

On stimulus for citizens' use of e-government services

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Abstract—The paper presents the desk research on interdependences between individual use of e-government services and group of selected socio-economic indicators, results from public opinion polls on S&T, and work requirements in EU27 countries. We identified six distinct groups of indicators that are significantly correlated with use of e-government services: national innovativeness and competitiveness, regular use of Internet, demanding and autonomous work, interest in innovations and S&T, data protection and security and personal trust. Among others, research opens questions about possible role of social capital in public acceptance of e-governments services. Deeper insight into interdependences between studied indicators also reveals that old EU15 and the new EU member states in some cases demonstrate different behavior patterns.

I. INTRODUCTION

SUCCESSFUL implementation of e-government projects depends on public acceptance of new services. Practical experiences and researches [1][2][3] confirm that users' acceptance is not granted per se. Public approval is quite often below what developers expected [4]. To understand what motivates citizens to use e-government services is equally relevant issue for policy-makers and for developers [5]. Public providers cannot "force" individual citizens to use their services, as governments or corporations can do with their own employees. Motivation of citizens is often underestimated and many governments believe that it is enough to passively offer new services. Providers of e-government services should be more aware also of users' absorption ability for new technologies and applications. Some categories of citizens like elderly population [6] and people with special needs are already studied, but we are referring to general population.

From this point of view, it is attention-grabbing to see that the use of e-government services strongly vary across different European countries [7][8] The usage is clearly correlated with economic power of particular country and its ability to invest into development of e-government. But, economy cannot explain all regional differences. There are also other forces that can influence use of public services [9][10].

We were particularly interested in the role of socio-economic environment and citizen's perception of new technologies, as unseen forces behind innovativeness and consequently use of e-services [11]. Many researches confirm that social capital and other social characteristics strongly influ-

ence individuals' behavior and make them more or less opened for new ideas [12][13]. We still lack comprehensive definitions of social capital and variables, so we are using many substitutes like general trust. We took similar approach in our research, including results from selected public opinion polls in EU27.

II. RESEARCH AND HYPOTHESIS

In the paper we present a part of a wider research on interdependences between socio-economic environment and national performance indicators. In the focus of this particular research was the question which social and citizens' characteristics identify an environment that is favorable for use of e-government services by individuals. We were also interested in regional differences between EU countries, partly because it was relevant issue for policy-makers, and partly because there were available data on EU level. Socio-economic diversity in the EU is very high and offers an opportunity to study its influence and interdependences between different national performance indicators. In our desk research we also searched for possible dissimilarity between old EU15 and new EU member states.

Research hypothesis were based on prevailing perception of users' behavior like: high national innovativeness and positive attitude towards science and technology, high public interest in Internet and new on-line technologies, trust and awareness on personal data protection they all stimulate use of e-government services. In our previous researches [1] we noticed that in many cases old and new EU member states behaved differently, so we were interested to see if they follow the same pattern or not.

Main information sources for research were EUROSTAT data bases and public opinion polls published in Eurobarometers (Table 2). Our research sample was set of EU27 member states. Research was conducted in three steps:

- With factor analysis we reduced number of variables, considering only variables that load on the first principal component associated with use of e-government services by individuals (we started with nearly 50 indicators and ended with 24);
- In the second step we calculated correlations between remaining variables and the use of e-government services by individuals;

- To get a deeper insight into the structure of some particularly interesting correlations we decided to use also graphical presentations to visualize behavior of individual countries and their eventual clustering.

III. PRESENTATION OF RESULTS

Correlations between use of e-government services and the most relevant economic indicators have been already recognized and interpreted (Table 1). These correlations just confirm that economically more developed countries can invest relatively more into e-governments than others, and con-

sequently increase its usage. It is evident that innovativeness and national competitiveness are the most prominent characteristics of environments with high use of e-government services. Other correlations are not that high, so there is still a room for other often hidden forces that influence e-governments.

Less recognized and studied are correlations between use of e-government services and social indicators or public opinion which determine socio-economic environment that that can also significantly influence behavior of individuals. The Table 2 presents correlations with such indicators and

TABLE I
CORRELATIONS BETWEEN E-GOVERNMENT USE BY INDIVIDUALS AND
SELECTED NATIONAL PERFORMANCE INDICATORS FOR EU27 MEMBER STATES

	Source of data	Correlation with e-government use by individuals
Innovativeness (SII)	European Innovation Scoreboard	0,881 **
National competitiveness	IMD World Competitiveness Yearbook	0,848 **
GDP per capita in PPP	Eurostat	0,724 **
Economic performance	IMD World Competitiveness Yearbook	0,653 **
Labor productivity	Eurostat	0,651 **
Spending on human resources	Eurostat	0,519 **
Science and technology graduates	Eurostat	0,376 *

** Correlation is significant at 0,01 level.

* Correlation is significant at 0,05 level.

