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Проаналізовано системи формування міжнародних індексів електронної зрілості державного управління. Виявлено специфіку динаміки реалізації програми «Електронна Україна» у рамках базових субіндексів міжнародних систем оцінювання е-врядування. Зазначено, що прогрес у поліпшенні показників індексу он-лайн сервісу потребує відповідного контенту управлінської зрілості системи врядування. Керуючись методологією програмного менеджменту, запропоновано багатокритеріальну систему оцінки змісту процесів моніторингу національної е-програми

Ключові слова: е-врядування, електронна готовність, он-лайн сервіс, стейкхолдери, менеджмент програм, зрілість управління

Проанализированы системы формирования международных индексов электронной зрелости государственного управления. Выявлена специфика динамики реализации программы «Электронная Украина» в рамках базовых субиндексов оценки э-управления. Отмечено, что для улучшения показателей индекса он-лайн сервиса требуется соответствующий контент управленческой зрелости системы. Руководствуясь методологией программного менеджмента, предложена многокритериальная система для формирования содержания процессов мониторинга национальной э-программы

Ключевые слова: э-управление, электронная готовность, он-лайн сервис, стейкхолдеры, менеджмент программ, зрелость управления

UDC 005.8:061.1
DOI: 10.15587/1729-4061.2016.71606

E-READINESS EVALUATION MODELLING FOR MONITORING THE NATIONAL E-GOVERNMENT PROGRAMME (BY THE EXAMPLE OF UKRAINE)

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1. Introduction

Use of information and communications technologies (ICTs) is a necessary component of programmes and projects to increase public administration efficiency. ICTs can help improve the quality of public services, transparency of power and the level of trust to it among citizens as well as produce an overall positive effect on the competitiveness and welfare of nations. Special methods are developed and indices are calculated to assess the level of implementing the e-government tools that determine the rankings of the corresponding countries (including the Networked Readiness Index [1] and the UN E-Government Development Index [2, 3]). In spite of the rapid rate of globalization, there are significant differ-

ences between countries in terms of their use of ICTs. The global indices demonstrate a general tendency to a quite slow development of digital transformations in most countries, even with a further increase of a "digital gap" between them and the leading countries. To date, some uncertainty still remains as to evaluating e-government in both theory and practice. Thus, the developers of the study "Global e-readiness – for WHAT" even by the very title encourage finding an answer to the fundamental question: how can global e-readiness be utilized? Should the approach to e-government evaluation have the same template for all countries, or is it necessary to consider national peculiarities? [4].

Many governments continue to seek ways to improve the efficiency of digital transformations, taking into account both their positions in the global indices and the national characteristics of e-government contents [5, 6]. After all, in every country, e-government programmes are implemented under special national conditions in which the software environment is a set of specific external and internal factors that hinder or accelerate the electronic development of the country. The so-called "digital divide" among European countries has become the object of special emphasis in the EU E-Government Action Plan 2016–2020 [7]. In order to provide a reliable basis for an objective assessment of the country's level of achieving its goals, a respective analytical and empirical substantiation is developed to determine the national level of e-readiness for each individual country.

Adaptation to the European content of e-government has become important for Ukraine too on its way to implementing the action plan on the EU-Ukraine Association Agreement. It is necessary to overcome the negative tendency in the digital transformation of Ukraine from the 45th position in 2003 to the 87th position in 2014 [8]. This situation requires increasing attention to monitoring the national programme "Electronic Ukraine" and to the use of analytical tools that allow for national peculiarities beyond the global content of e-governance. While there is still some information and analytical uncertainty in the action plan for developing e-Ukraine, managerial decisions are made under the conditions of incoherent political goals without any possibility to assess the dynamics of the digital transformations through a multi-criteria system.

