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Analysis of the Dynamics of the Internet Use by Persons with Disabilities in Poland over the Decade 2003–2013 in the Context of Their Socio-Demographic Characteristics

Abstract: The aim of this article is to present changes in the scale and functionality of internet use by persons with disabilities in Poland over the course of a decade (2003–2013). In the first analytical step, the growth in internet use by disabled persons is presented in connection with the basic variables of their socio-demographic profiles. While demonstrating the stable pattern of influence of socio-demographic traits on internet use by disabled persons over time, an attempt has been made to verify the thesis that the side of the digital divide on which a disabled person will be situated is not determined by the sole fact of having a disability but is rather a derivative of the person's social status. As the second half of the article attempts to show, social status for this category of user also determines the level of the internet's functionality (the number of activities performed on the internet and the amount of time devoted to their performance). Empirical analyses were based on data from successive editions of the Social Diagnosis research.

Keywords: disability, internet, digital divide, Social Diagnosis.

Digital and Social Exclusion—Critical Factors

Along with changing the nature of social relations,[1] the internet is increasingly shaping all areas of daily life: economics, politics, culture, and science.[2] The internet is becoming an emanation of social networks—a reflection of the existing nodes (social actors and the resources at their disposition) and the connections between them (Martino and Spoto 2006). This simple analogy should not, however, lead to interpretation of the above-mentioned connections in the spirit of technological determinism. It is important to perceive that the

[1] Among the processes on which the internet has clearly put its mark, particular attention should be paid to human communications—with the spread of ICT, the number of persons who maintain interpersonal relations online is continually growing, transforming the present manners of communicating. This subject has been extensively discussed by many authors (cf., among others: Peter, Valkenburg 2006; Katz 2008; Kraut et al. 2006, Petrič, Petrovčič, Vehovar 2011).

[2] The universal and global influence of ICT is shown, among other matters, by the nature of indicators taken into account in producing the *Networked Readiness Index*, which determines a given country's place in a ranking of technological development. These are: 1) the political, legal, business, and innovation environment, 2) the quality of infrastructure, its accessibility, and the ability to make use of it, 3) the scale of technology use by individual, economic, and government entities, 4) the influence of ICT solutions on the economic and social sphere (see Dutta, Geiger, Lanvin 2015).

potential of technology does not always go in tandem with social potential. The essence of the fast growth of technological systems is their innovativeness and thus their orientation toward the future. In social systems, beside elements of motion, stabilizing mechanisms of inertia or conservation are also operating; surmounting them requires an effort of adaptation and the passing of psychological barriers (Zacher 2007: 164–165). In this sense, technology is not 'socially reflexive'; it does not allow the balance of future gains or losses consequent upon its use to be unambiguously estimated. Its functionality and usefulness depend mainly on the intention and potential (the resources, skills, and needs) of those who use it.

For more than half a decade researchers engaged in studying the role of information and communications technology (ICT) in contemporary societies have been struggling to identify the factors that are critical in determining use or non-use of the internet. Initially, the digital divide was analyzed in terms of physical access to the internet, differentiating society into the connected and the unconnected (Castells 2003). The process by which ICT tools proliferated on an increasing scale caused the first analytical assumptions about the digital divide to lose meaning and to be replaced ever more often by the notion of 'digital inequality', which refers to different forms of using the internet and the related consequences (DiMaggio, Hargittai, Celeste, Shafer 2004). Thus location on the side of the digitally privileged or underprivileged was supposed to be determined not by access to new information technology itself but by the ability to use it effectively. Lack of this skill determined an individual's digital—and thus social—exclusion (the problem of digital exclusion has been analyzed in depth by many authors—cf., for example, Castells 2003, Fink, Kenny 2003, Kleiman 2005, Warschauer 2002, Norris 2000, Dobransky, Hargittai 2006, DiMaggio, Hargittai, Celeste, Shafer 2004). With time, the critical factor for use or non-use of the internet came to be seen primarily as a matter of social characteristics (cf. Selwyn, Gorard, Furlong 2005: 7). In other words, the view came to predominate that the functions and aims for which the internet is or is not used by individuals are not exclusively or even mainly related to technical parameters but primarily to social factors. The influence of these factors can be observed on two levels. The first is connected with the location of the individual in the social structure—access to the internet and use of this medium is linked to socio-demographic traits such as age, income, gender, or education, which determine digital inclusion or exclusion. Then, in the individual dimension, the internet is not the same tool, used for uniform aims, for all its users. On the contrary, depending on the above-mentioned traits, various persons use it in entirely different manners and to achieve quite different effects: 'the internet is not a monolithic medium, but rather is a range of practices, software and hardware technologies, modes of representation and interaction that may or may not be interrelated by participants, machines or programs' (Miller, Slater 2000: 14). The complicated structure of factors responsible for shaping digital inequality makes clear that one distinctly marked borderline between the beneficiaries of development and those who are excluded from it does not exist, but rather we are dealing with many crossing divisions, as 'cyberspace' contains no fewer structuring factors than the real world beyond it (Graham 2011).

From this viewpoint it would seem justified, in conducting research, to turn from narrow indicators of 'access' and 'use' to diagnosing the parameters describing the social and individual specificity of a person's daily presence or non-presence in the online environ-