TABLE 2
CORRELATIONS BETWEEN E-GOVERNMENT USE BY INDIVIDUALS AND
SELECTED SOCIO-ECONOMIC INDICATORS FOR EU27 MEMBER STATES

	Source of data	Correlation with e-government use by individuals
Share of individuals recently used e-commerce	Eurostat	0,901 **
Share of individuals regularly using Internet	Eurostat	0,892 **
High individuals' level of computer skills	Eurostat	0,860 **
Personal Trust	Spec. Eurobarometer 223	0,848 **
Work at home	Eurostat	0,836 **
My job allows me to take part in making decisions	Spec. Eurobarometer 273	0,807 **
My job allows me to use my knowledge and skills	Spec. Eurobarometer 273	0,798 **
My job requires me to keep learning new things	Spec. Eurobarometer 273	0,758 **
Life-long learning	Eurostat	0,734 **
Interested in innovations and S&T	Spec. Eurobarometer 224	0,693 **
Properly protecting private information	Flash Eurobarometer 225	0,670 **
Transmitting your data over the Internet is sufficiently secure	Flash Eurobarometer 225	0,593 **
Interested in economics and social sciences	Spec. Eurobarometer 273	0,560 **
Interested in Internet	Spec. Eurobarometer 273	0,456 **
Globalization is opportunity	Eurobarometer 63	0,433 *
Well informed about inventions and S&T	Spec. Eurobarometer 282	0,381 *
Interesting in IT news in media	Spec. Eurobarometer 282	-0,282

** Correlation is significant at 0,01 level.

* Correlation is significant at 0,05 level.

results of public opinion polls that were selected with factor analysis out of nearly 50 subjective selected indicators. They load on the first principal component which is associated with use of e-government services.

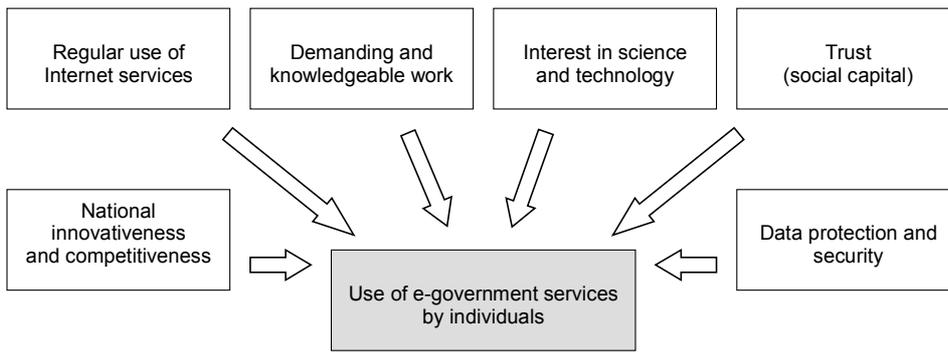


Fig. 1 - Groups of indicators influencing use of e-government services by individuals

The first three top ranking indicators confirm high interdependence between use of internet services and use of e-government by individuals. It confirms that from user point of view e-government services are just ordinary e-services as others. More intriguing is high correlation with personal trust. It indicates a potential role of social capital (trust is an important part of social capital) that has not been really studied in connection with e-governments issues. It is also noteworthy that the next four places occupy indicators describing individuals' work conditions and professional demands. Extensive work at home and high demand for knowledge and personal initiative at work make individuals keener for use of e-government services. Similar effect has an intensive life-long learning.

Public believe that personal information are properly protected is in the middle of the list with medium correlation ($R=0,670$). It is similar with public perception that transmitting data over Internet is sufficiently secure. It indicates that concern for data protection and security are relevant drivers for use of e-government services, but it is not decisive. Citizens tend to believe that their data will not be misused.

The next group of three indicators talks about individual awareness of S&T and Internet. Interest in S&T is much stronger motivator ($R=0,67$) than interest in Internet alone which demonstrate surprisingly low correlation ($R=0,46$). We can hypothesize that people accept Internet just as an useful tool, but they don't need to be very enthusiastic and interested in the tool itself. On the other side, general interest in S&T indicates a general innovative environment that is favorable also for implementation and use of innovative e-government services. Public perception that globalization is an opportunity is again a sign of open-minded society for new challenges. However, the correlation is already very low and it is statistically not really relevant.

Fig. 1 schematically presents six main clusters of national indicators and public opinions that are the most significant indication of stimulative environment for use of e-government services.