In the Ukrainian scientific community, there has been analytical intelligence assessment regarding national efforts for implementing e-governance. However, the authors of the suggested scientific and practical solutions did not give any special attention to the development of the national e-content in Ukraine. This epistemological situation particularly determines the relevance of scientific research on the development of analytical tools that would be based on the conceptual approaches of global indices and would be adapted to the specific software environment of e-Ukraine.

2. Analysis of previous studies and statement of the problem

The general theoretical framework for understanding the value of e-government has been provided by studies of "information society". The authors note that ICTs have the potential not just to reduce operational management costs but also to influence the political system, increasing the transparency of government and strengthening its participatory component (involvement of citizens in the development of socio-political decisions). At the national level (particularly in Saudi Arabia [6], India [9], and Greece [10]), methodological approaches to the e-government system are developed with a focus on developing e-services for citizens.

Nowadays, there has been a conceptual change of emphasis in the development of global indices. Since 2012, the UN has emphasized the importance of e-governance by using the term "e-governance" along with the term "e-government". An important aspect of this approach is expansion of the boundaries of e-government to its transformative role in the integration processes and institutions through which sustainable development occurs [2]. Similarly, the International Economic Forum extends the context of the problem by focusing attention on the role of ICTs for economic growth and suggesting an index of the countries' e-readiness. The 2015 report expands the role of ICTs beyond increasing productivity positions as a significant vector of social development [1].

At the same time, researchers point out that many countries are mainly characterized by such efforts in developing e-government that do not lead to qualitative social changes [11]. The researchers argue that e-governance development in most countries has a narrow focus and it primarily focuses on provision of information services rather than on the development of horizontal links between the state and its citizens. Some Ukrainian studies can be referred to the "first generation" of evaluating e-readiness: they focus on the problems of implementing the concept of e-Ukraine and the strategic directions of their solution [12] and outline the conceptual framework of information support of higher state authorities [13]. There have also been attempts at an analytical review of the problem of assessing e-government effectiveness [14].

It should be noted that nowadays the phenomenon of e-government, being multidimensional, becomes the object of studies that are rather diverse in their contexts and objectives. In particular, researchers are trying to analyse the differences in the electronic development of states under the influence of the national-cultural factor by applying the Geert Hofstede model [15].

There is a large gap in research moving from theoretical to practical exploration and implementation of ideas and concepts. This issue is raised in [16, 17]. The authors note that the existing indices for measuring e-government provide little information on how they were built and how they can be adjusted so that it would be possible to analyse the opportunities of a particular country. The absence of a reliable basis for empirical analysis induces scholars to pursue further research.

Interest in implementing the techniques for assessing e-government has also increased in Ukraine. For example, the Harvard method of calculating the integrated e-readiness index is taken as a basis in the Dnipro (Dnipropetrovsk) Region for the regional project of e-government [14]. A general evaluation system is also suggested to be used for regional e-governance projects.

However, Ukrainian researchers still have not offered any solution on the comprehensive assessment of the quality of the national projects on e-government. There are no such instruments in the published monitoring reports on the state of information society in Ukraine [18, 19]. It is especially important to find a solution to the problem of strengthening such a form of e-readiness as e-participation of the government, public, and businesses.

3. Research goal and objectives

The study is aimed at developing a solution to evaluate progress of a national e-government programme on the basis of a methodological platform of the Project Management Maturity Model (PMMM). To attain this goal, it is important:

– to analyse the global and national contents of e-government evaluation at a country level;

– to offer instruments for improving the contents of monitoring the programme "Electronic Ukraine" in terms of assessing its e-readiness.

4. Modelling of e-government evaluation: a case study of Ukraine

An overview of a relevant procedure with regard to the UN index of Ukraine is suggested to determine the information content that is required for modelling the assessment of the progress in implementing the national e-governance programme. The UN offers a generalized EGDI (the United Nations E-Government Development Index) that takes into account the system parameters of such three groups:

(1) the Online Service Index (OSI);

(2) the Telecommunication Infrastructure Index (TII);

(3) the Human Capital Index (HCI) as well as an additional parameter of the level of involvement of citizens in electronic governance (E-Participation, EPART).

