The Diffusion of Information and Communications Technologies. Objective and Subjective Obstacles[1]

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Abstract
Even though one of the noteworthy aspects of the Internet is the high speed of its diffusion all over the world, Internet use has been spreading relatively slowly in Hungary. This means, that the digital divide, a central topic for Internet-related scientific research, continues to be highly significant in Hungary. This paper examines the causes of the slow catching up of certain groups and the formation of the typical patterns of digital divides. Literature both on social diffusion and the digital divide was used in our research. Our results show that in addition to the divisive dimensions most often discussed by the literature on the digital divide, a further factor, cultural capital, seems to play an important role. The starting hypothesis of our research is that besides economic barriers, widely accepted as the most important cause of not using the Internet significantly influential cultural factors can be detected behind the patterns of diffusion in Hungary. With such a hypothesis we can counter the view, less and less present but still dominating public opinion, that providing access suffices to speed up diffusion and to help groups falling behind catch up.

Keywords: internet; diffusion; economic barriers; cultural capital; Hungary.

One of the most important issues of the information age and the post-industrial transformation is the nature of the dynamics of the diffusion of information and communication technologies crucial to the new period (Bell 1973; Castells 2000). However, upon registering the data on diffusion, and describing its patterns, a further phenomenon was noted by researchers: right from the beginning, the different adoption rates characterizing various social groups caught the attention of scholars. The concept describing this phenomenon, the *digital divide*, and the questions it engenders have been one of the most important fields of research to date for scholars studying the information society (DiMaggio-Hargittai, 2001). In addition, as the Internet has become an important concern for social policy as well, studying issues relating to the digital divide has become an even greater focus. It is important to note here a presumption, sometimes explicit, yet sometimes only implicit, behind the concept of the digital divide. From the perspective of social hierarchy, the difference between those who use the Internet and those who do not is not neutral. The majority of researchers take it for granted that using the Internet is beneficial, and that it brings about opportunities to improve one's resources and (social, financial, and cultural) capital. Thus, those who use

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the Internet can enhance their status, while those who do not suffer a relative disadvantage. This paper does not examine the validity of this presumption, but accepts it as true. Thus, it is accepted here that groups joining late, or not joining at all, which tend to already be disadvantaged in some regard, are in danger of falling behind to an even greater extent. In order to prevent this, major development projects have been launched in several countries to provide opportunities for non-users to utilize the advantages offered by the Internet in some manner (Dessewffy et al,. 2003). However, these initiatives can only be fruitful if we have a clear idea of what actually prevents various groups from going online. This paper attempts to answer that question. First, we will examine theories about the digital divide, as well as other bodies of sociological literature, in order to demonstrate the factors that need to be taken into account to answer the following question: Why do some people become users, while others cannot, or do not, participate in the digital world? This will be followed by a description of the characteristics of Internet diffusion in Hungary, and an analysis of the typical causes of non-participation and their relative weight. Our empirical analyses make use of the data gathered while carrying out Hungarian research projects for the World Internet Project. [2]

1. Theoretical background

For years now, the literature on the digital divide has dealt with the issue of which groups have not been able to take advantage of the opportunities provided by the Information Society, and which groups have been able to benefit from them. More simply put: Which social groups use the Internet, and which ones do not? The patterns observed by researchers in various parts of the world were quite similar. In rather blunt terms, we can say that better educated, better-off, and younger people tend to adopt the technology faster (DiMaggio et al. 200 1, Norris 2001) [3]. This statement accurately describes the situation in Hungary as well. As the data gathered by the WIP seems to demonstrate, the groups mentioned above lead the way in adopting the Internet in Hungary (Galácz – Molnár, 2003).

