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TO THE QUESTION OF THE E-GOVERNMENT PERFORMANCE ASSESSMENT

D. A. MARUSHKA^a, M. S. ABLAMEYKO^a, NGUYEN NHU SON^b

^aBelarusian State University, Niezaliežnasci Avenue, 4, 220030, Minsk, Belarus ^bInstitute of Information Technology – Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Hanoi, Vietnam Corresponding author: D. A. Marushka (dam@tut.by)

Methodical approaches to assess the e-government performance using integral and private indicators have been developed. Proposed recommendations describe the stages of conducting a comprehensive analysis and assessment of the e-government performance; include system of integrated indicators defining e-government development results and model system of key indicators for e-government performance assessment.

Key words: e-government; system of indicators; efficiency; performance; information technologies; information society.

К ВОПРОСУ ОБ ОЦЕНКЕ ЭФФЕКТИВНОСТИ ЭЛЕКТРОННОГО ПРАВИТЕЛЬСТВА

Д. А. МАРУШКО¹⁾, М. С. АБЛАМЕЙКО¹⁾, НГУЕН НХУ СЫН²⁾

¹⁾Белорусский государственный университет, пр. Независимости, 4, 220030, г. Минск, Беларусь ²⁾Институт информационных технологий Вьетнамской академии наук и технологий, 18 Хоанг Куок Вьет, г. Ханой, Вьетнам

Разработаны методические подходы к оценке эффективности функционирования электронного правительства, основанные на использовании интегральных и частных показателей и критериев. Предложенные рекомендации содержат описание этапов комплексного анализа и оценки эффективности функционирования электронного правительства, характеристику модели формирования экономических показателей системы комплексного экономического анализа функционирования электронного правительства, блок-схему формирования и анализа основных групп показателей эффективности функционирования электронного правительства.

Ключевые слова: электронное правительство; система показателей; эффективность; производительность; информационные технологии; информационное общество.

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Авторы:

Дмитрий Александрович Марушко – кандидат экономических наук, доцент; заведующий кафедрой экономической информатики экономического факультета.

Мария Сергеевна Абламейко – кандидат юридических наук, доцент; доцент кафедры государственного управления юридического факультета.

Нгуен Нху Сын – доктор наук (информатика); руководитель отдела.

Authors:

Dzmitry Marushka, PhD (economics), docent; head of the department of economic informatics, faculty of economics. *dam@tut.by*

Maria Ablameyko, PhD (law), docent; associate professor at the department of public administration, faculty of law. *masechka86@mail.ru*

Nguyen Nhu Son, doctor of science (informatics); head of the department.

nnson@ioit.ac.vn

Analysis of international experience [1-4] shows that functional e-government is a complex multidimensional process that depends on timely completed projects and accurately assessed quality of the obtained results. E-government analysis is based on different estimation periods meaning that its conduction requires assessment methods development of the e-government performance.

E-government performance and quality assessment of the obtained results could be carried out with the usage of integrated and individual indicators. The system of indicators to assess e-government performance of Belarus and Vietnam that would help make informed management decisions does not currently exist. Official statistics of the e-government development field in Belarus and Vietnam is fragmented.

E-government performance assessment should be conducted with the usage of grading system designed to analyse and identify strategic directions for its further improvement. Our attempt to assess e-government performance in Belarus and Vietnam using the data provided by the state statistical bodies revealed the lack of necessary information. Available information about amount of business entities, data-processing services and software development companies do not allow us not only to assess the e-government performance but also to make a comparative analysis of its improvement.

The demand for the system of objective indicators development also lies in the fact that e-government projects have to attract significant investment resources, which should deliver expected outcomes. E-government performance analysis should be conducted with the usage of interconnected and interdependent indicators. Such performance analysis requires systematization of indicators due to the fact that their combination regardless of their subordination and the relationship will not allow assess real outcomes of the e-government development projects. That is why it is necessary to develop integrated system of indicators that takes into account different trends in e-government development.

The system of indicators for e-government performance assessment should be developed not only on the base of existing metrics of statistical reporting but also take into account the detailed study of the information needs of government agencies, private organizations and the public focused on the goals and objectives of socio-economic development.

It is necessary for the new e-government performance monitoring system to identify a group of indicators that characterize the current state of e-government development and composition of the sources for the primary data collection. This system should take into account and reflect the characteristics of the analysed activity areas.