Correlations are just statistical figures and cannot reveal details in the structure of interdependences. For that reason we visually investigated positioning and eventual clustering of individual countries. As we already mentioned, the correlation between public interest in Internet and use of e-government services was low.

This result contradict our common believe that sole interest in internet powers its use.

However, in the Fig. 2 we can notice two clusters of countries. In the first cluster are the most developed EU countries (Denmark, Netherlands, Sweden, Luxembourg, Finland, Germany, France and UK). They demonstrate high use of e-government services but a wide range of interests in internet, from very low to very high. We can conclude that these variables are nearly independent for this cluster. On the other side, in all other EU countries we can witness much lower use of e-government services, but much stronger correlation between it and interest in Internet. We can hypothesize that in the beginning of e-government implementation public interest in Internet plays a relevant role, but not in the more mature development phase when Internet becomes a "normal" and widely accepted technology. It indicates a nonlinearity that can be noticed in many other cases, too.

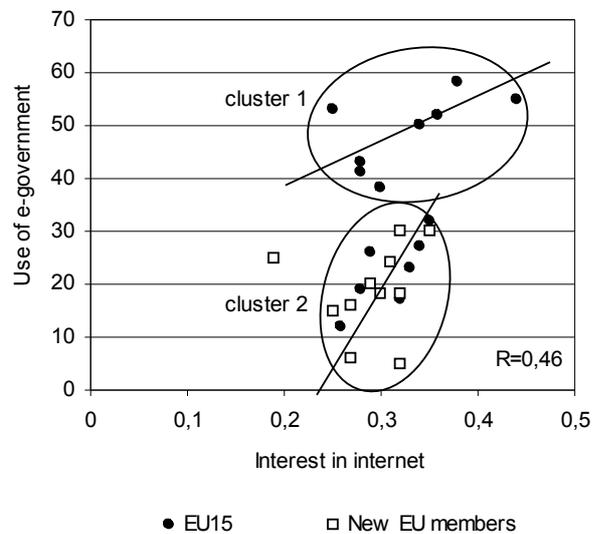


Fig. 2 - Interdependence between public interest in internet and use of e-government services

Stronger motivator for use of e-government services than interest in Internet is a general public interest in S&T (Fig. 3). In this case too, behavior of old (EU15) and new EU member states shows different pattern. In contrast to the old EU member states (full line in Fig. 3), in the new EU members higher interest in S&T doesn't result in considerably higher usage of e-government services (dotted line in Fig. 3). Relatively high interest in S&T in new EU member states is

noticed in many researches and is attributed to educational system and some historical reasons. However, this interest alone cannot significantly raise use of e-government services because there are other, particularly economic brakes.

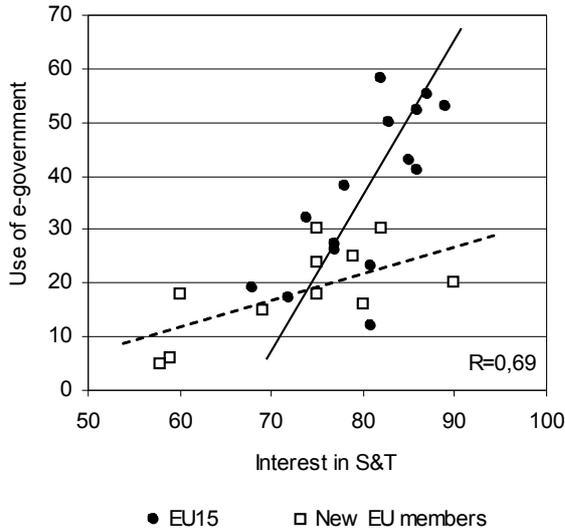


Fig. 3 - Interdependence between citizens' interest in S&T and use of e-government services

One of the strongest motivator for use of e-government services is a general national innovativeness. It identifies environment in which individuals are more attracted and opened to new ideas and ready to experiment with new technologies. So, it is not a surprise that such environment significantly stimulates use of e-governments. Investigating this interdependence in more details we can notice (Fig 4) that the most developed EU countries (marked cluster) have significantly higher level of innovativeness which is very likely one of the main reasons for their higher use of e-government services. However, we have to additionally comment this issue. The European Commission annually evaluates and ranks national innovativeness through Summary Innovation Index which also includes infrastructure issues and economic power that enable innovative processes in particular country. So, even national innovativeness is not just state of the mind, but reflects the strength of national economy. The circle is so closed, because the economic power makes possible higher investments into e-government projects and their higher use (Table 1).

Correlation between the level of computer skills and use of e-government services by individuals is high ($R=0,86$), but again we can see two clusters of countries (Fig. 5). Trend lines are parallel but shifted indicating that at the same level of computer skills in northern EU countries exhibits higher level of e-government usage than in other countries that are on a lower "development" trajectory. In the new EU members, including Spain, Portugal, Italy and Greece, we see that even high level of computer skills results with lower use of e-government services. We can just guess that in the first phase of e-government development computer skill are more important and simulative than later stages.