ment (cf. Anderson, Tracey 2001). The phenomenon of using (or not using) the internet is thus best explained by categories of social stratification (determined by socio-demographic traits) on the one hand and individual conditions on the other. Such a perspective has been adopted in the analysis below. It has been applied to the particular social category of persons with disabilities. In their case, the potential of the internet to provide multidimensional social activation could mean a significant improvement in various aspects of their quality of life—daily activities necessary for independent functioning, occupational activity, education, participation in culture and politics or social relations, to name a few of the most important[3]—on the condition, however, that they are users. This in turn depends in large measure on a disabled person's initial capital, understood as the general knowledge he or she brings to the internet in the form of skills and ability, which in addition to technical knowledge is the key factor influencing the choice and manner of using a medium such as the internet to achieve aims (DiMaggio, Hargittai, Celeste Shafer 2004: 10–12). In the case of disabled persons this initial capital is not usually large, as a consequence of their socio-economic situation. These are people who statistically have lower levels of education and higher levels of vocational inactivity than the general population (Jaeger 2012: 27), and in addition are older. Internet users, on the other hand, are predominantly educated (and consequently higher in economic status), young, and employed (DiMaggio, Hargittai, Celeste, Shafer 2004: 9–10, Jaeger 2012: 28). In this case, the knowledge and ability connected with social status plays a key role in the formation (or reproduction) of inequalities among internet users. The nature of internet users comprises above all: 1) higher communication skill, thanks to which information accessible on the internet can effectively be acquired, 2) larger prior knowledge, enabling the apt appraisal of the usefulness of the information available, 3) wider social networks (relevant social contacts), which members use for support and for sharing the resources in their possession, and 4) greater tendency to search for information (selective use, acceptance, and storage of information) (Bonfadelli 2002). A deficit in any of the aspects listed above increases the likelihood of social and digital exclusion, which in the case of disabled persons is also immanently connected with their disability. There is one more factor that has an important impact—the lack of accessibility and usability, for disabled persons, of websites. The adaptation of websites to the abilities of disabled persons remains at a low level in Poland. The majority of sites are not planned with a thought for users whose cognitive, motor, or sensory abilities are limited. This is the case even though the obligation to treat all citizens equally—persons with disabilities as well—is set forth in numerous legal regulations, including those concerning basic rights contained in the Constitution of the Republic of Poland, which state that everyone has the right to access documents concerning himself and to acquire information, and that no one can be discriminated against in public, social, or economic life

[3] In Poland in recent years the question of the possibility and scale of a multi-scale activization of persons with disabilities through the use of new media is being better explored. Particular analyses devoted to the role of the internet in various spheres of life for persons with disabilities can be found in many articles and other works. The significance of internet technology in the psychological, social, and occupational integration and rehabilitation of persons with disabilities has been extensively presented in the following publications, among others: Ślusarczyk 2009a, Grześkowiak 2010, Ślusarczyk 2009b, Burczyc 2015, Stojkow, Żuchowska 2014, or Masłyk, Migaczewska 2014. Questions connected with the potential of the internet to improve the quality of life for persons with specific types of disabilities is discussed in studies of Walter 2012, or Plichta 2012.

for any reason, and that disabled persons have the right to assistance (cf. Dejnaka 2012: 42, Królewski et al. 2014: 362). These obligations are also set forth in the Charter of Persons with Disabilities, in which the right of disabled persons to live in an environment free of functional barriers, including access to information and human communication, is emphasized. The question of accessibility is also regulated in numerous acts intended to improve the accessibility of public websites for persons with disabilities (Królewski et al. 2014: 362).

At the same time, in practice, the degree to which websites have been adapted in accord with the recommended technological solutions to improve general accessibility for disabled persons is very low, as research has shown (cf. Dziwisz, Witek 2013, Marcinkowski, Luboń 2015, Królewski 2013). Analyses of public administration and NGO websites in particular have revealed that the majority are not adapted for use by the disabled. They are characterized by a 'lack of visual cohesion; the great majority do not offer a mobile version or adequate information about the site's privacy policy; they do not ensure adequate technical facilities and in consequence do not provide a positive user experience. Even sites addressed directly to persons with disabilities are not designed so that these people can read them without problem and make full use of them'[4] (Królewski et al., 2014: 365).

In order to change this situation, a comprehensive approach to the problem of accessibility for people with various kinds of disabilities is necessary: the blind, the hearing impaired, persons with impaired limbs, and persons with mental disorders. Improvements that would increase accessibility for these users, in accord with the guidelines in specifications such as WCAG 2.0[5] should be implemented to enable the internet to become a space truly without barriers (through fulfilment of the series of other conditions discussed above). For the moment, however, we are dealing with the digital—and in consequence, social—exclusion of persons with disabilities (cf. Dejnaka 2012: 39–41). This phenomenon and its growth over the past decade, as well as its diversification within the group of disabled persons, are illustrated by the data analyzed below, showing the proportion of persons with disabilities among internet users, the extent of their internet use, and the forms of online activity they undertake in the context of their socio-demographic characteristics.

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[4] Findings based on research into the accessibility of public administration and NGO websites using so-called heuristic analysis and expert analysis enabling verification and evaluation of the accordance of those websites with the generally applied and recommended technological solutions improving accessibility in the broad sense. In the analyses, attention was drawn to the technological capacities necessary for proper reception of online content—including for persons with disabilities—in the websites studied, which were evaluated using Jacob Nielsen's usability heuristics (1995). The elements evaluated involved information architecture, usability, interface ergonomics, user experience, and accessibility. For the purpose of verification and due to the need to acquire additional data, the Utilia.pl instrument was used. Evaluation of the sites was also constructed on the basis of the recommendations of international organizations, such as the advisory group Web Accessibility Initiative (WAI) and the documents WCAG 2.9, W3C, Section 508, and EU legal requirements and documents. The research was conducted within the framework of the project 'From Comprehensive Diagnosis of the Situation of Persons with Disabilities in Poland to a New Model of Social Policy for Persons with Disabilities' within the module 'Disabilities and Persons with Disabilities in the New Media' (http://polscyniepelnosprawni.agh.edu.pl/publikacje).

[5] The WCAG 2.0 specifications (Web Content Accessibility Guidelines, version 2.0) are principles concerning the design of websites adapted to the requirements of persons with disabilities (cf. Zadrożny 2014).

Data and Methodological Premises

The main aim of the analysis has been to describe the nature and scale of changes in internet use by disabled persons in Poland on the basis of data from the Social Diagnosis: Conditions and Quality of Life of Poles (Social Monitoring Council 2013).[6] To achieve this goal, data from the Social Diagnosis, collected over the course of the decade 2003–2013 in biennial cycles (2003, 2005, 2007, 2009, 2011, 2013) was used.

At the first stage of analysis, two perspectives were considered. In one, the dynamic of change occurring within categories of basic socio-demographic traits—such as gender, age, education, income, size of place of residence, and socio-occupational status—of persons with disabilities was described. This made it possible to distinguish between disabled users of the internet in terms of their socio-demographic profiles as well as to show specific change within each category. It was then determined which of the variables had a real impact on internet use by persons with disabilities, and how the nature of the relations changed in the last decade.

At the second stage of analysis an attempt was made to define the level of functionality of the internet for persons with disabilities (the category used as a reference point was that of persons without disabilities), operationalizing it in relation to the nature and number of activities performed by its means. Here too disproportions between the popularity of specific activities at successive points of time are described and the rate of change recorded over time is presented.