According to these indices, the 2003–2014 positions of Ukraine were the following (Table 1).

It is obvious that Ukraine already demonstrated a high level of readiness for the implementation of e-government in 2008, when it had the forty-first position. Moreover, at that time it was the first position among the CIS countries and the fourth place, after the Baltic states, among the post-Soviet space countries. Considering the fact that the current positions of Estonia, Lithuania, and Latvia (according to 22, 31, and 33) are an example of high achievements on the way to developing information society [4], the Ukrainian e-government regression needs explaining.

Table 1

Ukraine's positions in international rankings of e-governance from 2003 to 2014

Global e-government indices	Years							
	2014		2012	2010	2008	2005	2004	2003
The E-Government Development Index (EGDI) of Ukraine	0.5032	87	68	54	41	48	45	54
The E-Participation (EPART) Index of Ukraine	0.4314	77	83	48	14	28	24	24

A more detailed analysis of the global indices and sub-indexes reveals that Ukraine has had a high rate of human capital of 0.8616 [3] and a low rate of the telecommunication infrastructure index (TII) of 0.3802 [3]. However, there can be notices insufficient but still positive TII dynamics, as in 2003 the figure was 0.1157. Regarding the OSI, the following situation is observed: 2003 – 0.3493, 2014 – 0.2677 [8], whereas, during the analysed period, the technical infrastructure had improved almost threefold.

According to the revealed dynamics of Ukrainian e-governance development, progress depends on further improvement of the telecommunications infrastructure, but to a greater extent it requires expansion of online services. It is improvement of both indices – the OSI and the TII – that should be the country's priority issue for raising its overall index in the global ratings. While developing national strategies, it is necessary to focus on the indices that are essential for the country. The UN evaluation method, based on the average of three indices [2], has to be extrapolated onto the specific Ukrainian situation. It is expedient to evaluate the country's e-readiness by the use of weighting coefficients instead of a weighted average (Fig. 1).

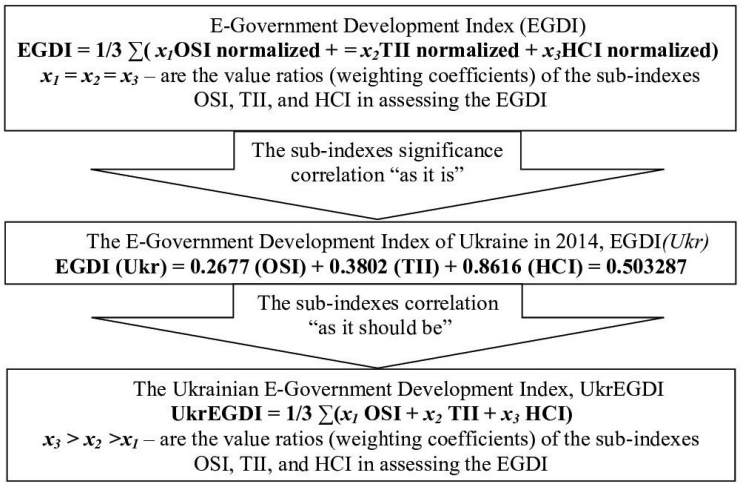

Fig. 1. The correlation of the weighting coefficients importance in assessing the country's e-readiness

It is also important to note a complexity of the OSI measurement method, as the expected assessment involves qualitative rather than quantitative values. It concerns four stages of developing and providing online services [3]:

– *stage 1*: emerging information services: government websites providing information on public policies, governance, laws, regulations, relevant documents, and the types of government services provided;

– *stage 2*: enhanced information services: government websites delivering enhanced one-way or simple two-way e-communication between government and citizens, such as downloadable forms of government services and applications;

– *stage 3*: transactional services: government websites engaged in two-way communication between the government and citizens, which can include requesting and receiving inputs on government policies, programmes, and regulations; citizens can get specialized data and download various forms after electronic authentication of their identity;

– *stage 4*: connected services: government websites use Web 2.0 and other interactive tools to communicate with citizens. E-services and e-solutions cut across the departments and ministries in a seamless way; information, data

and knowledge are transferred from government agencies through integrated applications. The government creates an environment that empowers citizens to be more involved in government activities to have a voice in developing and making decisions.