The next step in formulating a theory on the digital divide is to go beyond mere description and attempt to shed light on the factors that prevent various groups from using the Internet. For some time, this issue was explained by rather simple reasoning: the major obstacles were seen to be economic, since it is the economically deprived strata of society that cannot afford Internet use. Therefore, the reasoning went that what was needed for wider diffusion was, first and foremost, a decrease in the price of equipment and

[2] The World Internet Project (WIP) was initiated by UCLA in California and the NTU School of Communications Studies in Singapore in the summer of 1999. This international research project on the Internet involves more than 15 countries from around the world. Since 2001, WIP research in Hungary has been carried out by a joint research group including TÁRKI, BME-ITTK, and ELTE-ITHAKA. The study uses a panel sample. The starting sample in 2001 was a representative national sample of 5,032 participants. For more information on this research, see www.ithaka.hu/wip or www.worldinternetproject.net.

[3] Naturally, in addition to these most often mentioned dimensions, other fault lines have also been pointed out in Hungary, as well as elsewhere. Occupation, regional location, economic activity, and in certain societies, ethnicity and gender can also be important dividing factors. (Bognár, 2003)

services, or completely free services available to everyone. The labels typically used to describe the two groups – the haves and the have-nots – obviously refer to this kind of perception. Thus, in this case, the key to the digital divide is "access," a term used in early interpretations specifically to describe whether a person had the *opportunity* to have Internet access, regardless of whether he/she wanted to (DiMaggio et al. 2001).

As penetration progressed, debates ensued not only on whether the digital divide – the digital gap – was decreasing, increasing, or stagnating. Instead, more and more scholars discussed the concept itself, as well as the benefits and problems it presented, with some suggesting the use of new terms thought to be more appropriate to describe the phenomenon. This was necessary principally because, as the Internet became more widespread, the price of access generally decreased, thus lifting the economic barriers. This can be interpreted as an indication that, while economic obstacles are not insignificant, there must be further reasons for rejecting the Internet.

This has been pointed out by Warschauer, arguing that theories and policies dealing with the digital divide often ignore social factors, and focus too much on questions of infrastructure. In contrast, Warschauer maintains that access is actually a gradual process, which does not simply end with the provision of access (Warschauer, 2002).

A similar point was argued by Ernest J. Wilson, dividing the concept of access into *formal* and *effective* access. Wilson claims that, as long as the intertwined elements of effective access are missing, access remains merely formal. Having physical access is merely the first step in the process towards effective use. In addition to an available infrastructure, financial access is also needed. That is, the user must be able to cover the costs of Internet use. Furthermore, the user must be able to use the Internet in the cognitive sense as well – i.e. he/she needs to possess the necessary skills and abilities. The next step towards access is a question of content: Is the content written in a language spoken by the user? The final step involves political access: Does the consumer have access to the institutions where the rules of the game of the distribution of ICTs are decided? According to Wilson, effective access is required in order to bridge the gap. Thus, all of the elements of access discussed need to be provided (Wilson, 1999).

Other analyses use definitions with even more layers, distinguishing, for instance, the level of attitudinal access (that is, what kinds of emotions and presumptions potential users have about the given technology) or the level of cultural factors (the existence of a value system, typical values, and the cultural capital necessary for the adoption of the technology) (Dessewffy et al., 2003).

Another body of sociological literature – the concepts and theories on social diffusion –also stresses the non-exclusive nature of economic and demographic variables in the process of adopting new technologies. As Everett M. Rogers demonstrated in his highly respected book Diffusion of Innovations (Rogers, 1995),

communicational and attitudinal variables, as well as the extent and nature of the individuals' social capital, are also relevant.

Recent research has also found that income and other socio-economic variables alone cannot explain why certain groups abstain from using the Internet, or discontinue using it. William Dutton et al. called this factor 'digital choice,' meaning that somebody simply chooses not to use the Internet. According to the authors, the important question is: In addition to the aforementioned variables, what motivates these choices? Why do certain groups decide to use, or not use, the Internet? (Dutton et al., 2006)

Finally, yet another phenomenon supports the significance of investigating the role of non-economic variables. As DiMaggio et al. points out, as penetration continues, differences may remain in how people can use the Internet, and what they can use it for. Thus, quality of use becomes the most important dimension (DiMaggio et al., 2001). We can assume that this dimension can also be better understood by analyzing cultural and attitudinal factors.