The general thesis verified at each stage of analysis was that as the internet has spread it has become an increasingly egalitarian tool, including for persons with disabilities, although its use is still conditioned by skills and needs which are strongly connected with social status, situating representatives of this social category on either side of the digital divide.

Persons with Disabilities using the Internet—the Dynamics of Change

The internet is an element of our daily lives and while this statement is a truism in general an endeavour to understand that ordinariness supported by new technologies becomes complex, and the results of such conceptual (what it is) or operational (how it is studied) attempts will indubitably be far from straightforward. The fact is that the rate of social absorption of ICT has become so great that premises about its egalitarian nature are defended by the force of statistics. The periodic reports of the World Economic Forum announce that in certain societies of the West the proportion of individual internet users approaches 100%. This is the situation in Iceland (96.5%), Norway (95.1%), Sweden (94.8%), Denmark (94.6%), The Netherlands (94%), Luxembourg (93.8%), or Finland (91.5%) (Dutta, Geiger, Lanvin 2015). In many other regions of the world the relation of users to non-users of the

[6] The Social Diagnosis is a representative nationwide panel study initiated in 2000 by the Social Monitoring Council. It studies both households in Poland and inhabitants over 16 years of age. It places respondents in categories of persons with disabilities on the basis of two criteria: legal (certification by a medical commission) and biological (declaration of a disability or chronic illness limiting the ability to perform basic life activities).

internet is more equal, which means that in relation to those places it is still possible to consider the phenomenon of a digital divide in its most basic sense of 'accessibility'. As the report above relates, in 2013 in Poland 62.8% of persons were internet users, and thus every third inhabitant of the country was a non-user.

Persons with disabilities form a category of increased risk of social exclusion, including in the technological field. This is confirmed by data of the Social Diagnosis: while 67% of non-disabled participants were internet users in 2013, there were two times fewer internet users among the disabled (32.9%). Over the course of the last decade, along with the development of new technologies and their growing accessibility and usefulness, the proportion of persons with disabilities who are internet users has systematically grown. In 2003, when the Social Diagnosis research estimated the scale of internet use in Poland for the first time, this percentage was scarcely 4.9%. The rate of change between these two points of time was relatively high. In the biennial cycle, the average growth in the percentage of persons with disabilities using the internet was 46%. In other words, their share in the category of persons making use of this medium between the years 2003 and 2013 increased on average by nearly half every two years. The numbers are presented in Table 1.

The table also presents the change in the percentage of disabled persons who use the internet within specific categories of socio-demographic variables. Here only a few characteristic relations will be noted. First, persons from various categories of socio-demographic variables differed considerably in number terms at the starting point (if we consider 2003 to be such). In certain cases these disproportions were major. Second, regardless of the initial proportion of a given category of persons among internet users, there was growth over the course of the decade. Thirdly, the recorded dynamic or rate of change (increase of users) differed among disabled persons in individual categories of the variables analyzed.

In 2003 gender was the trait that fairly significantly differentiated internet users. With a generally low percentage of disabled persons using the internet (4.9%), the share of women in this category (3.9%) was considerably smaller than of men (6%). With the passage of years increasingly more disabled women as well as men began to make use of the internet, although in the case of women, the rate of change was greater—every two years there was a 51% increase in internet users, while in the biennial cycle the average growth in the percentage of male internet users was 43%. Thus in 2013 the disproportion between the sexes was much less than ten years earlier; men still predominated (35.3%) over women (30.6%), but the difference was not as large.

The largest differences noted, if all the variables are taken into account, are between the numbers of disabled internet users in various age categories. In 2003, every second person in the 16–24-year-old cohort was in the user category, while older persons (65+) comprised scarcely 0.5% of the user category. Generally it can be observed that the older the age group the lower its share in the group of internet users. Nevertheless, with the passage of time, these initial differences have begun to diminish. The share in internet society of the youngest persons with disabilities increased on average by 11% (in the biennial cycle) and among seniors by 79%. This model of change can also be seen among representatives of other age categories—the older the group the larger the average increase in persons declaring themselves to be internet users. For persons in the 56–65 cohort, the rate of change was

Table 1

Persons with Disabilities Using the Internet in the Years 2003–2013, in Terms of Their Basic Socio-demographic Traits

Socio-demographic traits		Internet users [%]						Average growth 2003–2013
		2003	2005	2007	2009	2011	2013	
Total		4.9	9.0	11.2	19.9	27.3	32.9	1.46
Gender	Women	3.9	6.5	8.9	16.0	26.1	30.6	1.51
	Men	6.0	11.7	13.6	24.1	28.5	35.3	1.43
Age	16–24	50.0	55.3	54.0	79.9	81.8	86.0	1.11
	25–34	24.6	32.6	33.3	51.0	70.1	71.2	1.24
	35–44	8.0	17.1	16.8	40.6	56.5	71.1	1.55
	45–55	4.4	10.1	17.4	25.7	37.8	43.3	1.58
	56–65	2.1	5.8	7.7	15.0	24.4	29.1	1.69
	Over 65	0.5	1.4	2.2	4.4	7.9	9.1	1.79
Education	Elementary or lower	1.5	1.4	1.3	3.7	7.3	8.0	1.40
	Middle school or vocational	2.6	6.7	11.8	22.2	27.5	31.6	1.65
	Secondary	8.7	17.2	20.9	29.1	40.7	46.8	1.40
	Post-secondary/higher	22.3	32.5	35.7	48.2	58.9	69.4	1.25
Income	Below the 1st quartile	1.8	6.6	8.7	13.7	18.8	23.3	1.67
	1st–2nd quartile	3.7	4.5	7.7	14.5	20.4	25.3	1.47
	2nd–3rd quartile	5.1	9.4	9.1	23.3	32.9	42.1	1.53
	Above the 3rd quartile	7.7	16.1	20.8	39.1	45.0	50.2	1.45
Place of residence	City with over 500,000 inhabitants	12.8	25.6	23.7	25.9	36.7	45.0	1.29
	Town with 200,000–500,000 inhabitants	7.9	12.5	18.9	31.8	36.2	38.3	1.37
	Town with 100,000–200,000 inhabitants	5.5	19.5	13.9	28.4	38.0	51.6	1.56
	Town of 20,000–100,000	7.2	8.5	12.9	21.4	35.2	38.2	1.40
	Town of less than 20,000	3.6	12.8	11.9	22.6	27.8	34.4	1.57
	Countryside	1.8	2.9	6.1	11.4	18.0	19.8	1.62
Socio-occupational status	Public sector employees	25.9	53.3	58.6	57.0	75.5	84.2	1.27
	Private sector employees	22.2	40.6	40.0	53.1	56.5	69.1	1.25
	Private entrepreneurs	28.6	66.7	58.3	75.0	78.3	65.2	1.18
	Farmers	0.0	0.0	23.5	13.6	33.3	38.1	1.17
	Disability pensioners	2.9	7.0	9.6	16.8	24.3	27.5	1.57
	Retirees	0.6	3.0	3.5	8.8	14.6	15.9	1.93
	Students	71.4	56.3	70.0	89.6	91.4	95.0	1.06
	Unemployed persons	12.5	22.2	16.3	34.7	52.3	62.2	1.38
	Other vocationally inactive persons	3.6	8.8	11.3	24.1	37.0	27.8	1.51