Experts assessing the level of online services development in Ukraine argue that only the first stage of the online services – the "emerging presence" – has been developed, but the other stages remain rudimentary. Currently, Ukrainians can use a number of services that have been launched by the State Agency for E-Governance in Ukraine in collaboration with NGOs and foreign organizations [20]. However, the e-circulation management of documents between government offices is completely absent [21]. Ukraine is claimed to have even no basic components of e-government. Consequently, it is not surprising that the OSI data on Ukraine correspond to the following sub-indexes: the first stage – 75 %, the second stage – 20 %, the third stage – 5 %, and the fourth stage – 18 % [3]. While outlining the prospects of e-services in Ukraine, especially in terms of the necessity to develop a stable second stage, it is important to identify the relevant priority directions for activities. Since the obstacle is not the technical development factor, problems exist at the level of the management system. A higher stage of developing online services requires transformations in the management system.

Therefore, it makes sense to suggest that OSI progress should be achieved through evaluating its current index and developing relevant improvement strategies on the basis of knowing the essentials of programme and project management, including the Harold Kerzner Project Management Maturity Model (PMMM) [22], which distinguishes between five maturity levels:

(1) common language (the use of basic knowledge on project management);

(2) common processes;

(3) a singular methodology (the unification of corporate methodologies to obtain a synergistic effect);

(4) benchmarking processes (to maintain a competitive advantage);

(5) continuous improvement.

According to the Harold Kerzner model, a certain "point of no return" for managerial transformations is the second level, whereas the achievement of the third level of maturity implies fundamental changes in the corporate management culture. Benchmarking at the third level helps accelerate and continuously improve the system development. The third, fourth, and fifth levels of the PMMM eventually form a peculiar management cycle [23].

There is certain interdependence in the extrapolated four management maturity levels of online services:

– the first stage of online services development should be accompanied by formation of a relevant administrative culture that can facilitate effective implementation of projects primarily related to the expansion of information services;

– the third level entails implementation of the national government programmes and projects for transactional services development, which is possible if there is a relevant management system, with project management as an integral part thereof; in fact, it is an "access" to further improvement;

– the fourth stage of online services requires a correspondingly high (third) level of management maturity, which opens a "fast access" to achieving the objectives of e-government (Fig. 2).