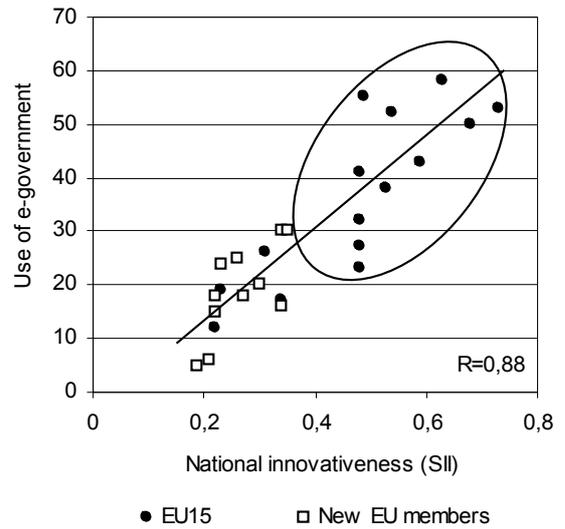


Fig. 4 - Interdependence between national innovativeness (Summary Innovation Index) and use of e-government services

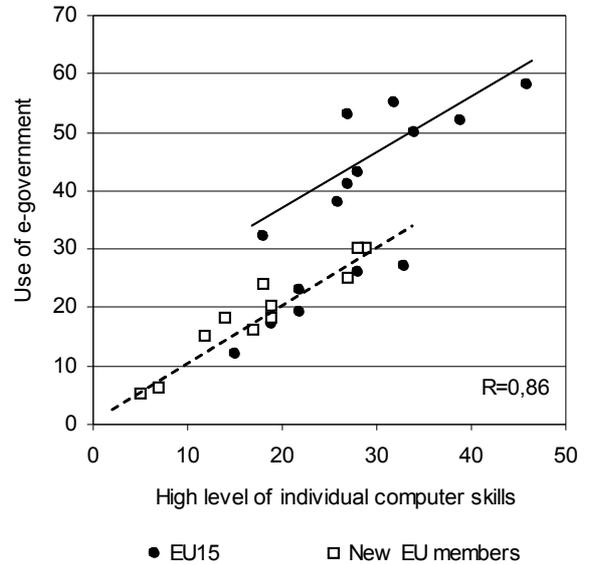


Fig. 5 - Interdependence between citizens' level of computer skills and use of e-government services

To summarize, figures from 2 to 5 illustrate four typical patterns in behavior dissimilarity in the old EU15 and new EU member states:

P1: In the most developed EU member states the use of e-government services is not very sensitive on changes in studied indicators (Fig. 2), but it is very sensitive in new EU members (and also for old EU15 members from the Southern Europe).

P2: The second pattern defines the opposite situation (Fig 3). In the new EU member states the use of e-government services is not very sensitive on changes in studied indicators.

P3: In the third pattern all EU member states demonstrates similar behavior (Fig. 4).

P4: The last pattern indicates different development trajectories for the most developed EU members and the rest, including all new member states and few old EU15 member states from Southern Europe (Fig. 5).

IV. CONCLUSIONS

In the research we identified six distinct groups of national indicators and public opinions that are significantly correlated with use of e-government services by individuals. Two of them are quite evident (National innovativeness and competitiveness, and regular use of Internet), the next are data protection and security, and other three are less obvious (demanding and autonomous work, interest in innovations and S&T, and personal trust).

Particularly intriguing is high correlation between use of e-government and personal trust. It opens many questions about possible role of social capital in acceptance of new e-government services. As we already mentioned, this issue have not been really studied in connection with e-governments'. We could hypostatize that high social capital in Scandinavian countries and UK significantly increase use of publically available e-government services and that it is one of the main reasons for regional differences.

Another interesting feature is clustering of countries with different behavior. Deeper insight into interdependences between discussed indicators reveals that the old EU15 and new EU member states often demonstrate different behavior patterns. It would be interesting for some future research to find out if these differences are caused by nonlinearities in functional interdependences between use of e-government services by individuals and presented socio-economic indicators, or by other reasons. We indicated that in early development and usage phases of e-government services some correlations are different than in more mature phases. But, we could also offer another possible explanation.

Lower level of e-government usage is characteristic of all new EU member states and some old EU15 member states from the Southern Europe, so we could hypothesize that their different attitude towards governments is relevant motivating factor in the use of e-government services. Particularly in Central European countries we could still see some public reluctance against government that has deep historical roots.

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