Note: average growth was estimated based on a geometric mean, using chain indices according to the model:

$$\overline{x_g} = \sqrt[n-1]{\frac{x_2}{x_1} \times \frac{x_3}{x_2} \times \ldots \frac{x_n}{x_{n-1}}}$$

where $x_1 \ldots x_n$ is the percentage of internet users in successive editions of the study, and n is the number of studies.

Source: own work on the basis of the Social Diagnosis 2003–2013.

69%, for those 45–55 years of age, 58%, for persons of 35–44 years of age, 55%, and for persons 25–34 years of age, 24%.

Education, like age, is an important trait affecting the degree of interest of disabled persons in internet use. In 2003, the percentage of persons with an elementary education or lower who made use of the internet was barely 1.5%, while at the same time the percentage of the best educated internet users (with a post-secondary or higher education) was 15 times higher and amounted to 22.3%. In comparison, the share of the remaining categories of education was relatively low: 2.6% for persons with a middle school or vocational education and 8.7% for persons with a secondary education. Over the course of the decade these percentages increased—the greatest growth was recorded among persons with a middle school or vocational education (65% every two years). A similar rate of change (40%) was recorded within two categories of education: elementary or lower and secondary. The numbers of the best educated internet users increased at the rate of 25% in the biennial cycle. Although the ranks of less educated persons with disabilities increased relatively more rapidly, in 2013 the difference between them and the best educated was still considerable. The best educated persons were 8 times more likely to be internet users than persons who finished their education at the elementary level or below (8%).

Income, which together with education determines an individual's socio-economic status, is also an important variable differentiating the share of particular categories of disabled persons in the online community. In 2003, among the best earning persons (average income above the third quartile) 7.7% were internet users, while among the lowest earning persons with disabilities (average income below the 1st quartile) only 1.8% were internet users. In the two middle categories this tendency was also reflected in the data—the higher an individual's earnings, the more often that person made use of internet technology. Over the course of 10 years the most rapid rate of growth was noted, however, among the lowest earning (67% every two years). It was higher in comparison with the two middle categories of income (47% for incomes in the 1st–2nd quartile and 53% for income in the 2nd–3rd quartile), and the highest category of income (45%). Nevertheless, as in the case of education or age, here too the greater rate of change occurring in the last decade was unable to overcome the large initial difference. In 2013 there were two times more best earning disabled persons who were internet users (50.2%) than least earning (23.3%).

The differences in internet use by persons with disabilities also appear in relation to the size of the place of residence. In general, people living in towns (regardless of their size) have a fairly large advantage over the countryside. In 2003 in the largest towns (population over 500,000) 12.8% of persons with disabilities declared that they use the internet, while in the countryside only 1.8% did. Changes in the countryside, in comparison to the city, were marked by a quicker tempo though. Every two years the percentage of rural inhabitants who use the internet increased by 62%. A fairly high rate of change (57%) was noted also in the smallest towns (below 20,000 inhabitants) and in towns of 100,000 to 200,000 inhabitants (56%). In the remaining towns the rate of change was relatively lower.

Diverse socio-occupational statuses, which are connected with education and income, also reflected disproportions in the scale of internet use among persons with disabilities. In 2003 there was a decided numerical preponderance of secondary and higher learning students making use of the internet (71.4%) over persons who were vocationally active—

private entrepreneurs (28.6%), public sector employees (25.9%), private sector employees (22.2%)—or vocationally inactive: retirees (0.6%), persons receiving disability pensions (2.9%), the unemployed (12.5%), and others (3.6%). In the 2003 study no member of the group of farmers was found who claimed to use the internet. In this case as well, the greatest average growth in users over the course of 10 years concerned those who had the largest deficit at the starting point. For example, the share of retirees among internet users increased every two years by nearly double (93%). A fairly high rate of change was also noted among disability pensioners (57%), other vocationally inactive persons (51%), and the unemployed (38%). The percentage of vocationally active persons also increased successively, from 18% among private entrepreneurs to 27% among public sector employees. On account of the large initial share of internet users among students, the rate of change in their case was relatively small (6%).

The data enables two characteristic tendencies to be observed—among disabled persons use of the internet is connected with social position, which is dependent on education, income, and occupational status, as well as with age and place of residence (rural or urban). On the other hand, with the passage of time these differences have decreased—ever more people who were in the digitally excluded group a decade ago are today inclined to make use of the solutions offered by the internet and accessory technology. By becoming a natural (and increasingly essential) element of daily activity the internet is in this sense equalizing society and in the process members of those categories (such as persons with disabilities) who were relatively far behind at the starting point are participating ever more generally.

Two Sides of the Digital Divide—the Socio-demographic Profile of Persons with Disabilities who use the Internet

Analysis of the disproportion observed within individual socio-demographic variables makes it possible to give a general answer to the question of what determines on which side of the digital divide a given person with disabilities will be found. It is not possible, however, to decide which variables have an important impact on being an internet user and which act indirectly through other variables.

Another question requiring analysis is to what degree the key socio-demographic variables determine belonging to the group of internet users, or in other words, how strongly use of the internet is conditioned by a disabled person's position in the social structure.

The last question concerns whether the pattern of relation between internet use by persons with disabilities and their socio-demographic profile has changed over the course of the last years and if so how. In trying to resolve this issue, a logistic regression model was used (identical for all six points in time) in which the dependent variable was a binary-coded answer to a question about internet use and the independent variables were previously categorized socio-demographic variables. The logistic regression made it possible to estimate the chance of an occurrence (here, use of the internet) for a given category of the independent variable (controlling for the influence of the remaining variables) in regard to the reference category of that variable. Thus for example if within the variable of the gender category the reference is a woman, the model makes it possible to indicate whether

in comparison to her a man is more or less likely (and by how much) to use the internet, with additional control of the indirect influence of other variables (the net effect).