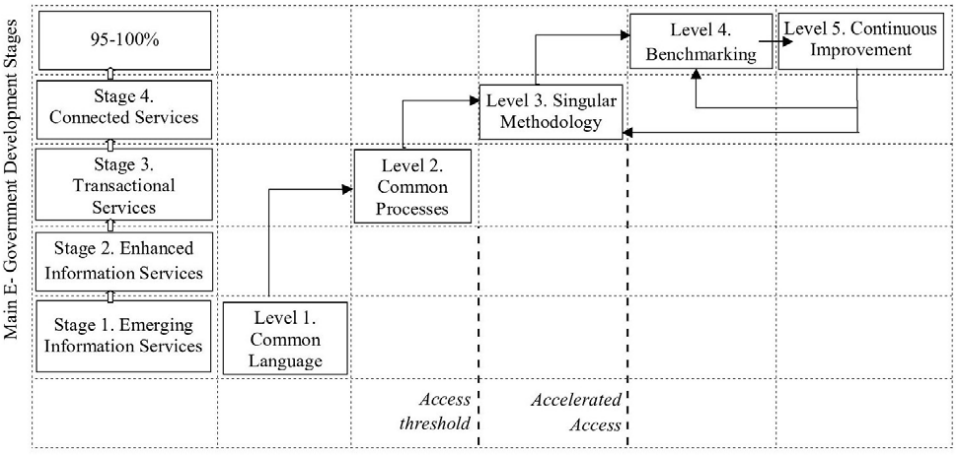

Fig. 2. The conceptual diagram of the e-management maturity

Since Ukraine has already developed the first stage of online services and its further development depends on the management context, it is necessary, firstly, to outline the system of parameters for proper evaluation thereof and, secondly, to introduce "treatment proceedings" for decision-making on selecting projects of e-government. In order to solve this problem, it is appropriate to use indices and sub-indexes of e-readiness (including the Networked Readiness Index, NRI) of the World Economic Forum [1], namely:

– the environment assessment for ICTs (A.1. *Political and regulatory environment sub-index*), which determines the extent to which the existing political and regulatory framework promotes the "penetration" of ICTs according to the nine parameters: effectiveness of law-making bodies (1.01), laws relating to ICTs (1.02), judicial independence (1.03), efficiency of the legal system in settling disputes (1.04), efficiency of the legal system in regulating government-to-business relations (1.05), intellectual property protection (1.06), the software piracy rate (1.07), the number of procedures to enforce a contract (1.8), and the number of days to enforce a contract (1.09);

– the assessment of e-readiness of the country's main stakeholders to use ICTs (B.8. *Government usage sub-index*), including parameters such as: the state significance level of ICT (8.01), the online state service index (8.02), government success in ICT promotion (8.03);

– the assessment of using ICTs by stakeholders (C.10. *Social impact sub-index*): ICT usage and management efficiency (10.03).

To formulate the "action plan" of developing e-Ukraine (achieving the second level of maturity), we suggest choosing the projects or project actions that focus on:

– the conformity to the "Electronic Ukraine" programme mission (how the fulfilment of an activity affects the solution of certain programme tasks and improves e-readiness indices and sub-indexes);

– the implementation of innovative forms of governance (involvement of all groups of stakeholders; establishment of cross-functional relations);

– the needs of the programme beneficiaries;

– the balance system of quantitative and qualitative parameters for monitoring and evaluating projects and project activities.

One of the objectives of implementing innovative programmes is to maximize the value (increase the effectiveness of projects and project activities and, subsequently, improve the indices and sub-indexes of the country's e-readiness). To include projects and project activities into the programme "Electronic Ukraine", we suggest analysing the projects from four evaluation perspectives:

– the e-project's compliance with the programme strategy;

– the feasibility of implementing the project by the project team (project management office, PMO);

– the influence of stakeholders on the e-project;

– the results of the e-project expected by its stakeholders, including beneficiaries.

Each group of criteria includes a number of individual parameters and has its "own" evaluation system (Table 2).

Table 2

Criteria for evaluating IT project(s) for inclusion in the action plan of the state programme "Electronic Ukraine"

