies spread, the more dynamic the process generally becomes. The saturation of the market with modern computer hardware weakens the growth dynamics of mobile technologies in the current period, but historical levels of market saturation usually do not significantly affect the values of the Gompertz function at the inflection point. The level of education of the society and its digitisation are potentially significant determinants of the dynamics of diffusion of mobile technology innovations. More educated populations generally had shifted inflection points, and thus the waiting time for the peak of the wave of diffusion of mobile technologies was generally longer. A similar nature of the influence of factors related to the level of education on Internet technologies can be found in the study of other authors (Prince & Simon, 2009). Also Singh and Singh (2023) and Liu *et al*. (2014) showed that the level of education stimulates the diffusion process of mobile technologies based on mobile telephony.

Knowing the phase cycle of the innovation diffusion pattern can support planning for the launch of high-tech products in a coordinated manner, so that the peak of the market penetration process occurs at the desired moment from the point of view of the company's strategy. The research approach presented in this article can be useful for company managers in planning strategies for the introduction of new products and services. Future research in this area should include modelling using other growth curves, as well as broadening the range of socio-demographic factors that may influence the diffusion of mobile technologies. The research results presented in this article have their limitations, which determine the next stages of research. In the future research, other diffusion models based on the S-shaped diffusion curve should be used (logistic model, Bass model and others), which will allow comparing these models and selecting the best one. Moreover, subsequent research may attempt to expand the list of explanatory variables, which may include important determinants of innovation diffusion. In the longer term, it also seems justified to conduct periodic surveys on a sufficiently large sample of mobile technology recipients. However, collecting the data necessary to analyse the diffusion process in this way will require repeating the survey over a period of at least several or a dozen years.

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Conflict of Interest

The author declares no conflict of interest.

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