In the proposed model, taking into account all the variables, the reference category was a 16–24-year-old woman with an elementary education or lower, with income below the 1st quartile, residing in the countryside, and working in the public sector (Table 2).

The first thing worth noting is the large predictive force of the variables included in the model, recorded in all the years analyzed. The Nagelkerke R^2 value varies between 0.41 in 2007 to 0.53 in 2013. These sizes can be interpreted in such a manner that the traits comprised in the model half determine (from 41% to 53%) whether we are dealing with an internet user or non-user. This likelihood is obviously shaped by the interaction of other traits connected with abilities (if only financial ones), needs, or competences, but in light of the above findings it could be supposed that they will be derivative (and not a causal factor) of the position a disabled person occupies in the social structure.

A second conclusion that could be drawn on the basis of the findings indicates that the socio-demographic traits comprised in the model had a very similar influence on the likelihood that a disabled person would use the internet. In spite of the observed and above-described quantitative changes (the growth of internet users) within individual categories of socio-demographic variables, the majority still remain important predictors of internet use by persons with disabilities.

The sole variable where an essential influence was not noted in most of the years analyzed is gender. Only in 2009 was the likelihood of a disabled man using the internet larger (by nearly 60%) than for a woman. In the other years, in spite of the quantitative disproportion between men and women using the internet, gender was not an important predictor of its use.

In the case of age, the model of dependence in successive years is convergent—younger persons (16–24 years of age) are characterized in general by the highest likelihood of using the internet in comparison with the remaining age categories. The exceptions were the studies of 2003–2007 and 2011 in which the youngest persons did not differ in this respect in regard to 25–34-year-olds, and in 2011 and 2013 to 34–44-year-olds. The subtle differences in successive editions of the study do not conceal, however, the universal pattern in regard to the age of disabled persons—in each older age category the likelihood of internet use decreases more.

Education is also an important predictor of the likelihood of being active online, and over the course of recent years the diagram of dependence has been consistent. Generally, the higher education a disabled person has the higher the chance that that person will use the internet. Only in the years 2003–2005 did persons with elementary education or lower not differ from those who had a middle or vocational school education; in the following years the likelihood of internet use was significantly higher in the case of the latter (two times higher in 2011 to four times higher in 2007). The likelihood of internet use among persons with a middle school education, in comparison with the reference category, grew even more. It was four times higher in 2005 and as much as 12 times higher in 2007. Incontrovertibly, however, the greatest likelihood of internet use is to be found among persons with at least

Table 2

Influence of Socio-demographic Traits on Internet Use by Persons with Disabilities in the Years 2003–2013—Results Estimated by a Logistic Regression Model

Socio-demographic traits		Study					
		2003	2005	2007	2009	2011	2013
Gender	Men	ref.	ref.	ref.	ref.	ref.	Ref.
	Women	—	—	—	1.595	—	—
Age	16–24	ref.	ref.	ref.	ref.	ref.	Ref.
	25–34	—	—	—	0.191	—	0.344*
	35–44	0.033	0.092	0.118	0.144	—	—
	45–55	0.014	0.023	0.130	0.052	0.204	0.128
	56–65	0.005	0.010	0.045	0.019	0.089	0.061
	Over 65	0.002	0.001	0.017	0.004	0.018	0.010
Education	Elementary or lower	ref.	ref.	ref.	ref.	ref.	Ref.
	Middle or vocational school	—	—	4.072	3.388	1.960	2.380
	Secondary	6.684*	4.321*	12.311	7.007	4.792	7.521
	Post-secondary/higher	23.202	14.691	31.952	19.096	11.862	19.965
Income	Below the 1st quartile	ref.	ref.	ref.	ref.	ref.	Ref.
	1st–2nd quartile	4.598*	—	—	1.442*	—	—
	2nd–3rd quartile	5.382*	—	—	2.243	2.426	1.970
	Above the 3rd quartile	5.780*	2.794*	—	4.379	2.792	1.782
Place of residence	City with over 500,000 inhabitants	9.308	14.597	2.263	2.147	2.203	2.771
	City with 200,000–500,000 inhabitants	—	9.343	—	2.426	2.346	2.187
	Town with 100,000–200,000 inhabitants	—	14.417	—	2.204	2.540	3.659
	Town with 20,000–100,000 inhabitants	4.771*	—	1.850*	1.791	2.454	2.673
	Town with less than 20,000 inhabitants	—	—	—	2.180	1.783	2.573
	Countryside	ref.	ref.	ref.	ref.	ref.	ref.
Socio-occupational status	Public sector employees	ref.	ref.	ref.	ref.	ref.	ref.
	Private sector employees	—	—	—	—	—	—
	Private entrepreneurs	—	—	—	—	—	0.146
	Farmers	—	—	0.149*	0.136*	0.182	—
	Disability pensioners	—	0.138	0.224	—	0.361	0.310
	Retirees	—	0.126	0.202	—	0.364	0.316
	Students	—	—	—	—	—	—
	Unemployed persons	—	—	0.188*	—	—	—
	Other vocationally inactive persons	—	—	0.134	0.484*	0.423	0.157
Nagelkerke R^2		0.52	0.50	0.41	0.47	0.45	0.53

Note: * for $p < 0.05$, the remainder for $p < 0.01$ f

Source: Own work on the basis of the Social Diagnosis 2003–2013.

a post-secondary education. In comparison with the reference category, their likelihood of being internet users was almost 12 times greater in 2011 and as much as 32 times greater in 2007.

The influence of income was not noted solely in the year 2007. In the studies of this year the amount of individual net income did not differentiate persons in the four income divisions in terms of likelihood of internet use. Nevertheless, in the remaining years the greater or lesser influence of this variable was recorded. In 2003 and 2009 the lowest earning persons were characterized by significantly less likelihood of using the internet in comparison to persons in each of the succeeding income categories. In 2011 and 2013 persons in the lowest income category did not differ in regard to this likelihood from persons with incomes between the 1st and 2nd quartiles, but were less likely to be users than persons in the third and fourth income categories. Moreover, in 2005 persons earning the most had a significantly higher likelihood of being active online. Although in relation to income the same consistency is not observed as in the case of age or education, nevertheless this variable should be added to the collection of important predictors of internet use by disabled persons over the course of the last years.