№	Project evaluation criteria	Criteria description	Criteria assessment scale, in points
1	2	3	4
I. Conformity of the e-project to the "Electronic Ukraine" programme strategy			
1	Value	determines the ability of the management system (the project team or the project office) to create a multi-dimensional (additional) value of the e-project in the context of the UN ranking	5 – a significant increase of the global Ukrainian E-Government Development Index, UkrEGDI (a positive synergy of 2+2=25...50...); 4 – an increase of the global Ukrainian E-Government Development Index, UkrEGDI (a positive synergy of 2+2=5); 3 – a significant increase of one of the sub-indexes (OSI or TII); 2 – an increase of one of the sub-indexes (OSI or TII); 1 – an increase of the sub-index "human capital" (HCI); 0 – no change in the e-readiness indices (unchanged UkrEGDI); –3 – a significant decline of one of the sub-indexes (OSI or TII); –5 – a significant decline in the global Ukrainian E-Government Development Index, UkrEGDI
2	Vision	determines the level of vision of management capacities on the part of the project management office (PMO) for the implementation of the e-project	5 – use of the methodology of managing innovative projects and programmes (applying P2M); 4 – compliance with the ratio of the sub-indexes of the e-readiness of Ukraine: $x_3>x_2>x_1$; 3 – project-oriented management (applying Project Management Body of Knowledge, PMBoK); 2 – compliance with the ratio of the sub-indexes of the e-readiness of Ukraine: $x_1=x_2=x_3$; 1 – functional management * the maximum grade point by the project evaluation criterion of "vision" can be 9
3	Project and project actions conformity to the indices and sub-indexes	defines the e-project as a specific target/objective on the strategic map of e-governance	The e-project is aimed at improving: 1 – the efficiency of law-making; 1 – the quality of regulations relating to ICTs; 1 – the independence of the judiciary system; 1 – the efficiency of the legal system to resolve disputes; 1 – the regulation (interaction) of relations between government and business; 1 – the protection of intellectual property; 1 – the state importance level of ICTs; 1 – the index of online public services; 1 – the government success in ICT promotion; 1 – the use of ICTs and administrative efficiency. The e-project is aimed at reducing: 1 – software piracy; 1 – the number of procedures to enforce a contract; 1 – the number of days for fulfilling the contract * the maximum grade point by the project evaluation criterion of "conformity to the indices and sub-indexes" can be 15
II. Feasibility of implementing the project by the project team (project management office, PMO)			
4	Competence of the project management team/office (PMO)	determines the positive experience of the project team/office in implementing similar e-projects	5 – more than 10 years of experience; 3 – 5 to 10 years of experience; 1 – less than 5 years of experience; 0 – no experience
5	Reputation of the project management team/office (PMO)	determines the team's background in using the "best practices" of managing similar e-projects	5 – has successfully implemented more than five big projects or programmes of e-governance; 3 – has successfully implemented two big projects of e-governance; 1 – has successfully implemented one big project of e-governance; 0 – has not implemented any successful project of e-government (only negative experience)

Continuation of Table 2

1	2	3	4
6	Financial analysis and risk assessment	determine the payback period and the net present value (NPV) of the e-project as well as the share of investment into the project by managers of financial resources of the "Electronic Ukraine" programme	5 – a high level of acceptability; 3 – an average level of acceptability; 1 – a low level of acceptability; 0 – not acceptable
7	III. The stakeholders' impact on the e-project	determines the degree of influence of the stakeholders on the implementation and outcomes of the e-project	1 – a positive influence; 0 – no influence; –1 – a negative influence
8	IV. The stakeholders' evaluation of the e-project	determines the level of meeting the stakeholders' needs in the implementation and outcomes of the e-project	5 – a high level; 3 – an average level; 1 – a low level; 0 – no influence; –1 – a negative influence

The e-project evaluation as to its conformity to the "Electronic Ukraine" programme strategy should include three elements: the value, the vision, and the objectives of the programme. The "value" parameter can be assessed by determining whether the management system can create an added value to the project/programme, which implies creation of a positive synergy effect (an increase of the global UkrEGDI). The level of the managerial capacities of Ukraine in managing innovation programmes according to international standards affects the "vision" parameter of the state in terms of the e-governance strategy development. Furthermore, it is necessary to determine the correlation between the e-government objectives and the specific actions (contents and contexts) of an e-project. The partial model of the e-project assessment as to its conformity to the electronic control strategy takes the following form:

$$ST_k = z_1 D_k + z_2 V_k + z_3 G_k, \quad (1)$$

where D_k is the value of a k-th e-project; V_k is the vision of the k-th project; G_k is the conformity of the k-th e-project to the programme objectives; z_1, z_2, and z_3 are the weighting coefficients; k=1; k is the number of e-projects.