The models discussed above all draw attention to the fact that economic factors are only part of the system of conditions required for the efficient and regular use of the Internet. In fact, non-economic factors will most likely become more and more significant as penetration continues, along with the significance of an inquiry which takes into account other features stressed by other factors. The importance of cultural capital in shaping social stratification and inequalities, as numerous studies have pointed out, has always had a special significance, both in Hungary and the entire East-European region. This is another reason why we have decided that, in studying the causes of non-use, we will attempt to explore the role played by one's cultural capital, cognitive background, and various attitudes.

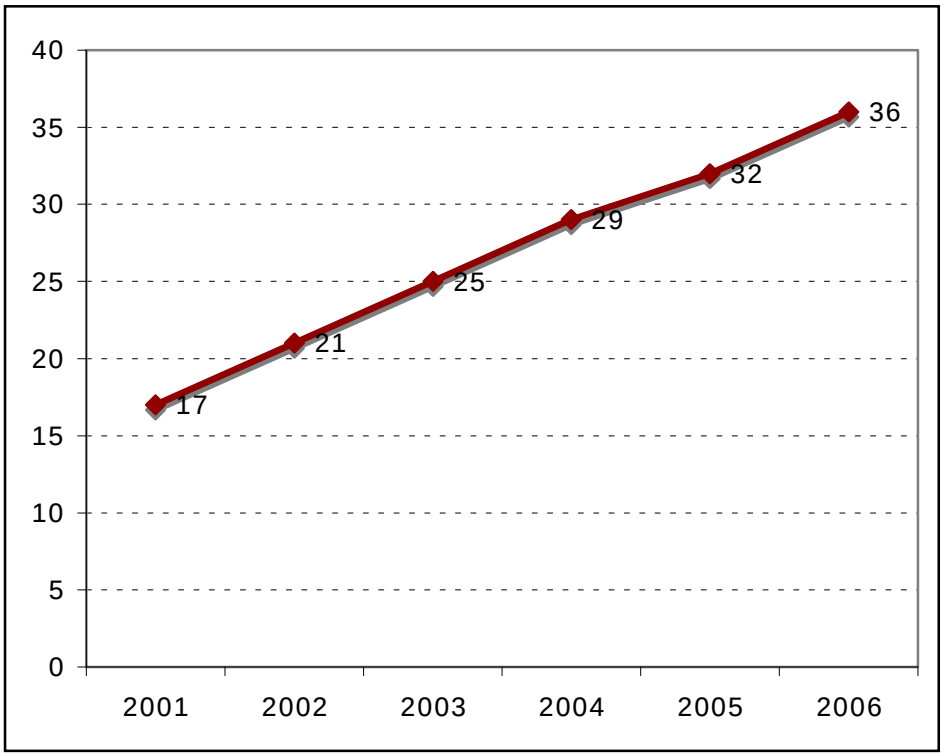
2. The Diffusion of Internet Use in Hungary

Before actually mapping out the causes of non-use, it might be worth looking at the raw indicators of Internet penetration in Hungary.

According to the WIP research, in the summer of 2006, 36% of Hungarians over the age of 14 used the Internet (*Figure 1*). Internet penetration has shown a steady linear increase in recent years. However, the intensity of this growth has been relatively small (approx. 4% per year). This rate of penetration can be considered quite small not only compared to the forerunners of the Information Society (i.e. the USA or the Scandinavian countries, where penetration can exceed 70%), but to other post-socialist countries in the region (for example, penetration in the Czech Republic was 54% in 2006). Using the terms of the diffusion theory, it can be said that the Internet users now include "innovators" and "early adopters." However, the Internet has not yet gained the support of the "early majority" in Hungary. Based on the data, the diffusion

of Internet use in Hungary has not yet reached the inflexion point. Thus, the dynamic phase of diffusion is possibly yet to come.[4]

Figure 1. The proportion of Internet users in the Hungarian population over the age of 14 (%)



Source: TÁRKI – ITHAKA, WIP (2001–2006)

For some time, it was widely accepted by both the Hungarian scientific and lay public that this slow rate of diffusion was a result of high telecommunication and Internet service fees. However, analyzing the data on reasons for not using the Internet suggests another scenario.