Size of the place of residence also has an important influence on whether persons with disabilities become active online. In the model analyzed the reference category was inhabitants of the countryside, and their likelihood of using the internet was in each succeeding year lower than that of inhabitants of the largest towns—those with populations over 500,000 (from two times less in the years 2007–2011 to more than 13 times less in 2005). In the years 2009–2013 the fact of living in the countryside decreased the likelihood of using the internet in comparison with every other place of residence. In 2003 and 2007 inhabitants of the countryside did not differ in this regard from inhabitants of the smallest towns (to 20,000 inhabitants), medium-size towns (100,000–200,000 inhabitants), and large towns (200,000–500,000 inhabitants), while in 2005 the likelihood of being an internet user was the same for inhabitants of the small towns (20,000–100,000 inhabitants) and the smallest towns (to 20,000 inhabitants) as for inhabitants of the countryside. On the basis of the data, it can be concluded that the size of the place of residence does not (consistently) differentiate the likelihood of internet use among town dwellers, although there is a demarcation line between town and country.

The reference category for the variable of socio-occupational status was that of public sector employees. In successive years they did not differ in terms of internet use from private sector employees, students, or private entrepreneurs (in the case of the latter, the exception was 2013, in which the likelihood was significantly lower). In 2003 no difference was recorded between representatives of the various status categories, but in the following years the influence could be noted. The general conclusion that can be formed on the basis of the data presented indicates that vocationally or educationally active disabled persons belong significantly more often to the group of internet users than vocationally or educationally inactive persons. In the following years the diagram of dependence did not display an identical consistency, but overlooking specific differences, this finding is characterized by universality in reference to the entire decade. The exception to the division between the vocationally active and inactive was farmers, for whom the likelihood of internet use in comparison with the reference category was lower (in 2007–2011). In addition, a lesser likelihood of internet use characterized persons on disability pensions and retirees (in the years 2005–2007 and 2011–2013), the unemployed (2007), and other vocationally inactive persons (2007–2011).

Changes in the Functionality of the Internet for Disabled Users

The functionality of the internet should be seen through the prism of the number of activities that can be performed through its medium, which in a general sense fulfil a substitute or complementary role in regard to activities undertaken in the world outside the internet. The possibility of performing various forms of activity thanks to the internet is particularly important for disabled persons on account of their limitations. These limitations not infrequently create insurmountable barriers in the 'real' world but can be successfully managed online. The internet in this aspect could actually be an 'extension of man' (see McLuhan 1964), allowing persons to overcome their disabilities.

Which functions, and with what intensity, will be performed by internet users depends on their individual traits connected with various forms of capital: financial (the possibility of purchasing technology), human (skills and knowledge), or social (the extensiveness of the social network in which an individual functions). In this sense, social position can play a not insignificant role. It is the more important when we acknowledge that Polish internet users with disabilities, in spite of a certain status advantage over disabled persons who do not use the internet, are still less likely to be users than persons without disabilities. This observation is illustrated by the data presented in Table 3, derived from the study of 2013.

The major difference between disabled and non-disabled internet users is visible in four major traits: age, education, income, and socio-occupational status.

There are fewer disabled persons using the internet than non-disabled users in the three youngest age categories (between 16 and 44 years of age) by nearly 10%, but they predominate in the oldest categories (from 5.9% among 45–55-year-olds to 17.5% among 56–65-year-olds).

A major difference can also be observed in the case of education. Here internet users with disabilities come out worse. There are significantly more non-disabled persons who have a post-secondary education or higher and are internet users than similarly educated persons with disabilities who are internet users (by 9.7%). At the remaining levels of education, persons with disabilities dominate, particularly in the category of elementary education or less (4%) and middle school or vocational education (5.2%).

The largest income disproportion concerns the best earning persons. There are as many as 22.6% fewer disabled internet users with income above the 3rd quartile as non-disabled internet users in that category. Similarly the second highest income category of internet users (the 2nd–3rd quartile) is dominated by non-disabled persons, although here the disproportion is no longer as large (1.2%). A considerable preponderance of disabled persons who use the internet is revealed among those whose income does not exceed the 1st quartile (19.3%) and those whose income is between the 1st and 2nd quartile (4.4%). What produces these differences? Doubtless socio-occupational status has considerable significance here. Non-disabled internet users more often remain vocationally or educationally active: they have the advantage among public sector employees (7.7%), private sector employees (17%), private entrepreneurs (5.3%), farmers (3%), and students (6.3%). On the other hand, the disabled dominate among pensioners (29.5%) and retirees (10.7%). The differences in both categories between the unemployed and other vocationally inactive persons are relatively small.

Table 3

Socio-demographic Traits of Internet Users With Disabilities in Comparison to Users Without Disabilities [in %]

Socio-demographic traits		Persons with disabilities	Persons without disabilities	Difference
Gender	Woman	47.5	51.1	–3.6
	Man	52.5	48.9	3.6
Age	16–24	11.1	21.3	–10.2
	25–34	16.9	28.1	–11.2
	35–44	13.6	22.6	–9.0
	45–55	22.3	16.4	5.9
	56–65	26.5	9.0	17.5
	Over 65	9.6	2.6	7.0
Education	Elementary or below	7.2	3.2	4.0
	Middle or vocational school	32.1	26.9	5.2
	Secondary	36.8	36.4	0.4
	Post-secondary/higher	23.9	33.6	–9.7
Income	Below the 1st quartile	32.9	13.6	19.3
	1st–2nd quartiles	19.1	14.7	4.4
	2nd–3rd quartiles	31.9	33.1	–1.2
	Above the 3rd quartile	16.1	38.7	–22.6
Place of residence	City with more than 500,000 inhabitants	13.7	15.3	–1.6
	City with 200,000–500,000 inhabitants	11.3	11.0	0.3
	Town with 100,000–200,000 inhabitants	12.1	8.4	3.7
	Town with 20,000–100,000 inhabitants	27.8	19.7	8.1
	Town below 20,000 inhabitants	13.8	11.7	2.1
	Countryside	21.3	34.0	–12.7
Socio-occupational status	Public sector employees	10.7	18.4	–7.7
	Private sector employees	18.1	35.1	–17.0
	Private entrepreneurs	1.4	6.7	–5.3
	Farmers	0.8	3.8	–3.0
	Disability pensioners	30.6	1.1	29.5
	Retirees	17.2	6.5	10.7
	Students	7.2	13.5	–6.3
	Unemployed	8.0	8.1	–0.1
	Other vocationally inactive persons	6.0	6.7	–0.7

Source: own work on the basis of the Social Diagnosis 2013.