Indicators should be focused, clear, and specific in order to carry out calculations and obtain reliable estimates. The next requirement for such system is to provide full compatibility and interoperability parameters for the assessment. In short, the system must be independent in relation to the evaluation conditions and the research object. The system parameters can be set up only in the case of joint implementation of these two requirements that will give professionals the opportunity to obtain quantitative characteristics of e-government for its objective assessment and allow it to be used on a national scale.

This system of indicators was formed on the basis of structure-factor model that characterizes the level of e-government development. The model represents the functional components comprising four main components: U – the level of e-government development; P – political factor; E – economic development factor; S – the social factor; T – technical factor.

Hierarchical structure is represented by the contents of e-government development factors, where the highest level is formed by two political and economic factors, the next level factors by social and technical. System unity of these factors maximize the usage of each of them that increase the structure efficiency.

The developed system of indicators is focused on the e-government performance assessment that is based on the proposed structure-factor model with 194 parameters that are organized into four groups: political factors development; economic factors development; social factors development; technical factors development.

In accordance with the proposed model, the first group of indicators characterizes efficiency implementation of the socio-economic program conducted by the public administration bodies. It contains both qualitative and quantitative indicators reflecting the state of the regulatory framework. The first group includes the following parameters: concept and the program of e-government development existence; laws and regulations; participation in national and industry-specific e-government development programs and projects; amount of enterprises and workers using computers, Internet; amount of existing websites; Internet usage by type of access; LAN; extranet; Internet usage by type of activity (purpose of usage); cost of ICT (information and communication technologies) of the total corporate budget; ICT costs with the state budget.

The second group of indicators reflects qualitative and quantitative dynamics of the formation and distribution of economic resources, and includes the following criteria: tariffs for Internet access (20 hours per month / traffic); mobile cellular communication costs (100 minutes per month); number of employees in the ICT (of the total business sector); imports and exports of ICT goods and services (as a percentage of total imports and exports). The third group of indicators characterizes social factors and contains the following criteria: number of schools connected to the Internet; number of pupils per 1 computer in schools; number of students who have a PC with Internet connection (cable, wireless, broadband and DSL); number of pupils per computer with Internet access (PC used in the educational process), distributed by types of educational institutions and their geographical location; number of pupils / students per computer, distributed by types of educational institutions and their geographical location; number of pupils / students per computer connected to the Internet, distributed by types of educational institutions and their geographical location; number of pupils / students per computer connected to the Internet, distributed by types of educational institutions and their geographical location; number of pupils / students per computer of schools connected to the satellite channel of distance learning; educational institutions financial costs of ICT in the total state budget.

The fourth group of indicators allows assessing technical factors such as: information and communication technologies development, information networks access, e-commerce development. These indicators should reflect the characteristics and opportunities of ICT for the processing, transmission and presentation of various information resources and meet the generally accepted at present ICT functional definition. This group of indicators include: number of fixed telephone lines per 100 inhabitants; amount of mobile cellular subscriptions; amount of Internet subscribers with broadband access; total capacity of external Internet access channels per inhabitant; percentage of the population covered by mobile cellular network; amount of centers that provide collective access to the Internet (PIACs) per number of inhabitants (rural / urban population); number of Internet service providers; number of websites in domain zone BY.

Carrying out comprehensive e-government performance analysis requires a systemic approach that involves all e-government stakeholders in order to rationalize their relationship. In our research, the following stages of e-government performance analysis were identified:

At the first stage of the e-government performance assessment, our system of indicators that consists of five interrelated elements (resource usage, efficiency, effectiveness, impact and quality) is developed. Selection and review of indicators that characterize e-government performance are conducted at this stage. The e-government economic principle is to increase its performance in accordance with the planned budget. System analysis task is to determine the impact of any particular factor that ensure e-government effectiveness.

At the second stage a detailed indicators analysis of the e-government performance is done. For example, provided volume and composition of the information services is a general indicator, the number of qualified workers in the information sphere is a factorial indicator. Our model helps to discover relationships between the blocks and the factors that influence the change summary measure. For example, the composition and volume of information services are influenced by such factors as the cost of produced information services, average payback period of e-government projects, level of foreign demand for domestic information services. Obtained results are based on the analysed qualitative and quantitative data.

At the third stage, collected qualitative and quantitative data is analysed and assessed, and report on results is produced. It provides an objective assessment of the e-government performance and existing reserves, recommendations on the established reserves usage and description of ways to increase the e-government efficiency.