[4] It is important to note that Internet use is discussed here in general terms. That is, we have included every Internet user, whether using it at school, work, or elsewhere.

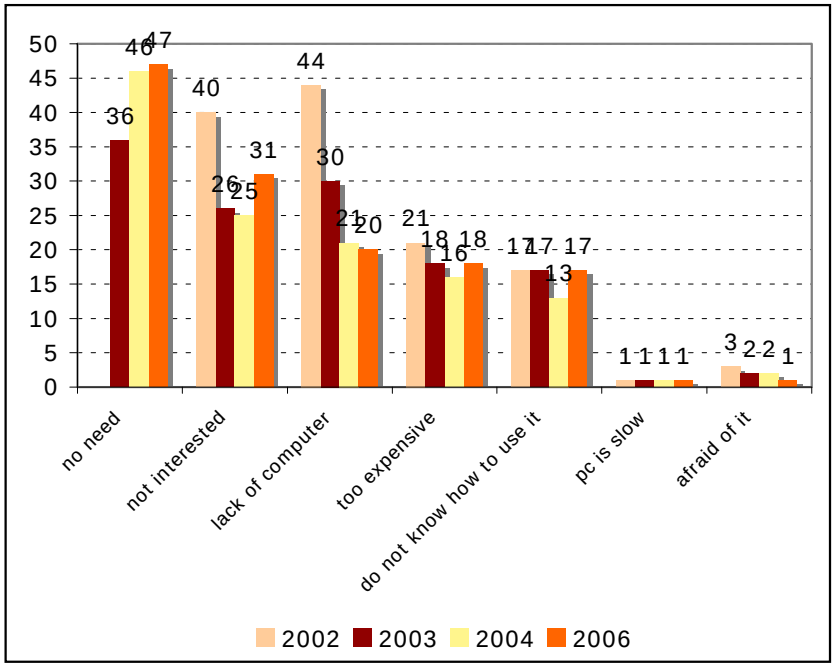
3. Factors Explaining the Use and Non-Use of the Internet

What factors hamper the dynamic diffusion of the Internet? What prevents a large portion of the population from using it, and what sorts of reasons are given to explain this?

According to the research, almost half of the non-users (47%) in 2006 claimed that one reason they do not use the Internet is that they do not need it (*Figure 2)*. Another highly significant explanation was lack of interest (31%). Not having a computer was an important factor as well: 20% of the non-users reported this as a reason. 18% of the non-users mentioned a purely financial reason: they found the Internet too expensive to use. In addition, (assumed) lack of skills proved to be a major deterrent as well: 17% of the non-users mentioned that they did not use the Internet because they do not possess the necessary skills [5].

With the help of Figure 2, we can also analyze how the significance of each reason has changed since 2002.

Figure 2. Why do you not use the Internet? – The proportion of valid responses among non-users between 2002 and 2006



Source: TÁRKI – ITHAKA, WIP (2002–2006)

Note: Respondents were allowed to give more than one answer. The category 'no need' is only an option since 2003. We can assume that the significant drop in the frequency of the answer 'not interested' could be a consequence of this new category.