Differentiation within groups of socio-economic status is doubtless an important factor influencing the kind of needs fulfilled through internet use. Let us therefore try to look at the popularity of various internet functions among disabled and non-disabled users and how interest has changed over the years for representatives of these two groups. In concentrating on recipients of internet services (the demand side) it should also be remembered that change is affected by the supply side (innovators and initiators), on which the accessibility and usability of the solutions offered to internet users depends and which in the case of disabled persons plays a not small role, as has already been mentioned.

In the data, one indicator of the growing functionality of the internet is the number of activities presented to respondents in individual editions of the study. While in 2003 the questionnaire took account of 12 different kinds of activity, in 2013 there were already 26. The popularity—and change in popularity—of specific activities is defined by considering two points in time: the edition of the study in which a given activity was listed for the first time and the edition in which it was last included. In the end, the analysis took 25 activities[7] into account (Table 4).

Several conclusions can be reached by analyzing the data illustrating the percentage of disabled and non-disabled persons performing a given online activity.

In the first year of the data (depending on the activity this was 2003, 2005, 2007, or 2011) the percentage of disabled persons performing a given activity was in most instances lower in comparison to non-disabled persons. The exceptions were: purchasing products online (a difference of 11.2% more among the group with disabilities), calling online (6.7%), downloading free programs, music, or films (5.2%), participation in online auctions (2.7%), and seeking work or sending employment offers (0.7%). The remaining 20 activities were relatively more often performed by persons without disabilities. Their largest predominance was in performing such activities as visiting social networking sites (15.9%), reserving tickets (11.9%), checking and sending emails (9.6%), and listening to music and radio online (8.8%). In spite of the observed difference, the 'popularity ranking' of individual functions among disabled and non-disabled internet users was similar. The first fifth of most frequently performed tasks, in both categories of users, included viewing websites, collecting material necessary for education or work, visiting social networking sites, and reading newspapers (or books). On the other hand, those tasks requiring a larger degree of engagement or higher skills (creation and modification of one's own internet site, publication of one's own creations, participation in courses or training) or the accessibility of a given offer (electronic banking, video conferences) were comparatively least often undertaken.

After years (the last year of data on the question) there was a growth in the number of people performing specific tasks in regard to nearly all activities, both among disabled and non-disabled internet users. In both categories there was a fall only in the percentage of persons claiming to collect materials necessary for education or work (the fall in percentage of users amounted respectively to 4.6% and 5.1% between each successive edition of the study) and of those visiting social networking sites (by 5.9% and 5.1%). In the case of the users with disabilities, there was an additional decline in interest in seeking information on the websites of public institutions or administrative offices (by 1%).[8] With the passage

[7] The activity 'paying bills online', which was included in the 2005 study, was not considered. The percentage of internet users with disabilities who performed this activity was 21.8%, and of internet users without disabilities—20.2%.

[8] The drop in interest among persons with disabilities in seeking information from public administration websites should perhaps be explained by the fact of those entities' underuse of the internet's potential, as was shown in studies conducted by the authors of the present article within the framework of a research project entitled 'From Comprehensive Diagnosis of the Situation of Disabled Persons in Poland to a New Model of Social Policy in Regard to Disabilities', realized through a grant financed by PFRON. The findings (which revealed that ministerial, county, and district websites did not make it sufficiently possible for disabled persons to acquire the information they needed on subjects connected with disabilities) show that in regard to users with disabilities public administration websites at the central and local levels fulfill their information function to a negligible degree (Masłyk, Migaczewska 2013).

Table 4

The Popularity of Individual Activities Performed on the Internet (and Change of Interest in Them) Among Disabled and Non-disabled Users

Activity	Persons with disabilities [%]		Average growth [geometric mean]	Persons without disabilities [% difference in comparison to persons with disabilities]		Average growth [geometric mean]
	1st year	Last year		1st year	Last year	
Viewing websites or use of a search engine (2003–2011)	83.3	91.3	1.023	+1.9	+4.9	1.031
Gathering material necessary for work or education (2003–2013)	72.7	54.4	0.944	+3.6	+16.9	0.987
Visiting social networking sites (2009–2013)	68.0	60.2	0.941	+15.9	+15.3	0.949
Reading and sending emails (2003–2013)	64.2	81.6	1.049	+9.6	+9.7	1.043
Reading newspapers (or books) (2007–2013)	51.9	56.9	1.031	+5.7	+5.4	1.026
Acquiring information from the internet sites of public institutions or administrative offices (2005–2013)	50.5	48.6	0.990	4.3	+9.3	1.058
Downloading free programs, music, or films (2003–2013)	45.3	51.4	1.026	−5.2	+12.5	1.098
Use of instant messenger programs (2003–2013)	42.6	67.1	1.095	+7.8	+12.3	1.095
Participating in online chat (2003–2013)	40.8	47.8	1.032	+5.1	+12.9	1.057
Listening to music or radio online (2005–2013)	36.6	60.0	1.132	+8.8	+9.3	1.112
Making internet calls (2005–2013)	35.6	62.3	1.15	−6.7	+9.1	**1.254**
Seeking work, sending employment offers (2005–2013)	31.7	44.0	1.085	−0.7	+10.4	1.151
Downloading or filling in official forms (2005–2013)	31.7	45.2	1.093	+0.3	+10.4	1.148
Purchasing products online (2003–2013)	30.8	56.6	1.129	11.2	+15.5	**1.298**
Playing online games (2003–2013)	25.9	47.2	1.128	+1.6	+7.7	1.148
Use of the internet and email from a home computer for work purposes (2005–2013)	25.7	37.7	1.101	+8.0	+14.0	1.113
Watching television or video files online (2005–2013)	23.8	49.5	**1.201**	+0.6	+8.0	1.239
Participation in discussion groups or forums (2003–2013)	23.1	43.9	1.137	+4.3	+11.9	1.153
Ticket reservation (for instance, airline, movie, or theatre tickets) (2007–2013)	20.3	37.2	**1.224**	+11.9	+14.2	1.169
Participation in online auctions (2003–2013)	17.3	37.9	1.170	−2.7	+12.8	**1.283**
Participation in courses or training (2005–2013)	16.8	32.6	1.180	+1.2	+10.0	1.240
Video-conferencing (2005–2009)	14.9	31.4	**1.452**	+1.2	+10.1	**1.606**
Creation and publication of own texts, graphics, music, or other creations (2003–2013)	13.9	27.3	1.184	+1.3	+8.1	1.235
Creation or modification of one's own website (2003–2013)	11.5	34.3	**1.244**	+7.5	+9.4	1.181
Online banking (2003–2013)	9.6	56.0	**1.423**	+6.2	+9.5	**1.329**

Note: date of first and last data in parentheses.
Average growth estimated based on a geometric mean calculated with the use of chain indices.
The five activities that gained the most adherents in successive years are marked in bold.