The information base for complex economic analysis of e-government performance advocates a system of indicators that includes all aspects of e-government development. Depending on the subject and the direction analysis, indicators can be combined into five sections.

Section 1. Analysis of resource intensity of e-government development. The basis of the economic e-government performance indicators represented in the section 1 contains a set of the following indicators:

- e-government projects cost;
- information activities costs;
- average payback period of e-government projects.

Economic analysis should start with the definition of the e-government projects resource intensity as it affects all other factors including demand level of information services, composition and amount of rendered computing and information services.

Literature analysis [2; 5] shows that the usage of resource intensity indicators of e-government projects is focused on all resources costs assessment, including labour, material, energy, information, etc. Exceptions are time-consuming indicators that are estimated in the next section.

Section 2. Analysis of e-government efficiency. This section is characterized by the following important indicators:

- average time to process a single query to the information system;
- number, qualifications and composition of the information field staff;
- user training requirements;
- average waiting time to access the information system.

Time spent indicators are used to assess e-government projects execution efficiency.

Section 3. Analysis of the e-government impact. Performance indicators usage should make it possible to assess quantitatively and qualitatively the following:

- level of e-government development to ensure the effective national economy development;
- quantity and quality of information resources, national and global information resources usage;
- level of the information infrastructure quality and its elements;
- access quality to the national and global information resources infrastructure;

• level of informational culture and computer literacy as well as the willingness to use the provided information resources;

• information needs requirements and the level of users' satisfaction of the e-government development results.

Identification of performance, resource intensity and efficiency indicators should be scientifically justified. On the basis of the identified indicators it is worth developing criteria to monitor e-government progress results to draw conclusions about its effectiveness.

Section 4. Analysis of the e-government effectiveness. Four key indicators characterize the section:

- e-government projects cost;
- produced information services cost;
- profit increase of the e-government facilities;
- average payback period of the e-government projects.

Sections 1–3 form a section 4 that affect the e-government effectiveness.

E-government efficiency indicators should allow capabilities assessment of the goals and performance achievement of specific development directions, compare and select the most efficient out of the evaluated areas.

Section 5. Analysis of the e-government quality. E-government quality analysis and evaluation are made by integral and partial indicators of the sections 1-4. All the qualitative indicators of the sections 4 and 5 depend on the sections 1-3 that reflect the state of e-government development (see figure).



Model system of key indicators for e-government performance assessment (source: in-house development)

Quality indicators assess the e-government state and performance indicators help to control e-government development.

The study showed that e-government performance results are characterized by the integrated indicators. Integrated indicators are divided into external and internal. National results of e-government development are characterized by external indicators that include social, economic and operational performance.

Integral estimates of the e-government performance define social indicators directly from the user needs. The social indicators system covers the users' awareness level, content and volume of provided information services, satisfaction of data services demand, number and staff qualification.

Terms of use and information systems maintenance are characterized by e-government performance indicators. The approximate composition of such indicators include the average time of a single query to the information system processing; average waiting time of information systems availability; members qualification requirements; required quantity and information workers composition and others. It is proposed to divide private indicators into three subsystems. The first subsystem is designed to assess the status of the individual areas and areas of e-government development. This subsystem includes technical and performance indicators for each area. E-government development level on key areas of national economic activity is assessed using the second subsystem of particular indicators. Third subsystem of particular indicators helps to assess support activities of e-government development. Choosing the most effective variety of alternative directions of e-government development, testing and evaluation of the identified areas allows analyzing e-government development cost-effectiveness.

E-government development cost-effectiveness is used for performance assessment that takes into account the quality and conditions in which it is carried out. E-government economic efficiency most deeply is estimated using the integrated (composite) indicators which components are selected as quality indicators. External quality indicators of e-government development are based on the principle of trust and can be included in the group noted above. This can be justified by the fact that they are focused on the e-government development impact to the greatest degree. In our view, at least three components have to be included to the economic efficiency index. Using the first component should enable to assess e-government development impact, i. e., the level of achievement of its objective (for example, the cost of manufactured and provided information services). Evaluation of the resources cost are included to the second component (e. g., the cost of e-government projects). Temporary costs associated with the achievement of a certain level of e-government development make the third component. It is impossible to evaluate the cost-effectiveness of such a complex process and calculate e-government index correctly without defined three components.