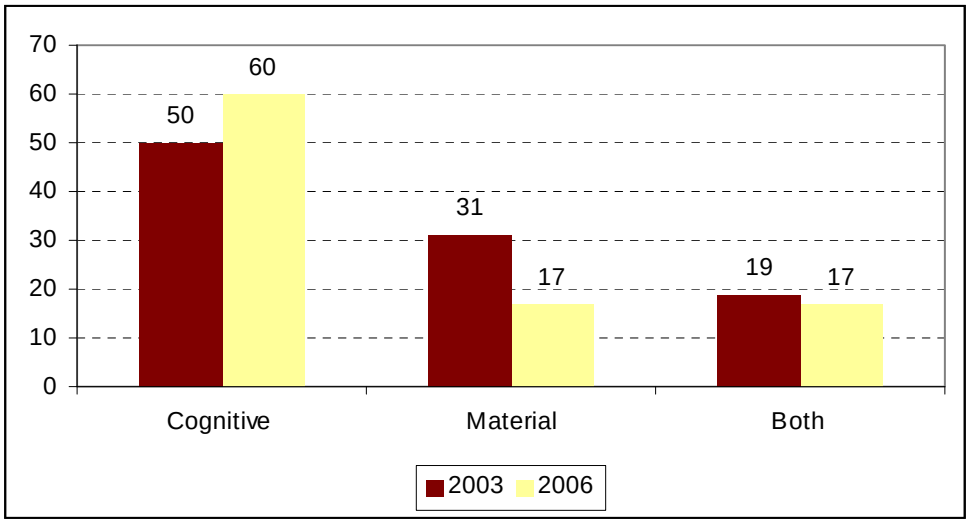
[5] It is difficult to compare the data sets, as the 2003 research project included the option "does not need it" among the possible answers, which altered the results considerably. The inclusion of this potential answer was necessary, due to the fact that in previous years a large portion of the responses in the "other" category hinted at such a cause.

Looking at Figure 4, it is clear that material causes, such as the lack of a computer or finding the Internet too expensive, are important reasons, yet in the long run, have become less significant. During the investigated time period, a notable drop in the importance of the reason 'do not have a computer' can be observed (from 44% to 20% in four years). Meanwhile, although in a less dramatic manner, mentioning that Internet usage is 'too expensive' has also become less frequent (from 21% to 18%). Contrastingly, the overall significance of cognitive, non-material reasons has steadily increased (the temporary drop in the frequency of the response 'not interested' can be attributed to the advent of the new category 'no need' in 2003). In addition to motivational obstacles ('no need', 'not interested'), the cognitive burden (namely, the reason 'do not know how to use it') has also remained significant.

As respondents were allowed to give more than one response when answering the question of why they do not use the Internet, in the interest of making the cognitive and material reasons easier to grasp, we created a variable that places all respondents into various categories based on whether they mentioned only material, only cognitive, or both types of explanations for their non-use. This new variable views responses falling under any of the above categories as true values, ignoring answers in the "other" category. The following explanations were assigned to the three attributes of the variable:

1. cognitive: "does not need it," "not interested," "lacks skills," "afraid of it"
2. material: "lacks computer," "too expensive," "slow computer"
3. both: if cognitive and material reason(s) were mentioned

Figure 3. Types of reasons for non-use – percentage of non-users giving the explanation, 2003



Based on the above data, it can be stated that half of the respondents who provided an explanation for their non-use gave only cognitive reasons, and that a further one-fifth (19%) voiced such causes as deterrents while also providing other reasons as well (*Figure 5*). Thus, altogether a great majority (79%) of those not taking advantage of the Internet find cognitive and cultural barriers to connecting to the online world. Naturally, this cannot overshadow the fact that 17% of the non-users only cited material reasons, and approximately 34% mentioned financial reasons (among others) as explanations for their not using the Internet.

Analyzing this data in conjunction with market and policy developments can lead to interesting conclusions. Between 2002 and 2006, a significant decline in the cost of Internet access and telecommunication services could be observed in Hungary. While in 2001 and 2002 the average monthly cost of a broadband Internet plan was around 10,000 Hungarian Forints (approx. 50 US Dollars), the prices decreased by nearly 50% by 2006. In addition, important government programs were launched which helped families buy computers by providing significant tax cuts to those purchasing info-communication tools (the so-called SuliNet Express). These developments are reflected in the data, since fewer non-users reported, for example, the lack of a computer as an obstacle. However, a dynamic increase in the overall rate of penetration could not be observed in any year: the yearly growth continued at a routine slow rate. It seems that after the material obstacles were overcome, other issues came to the forefront. This suggests that material obstacles were perhaps not as important as they were perceived, even in the years when prices were relatively high.

To identify the decisive factors behind this phenomenon, we constructed a more sophisticated explanatory model for the rejection of Internet use.