Source: own work on the basis of the Social Diagnosis 2003–2013.

of time, non-disabled persons acquired a relative numerical predominance over disabled persons in relation to all the activities studied, although popularity rankings among users representing both categories were still similar. The most often performed were basic activities not requiring inputs of time or money, or higher skills.

In the categories of both disabled and non-disabled users the most rapid rates of growth over the years were noted in video-conferencing (average growth in percentage of users was 45.2% and 60.6% respectively between each successive edition of the study) and online banking (42.3% and 32.9%). Activities in the first fifth of those performed by disabled internet users and characterized by the greatest growth of users in the most recent years included: creation or modification of one's own website (24.4%), reservation of tickets (22.4%), and watching television online (20.1%). On the other hand, in the group of persons without disabilities the activities acquiring users at the highest rate were online purchases (29.8%), online auctions (28.3%), and online calling (25.4%).

The general conclusion that could be drawn from this data is that it is hard to see the internet as an outstanding tool helping disabled persons overcome barriers. In this respect, they are surpassed by non-disabled persons, and moreover the differences between the two categories appear to be increasing. In 2003, for 12 activities analyzed, the average number performed by disabled and non-disabled internet users was similar (4.6 and 4.9 respectively), while the difference between these values was statistically non-existent (test t for $p < 0.01$). Ten years later 26 activities were analyzed. Persons with disabilities performed 12.5 of them on average, while the non-disabled performed 15.3, which reflected an essential statistical difference. The case is similar with the amount of time devoted to internet use. In 2003 internet users with disabilities devoted an average of 5.8 hours a week to it and non-disabled users 6.3 hours, which did not constitute a statistically significant difference. However, such a difference was recorded in 2013, when the average time spent online by users with disabilities grew to 10.4 hours but in the case of the non-disabled to 12.5. In this sense, the internet is characterized by lesser functionality for persons with disabilities. Is this the effect of disability as such? Indirectly, yes—a disability undoubtedly results in less likelihood of acquiring high social status, and this in turn shapes the needs that can partially be satisfied thanks to the new information and communications technology. If such needs do not appear or are not developed, the necessity of using the internet will be negligible.

Conclusion

This analysis has attempted to diagnosis the nature and scale of change in internet use by persons with disabilities as well as the level of the internet's functionality for that social category. The findings are intended to help determine and describe the situation of disabled persons in the web of digital inequalities. The first conclusion to be drawn concerns the improvement of that situation over the course of the decade 2003–2013. Along with the development of new technologies and their growing social accessibility, the share of disabled persons in the population of internet users has decidedly increased: while 5% of disabled persons were internet users in 2003, 10 years later at least one in three was using the internet. What is important is that positive growth (even though of varying rates)

occurred within every category of persons with disabilities, representing separate socio-demographic variables. However, these advantageous changes did not redefine the dominant characteristics of internet users with disabilities. Similarly, in 2013 as in 2003 (and in all the years in which succeeding editions of the Social Diagnosis were conducted between these points), the largest percentage of users were young, well-educated, well-to-do (on account of their occupational activeness), and living in a city. At the same time, among the population of persons with disabilities, there is a preponderance of persons with the opposite traits: older, not very educated and consequently less well-to-do, not active vocationally, not studying. It is therefore not strange that in spite of the increase in the number of disabled persons in the ranks of the digitally privileged, the majority are still located on the side of the digitally handicapped, and this is a direct consequence of the relation between internet use (or non-use) and their social situation, which is determined by level of education, income, and occupational status, as well as by age and place of residence.

These variables determine not only whether modern information and communications technology will be used by persons with disabilities but also the specific kind and extent of their online activities. In other words, socio-demographic traits determine the needs and aims that individuals set for themselves and that they can fulfil by use of the internet. In this context a second conclusion could be drawn. The findings prove that the internet is a less functional instrument for users with disabilities than for those without. Users with disabilities engage in fewer online activities, with less intensity, than other users as a consequence of their individual traits (their capital, above all in the sense of skill and knowledge), which influence the nature of the goals they set themselves. Thus the internet does not contribute in a major way to eliminating the phenomenon of their social exclusion. A cause of this situation can additionally be found in another process diagnosed in the series of studies on manners of internet use conducted over the last dozen or more years. It would seem that in the majority of cases when people use the internet they are performing activities they would previously have performed without this medium (Selwyn, Gorard, Furlong 2005: 22). In other words, the internet makes it possible to perform those same activities in a different, usually more effective, manner. On the basis of this observation, some researchers have advanced a stronger thesis: 'applications and services delivered via the internet are not changing the way people live their lives in a simple, straightforward manner, but are supporting and enhancing their existing lifestyles, whatever those lifestyles may be') (Anderson, Tracey 2001: 458). This claim, in light of the data presented, appears particularly to suit the situation of persons with disabilities. In their case, it is hard to perceive the internet as a medium changing their current mode of functioning in daily life. For this social category the internet can not be considered an outstanding tool for overcoming obstacles resulting from their disabilities. The spread of the internet, including among persons with disabilities, has unfortunately not translated into an improvement in their quality of life in terms of multidimensional activization and social inclusion. For persons with various kinds of disability, limitations in the accessibility and usability of websites create additional barriers to attaining this goal. Proper design of websites is a critical condition for enabling their use by persons with specific disabilities, particularly those of sight and hearing. At the same time, as research has shown, in Poland there are still many websites, including those of the public administration as well as commercial ones, that are not fully accessible for persons with disabilities.

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