The proposed system of indicators is described as a separate component of e-government development. However, it is necessary to identify the approaches to the requirements formation and the evaluated development parameters in the assessment criteria. Research literature [2; 5] allowed us to find a solution to the given problem using the following approaches:

• carrying out comparisons with the reference sample (requirements are specified as to the meaning of the reference sample and performance properties of the estimated object);

• extreme approach (extreme value should reach the estimated figure for each property);

• carrying out quality analysis and effective object usage (based on the quality requirements of the facility or the usage efficiency produced by the evaluated properties requirements);

• empirical approach based on the expert estimates.

General provisions are reflected in the e-government effectiveness evaluation method that allows evaluating the results quality and their cost-effectiveness.

The development of e-government is a normal operation and its efficiency is the most important property that determines the operation quality. The set of properties define efficiency (as a complex property) that includes resource usage, efficiency and effectiveness. E-government resource capacity is a property that includes consumption of different types of resources in the e-government projects implementation aimed at obtaining the desired effect – results that contribute to achieving the e-government development objectives. These resources are information, labour, material, energy, money and time. The e-government effectiveness is also a property meaning the ability to provide the desired effect to e-government.

International experience analysis [2; 4] shows that the effectiveness analysis of common usage and other factors should be used carefully and sufficiently justified as the scope of their usage can be to such an extent narrow that in practice the attempt to use such a measure may entail going beyond its borders.

Complex analysis should take into account all closely interrelated indicators of the e-government development. The analysis procedure starts from the primary indicators to generalize the defining relationship of the main indicators. This order corresponds to the objective and basic principles of the economic indicators formation.

Demand for the e-government development prioritization is due to the requirements of effective development of all resources in order to ensure a focused process management system employment. It is proposed to consider the following factors in determining the priorities of the e-government development:

1) purpose of socio-economic development, demographic and geographic characteristics and the people's economic specialization;

2) coordinated policy in the field of e-government development, the coordination of the priorities on the board;

3) periodic inspection and priorities confirmation depending on the previous stage of the analysis results;

4) balance of resources and needs in the field of e-government development.

The following priority areas for the e-government development were identified:

1) social services: education, employment services, pensions, healthcare, environment, culture, trade, consumer services;

2) financial and credit system: banking system, tax system, budget, customs, trade and intermediary operations;

3) management of objects: political activities, collection and processing of statistics, information support of economic reform, property registration activities, land-use system;

4) resources and material production: agriculture, construction industry, logistics, fuel and energy complex. As it can be seen from the above, the social sphere is one of the main priorities of the e-government development so it is obvious that in a modern society professional and educational characteristics of human resources forming intellectual potential of the state is one of the most important conditions for determining the prospects of its socio-economic and innovative development. Nowadays education and science are directly involved in the production process. The intellectual capacity and information resources have become the main factor of production that are more important than traditional factors such as labour, land, capital, and entrepreneurial skills. Therefore, it seems quite reasonable to evaluate the intellectual potential input of scientists that are involved to the innovative development. It is important to identify national and international trends, compare the development pace of various e-government priority areas in different countries.

However, comparison of different countries in terms of socio-economic development was not conducted in our research. It was to define intellectual potential influence on e-government performance. In this regard, intellectual potential is defined by the following features. On the one hand, the possibilities of modern science are to provide material and technical base that is the result of scientific advances, and on the other hand, the possibility of preparing the necessary number of qualified professionals. However, it should be taken into account that health is of primary importance for the intellectual development as it affects the quality of human resources. It is obvious that the level of health and educational process duration define national intellectual potential.

Based on the above and taking into account the results obtained in our research, it was concluded that intellectual potential, information resources and information technology are the most important productive resources that are necessary for the e-government development. It is proposed to employ expert methods using primary sources received from the interdepartmental commission on the e-government development due to the lack of statistical surveys of e-government development progress and necessary indicators. The advantage of this approach is that it allows to make informed decisions when other objective methods are unacceptable.

The practical significance of the provided recommendations is that the ability to use the data for the e-government performance assessment allows to identify weak elements of the e-government development process and justify solutions for their improvement. Recommendations for e-government performance assessment could be employed by a monitoring system for making timely decisions on updating the Development Strategy of the Information Society of the Republic of Belarus that will increase its efficiency and extend the analytical basis capacity of e-government development. Theoretical conclusions and developed structural-factor model, method of e-government performance assessment can be used in the diagnosis, monitoring and adjusting the directions of e-government development.

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