4. An explanatory model for the rejection of Internet use

Up to this point, we have examined the reasons the respondents themselves mentioned for not using the Internet. Let us now move beyond the self-representation of the respondents. Let us examine the relations of use, or non-use, and the cultural, cognitive, or material characteristics, as expressed in an explanatory model that incorporates these aspects as complex indicators differing from the reasons for non-use of the Internet.

In the following section, we will attempt to determine the extent to which Internet use can be explained by "cultural capital" and "financial status." To these ends, a synthetic path model will be utilized. A path model consists of linear regression models, in which the dependent variables are high variables. The dependent variable used here – the dichotomous variable of Internet use – can eventually fulfill this requirement, since

both the mean and the variance can be interpreted for dummy variables [6].

The two independent variables of the path model were aggregated as two main components from several elements representing cultural and financial capital. The indicator representing cultural capital was formed from six variables. Educational level[7], father's educational level, and language skills were used here. The other variables representing cultural capital were composed of certain cultural consumption habits: i.e. frequency of going to the theater, museums, and/or libraries.

The variable representing financial status was formed along three dimensions. The first indicator is the index of the degree of supply of durable consumer goods: it contains the number of durable consumer goods mentioned in the questionnaire that are owned by the respondent. The second variable represents the per capita income of the household, while the third refers to the housing situation and the cost of the household's furniture.

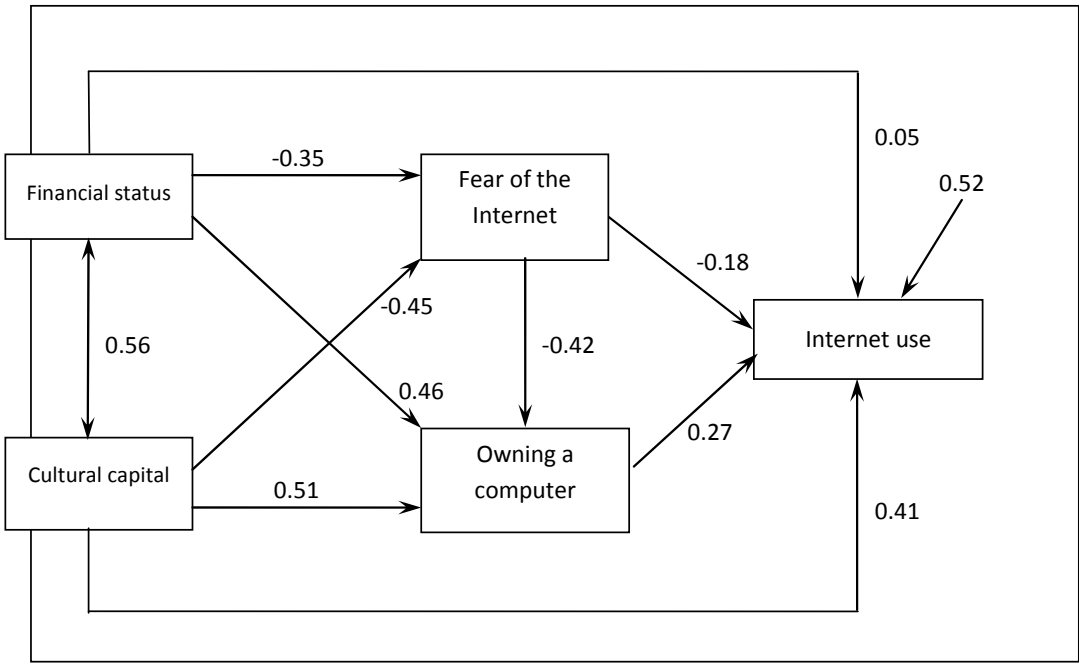
Owning a computer and an attitudinal variable were used as intermediary variables in our path model. The attitudinal variable aggregates four variables from attitudinal questions relating to Internet use which express aversion and fear regarding the Internet:

- People spend too much time using the Internet.
- The Internet does not provide you with anything important or significant.
- Children can access a lot of information not intended for them on the Internet.
- People using the Internet risk the security of their personal data.

[6] If we wanted to study Internet use simply as a dependent variable in a regression model, logistic regression would be used. This time, however, we want to demonstrate the process we assume to exist through a complex path model, with direct and indirect paths.

[7] The educational level variable was used here in a different manner than in the original questionnaire. The reason for this is that the research participants were all over the age of 15, and the original variable in the questionnaire regarded high school students as having attained only a primary level of education. In order to eliminate this downward distortion, we reformulated the education variable using the variable of economic activity. For those participants whose highest attained level of education was elementary education, yet who were enrolled as full-time students, we "anticipated" a secondary education. Similarly, those whose current highest level of education was secondary, yet who are full-time students, were considered to be college/university graduates.

Figure 4. The path model of Internet use with regression coefficients, 2006



In our path model, the binary variable of Internet use was naturally defined as the dependent variable. The two independent variables consisted of cultural capital and financial status, while owning a computer and fear relating to the Internet played the role of intermediary variables.

The explanatory power of the path model is remarkable: only 52% of our dependent variables could be explained with variables outside of the model (*Figure 4*). As expected, cultural and financial capital are not independent of one another: the correlation coefficient for their relation is 0.56. However, our chief point of interest here is the direct and indirect effects that financial status and cultural capital can have on Internet use. Apparently, cultural capital plays the leading role in terms of direct effects, since the weight of the path between cultural capital and Internet use can be characterized with a 0.41 beta, while the path between financial status and Internet use is merely a 0.05 beta. Owning a computer is linked to financial status with a 0.46 regression beta, and to cultural capital with a 0.51 regression beta. The partial betas of the linear regression analysis convey that, when comparing people with similar attitudes towards the Internet, the role played by cultural capital is somewhat more significant than that of financial capital in explaining computer ownership. There is a somewhat more significant difference between the weight of the paths connecting financial status and cultural capital to aversion to the Internet. Here, again, the role of

cultural factors is stronger. These findings together signify that providing efficient, easily understandable answers (whether by the market, the government, or society) to the question of "What is the Internet good for?" could, in and of itself, increase Internet diffusion.

One of the strongest direct paths in the model is the one linking cultural capital to Internet use with a 0.41 beta. Naturally, fear of the Internet has a negative impact on Internet use [8]. Similarly, there is a negative path between owning a computer and fear of the Internet, which can be understood as a more general fear of the technological unknown.

Finally, we examined the extent to which the direct and indirect paths influence Internet use, depending on whether the starting point is financial status, or cultural capital. The combined weight of the direct and indirect paths from financial status to Internet use was found to be 0.59, while the weight of the direct and indirect paths starting from cultural capital is 0.83.

Thus, the final conclusion of the path model, taking computer ownership and Internet-related attitudes into account, is that cultural capital has a significant impact on Internet use and non-use.

However, a new question arises at this point: Can the impact of age be left out of the model, given that there is a strong connection between age and Internet use? (Dessewffy-Fábián, 2003:11) Will what has been proven above remain valid if the variable of age is included in the path model?

When age is added to the path model, there is no significant change in structure in regard to direct effects. At the same time, the linear regression representing the explanatory power of the model and the regression coefficients of the direct effects on Internet use clearly demonstrate that age is a relevant explanatory factor of Internet use, since its inclusion in the model enhanced the model's explanatory power by 2%: while our first path model could explain 48% of Internet use, the new, expanded model can account for 50% (*Table 1*). The links between the direct effects of cultural capital and financial status on Internet use point in the same direction as before: the regression coefficient of cultural capital remains higher than that of financial status, even with the addition of age as a consideration. Nor does the inclusion of the age variable change the order of the effects of the other variables.

[8] From the perspective of the model used here, it is not worth discussing whether the causal relations between fear of the Internet and Internet use can be reversed. Of course, it is possible to work out a model in which attitudes relating to the Internet and Internet use are explained. However, this time the goal was to compare the strength of the effect cultural capital and financial status have on Internet use. From this perspective, it is legitimate to use an approach based on the assumption that Internet-related attitudes affect one's use or non-use. That is, it is acceptable to use a logic that assigns explanatory power to attitudes for Internet use, and not the other way around.

Table 1. The direct effects of the path model, including age in the linear regression model

	Beta	Significance level
Owning a computer	0.2	0,000
Fear of the Internet	–0.14	0,000
Financial status	0.07	0,000
Cultural capital	0.37	0,000
Age	–0.16	0,000

Note: R^2=0.50; Internet use is the dependent variable

5. Conclusions

In summary, it can be argued that cultural factors have an important explanatory power over Internet use and non-use, even beyond self-representation.

The importance of these findings cannot be overestimated. On the one hand, pointing out the significance of cultural factors draws attention to the fact that while public opinion still regards material causes as the primary barriers to the diffusion of the Internet, there is, in fact, an additional and different set of explanatory variables. On the other hand, if the existence and importance of cultural barriers are accepted, it is plain to see that decision-makers, whether in the commercial sphere or in government, need to work out and utilize a different, complex strategy and means to overcome material, as well as cultural barriers.

This means that, when analyzing the obstacles hindering the adoption of Internet use, it is crucial to focus on the cultural and cognitive barriers, and especially important to conduct longitudinal research on this topic. These kinds of investigations could also serve as good examples for research projects analyzing Internet related issues in a broader social and cultural context, which generally should be the major trend in Internet studies.

Bibliography

Bell D. (1973): "The Coming of Post-Industrial Society: A Venture in Social Forecasting." NY: Basic.

Bognár É. (2003): "Az internethasználat kulturális vonatkozásai és a Sulinet," (thesiswork), http://www.ithaka.hu/Letoltheto

Castells, M. (2000): "Materials for an Exploratory Theory of the Network Society," British Journal of Sociology, Vol. 51, No. 1, (January/March).

Dessewffy T. et al. (2003): "Digitális egyenlőtlenségek – nemzetközi példák és alkalmazások", (Digital inequalities – international best practices and implementation) Budapest: ITHAKA, 2004

Dessewffy, T. – Fábián, Z. (ed.) (2003): "Mapping the digital future." Hungarian Society and the Internet. Budapest: ITTK–TÁRKI- ELTE-ITHAKA, www.wiphungary.hu

Dessewffy, T. – Fábián, Z. (ed.) (2004): "Mapping the digital future." Hungarian Society and the Internet. Budapest: ITTK–TÁRKI- ELTE-ITHAKA, www.wiphungary.hu

DiMaggio, Paul, Hargittai Eszter, W. Russel Neuman and John P. Robinson. (2001) "Social Implications of the Internet" in Annual Reviews Sociology 27:307-336.

DiMaggio, Paul and Hargittai, Eszter. (2001) "From the "Digital Divide" to "Digital Inequality": Studying Internet Use as Penetration Increases." Working paper – Centre for Arts, Cultural and Political Studies, Princeton University.

Dutton, W. H – Shepherd A. – Di Gennaro C.(2006) : "Digitális megosztottságok és digitális döntések." In: Dessewffy T. Fábián, Z. (eds).: Internet.hu 3. Budapest: TÁRKI, 205–227. p.

Galácz, A. – Molnár, Sz. (2003): "A magyarországi információs egyenlőtlenségek," (Digital inequalities in Hungary) In: Z. Karvalics L. – Dessewffy T. (ed.): Internet.hu. Budapest: Aula Kiadó, pp: 138-159.

Rogers E. M. (1995): "Diffusion of Innovations" 4th Edition. NY: Free Press.

Norris, Pippa (2001): "Digital Divide? Civic Engagement, Information Poverty and the Internet in Democratic Societies," Cambridge University Press: New York

Warschauer, Mark. (2002.) "Reconceptualizing the Digital Divide." in First Monday, volume 7, number 7 (2002 July).

Wilson, Ernest J. III. (1999.) "Closing the Digital Divide." Internet Policy Institute, Washington http://internetpolicy.org/briefing/Ernest Wilson0700.html#contents