To monitor an e-government programme, it is necessary to take into account the assessment of the e-project feasibility and its implementation expedience produced by a certain management team/office (RMO) (2). Therefore, the RMO experience is determined with regard to the record of the "best practices" and reputation in managing similar e-projects. The mandatory elements of any project assessment are a thorough financial analysis and a risk assessment:

$$FR_k = y_1 K_k + y_2 I_k + y_3 C_k + y_4 R_k, \quad (2)$$

where FR_k is the estimate of an e-project feasibility produced by the project management office (PMO); K_k is the degree of the PMO competence in implementing e-projects similar to the k-th one; I_k is the image (reputation) value of the PMO in implementing e-projects similar to the k-th one; C_k is the value of the k-th project by financial parameters:

$$C_k = \sum_{j=1}^{j'} C_{jk} z_{ik},$$

where j is an exponent of the e-project fiscal analysis (including the payback period, the net present value (NPV), and the investment), z_{jk} is the importance degree of a j-th exponent in the fiscal analysis of a k-th e-project; R_k is the estimate of the risks of the k-th e-project; y_1, y_2, y_3, and y_4 are weighting coefficients.

Further, the logical structure of decision-making includes the issue of the stakeholders' influence on the e-project. The parties interested in introducing e-governance are: the state, the business, the citizen, and the e-project team (the project management office, PMO). Their impact on the project can be both positive and negative. Elaboration of the "action plan" requires a "balance of interests" of the participants concerned. Therefore, we suggest assessment of the stakeholders' influence on an e-project:

$$SH_k = \sum_{l=1}^{l'} SH_{lk} v_{lk}, \quad (3)$$

where SH_{lk} is the extent of influence of an l-th stakeholder on a k-th e-project; v_{lr} is the degree of interest of a certain l-th stakeholder in the outcome of the k-th e-project; l' is the number of stakeholders of an e-project (l'=3).

Furthermore, special attention is drawn to the fact that the added value of electronic control depends on the evaluation of an e-service by its users. For example, the recipient of an email service can be a "citizen" represented by various social or gender groups: the young, working vs. unemployed men and women, the elderly, people with disabilities, families in difficult circumstances, etc. Every social group has its "own" needs and expectations as to the structure and essence of services and electronic access to them; besides, every social group has a different level of IT provision and IT competence (Table 3).

Thus, we suggest a partial model of project evaluation by its beneficiaries:

$$B = \begin{bmatrix} B_{11} & \dots & B_{1x} \\ \dots & \dots & \dots \\ B_{m1} & \dots & B_{mx} \end{bmatrix}, \quad (4)$$

where B is the determinant of the matrix of e-services evaluation by the e-project beneficiaries; m is the number of groups of the beneficiaries; *x* is the number of parameters by which the beneficiaries evaluate the results of the e-project.

Table 3

The matrix of electronic services evaluation by its beneficiaries

The indicator/estimate of the electronic service quality	Social, gender, or otherwise specific groups of users				
	B_1	B_2	B_3	...	B_m
I_1	B_{11}	B_{12}	B_{13}	...	B_{1m}
I_2	B_{21}	B_{22}	B_{23}	...	B_{2m}
I_3	B_{31}	B_{32}	B_{33}	...	B_{3m}
...	...	...	...	...	...
I_x	B_{x1}	B_{x1}	B_{x1}	...	B_{xm}

The resulting generic estimate of the e-project context in terms of the "action plan for creating high-quality electronic services" can be presented in the following way:

$$R_k = \lambda_1 ST_k + \lambda_2 FR_k + \lambda_3 SH_k + \lambda_4 BF_k, \quad (5)$$

where ST_k is the value of a k-th e-project in its compliance with the "Electronic Ukraine" programme strategy; FR_k is the estimate of the k-th e-project in terms of its economic impact and safety; SH_k is the degree of the stakeholders' influence on the k-th e-project; BF_k is the beneficiaries' estimate of the k-th e-project; λ_1, λ_2, λ_3, and λ_4 are the weighting coefficients.

The model developed from (1) through (5) refers to a task of multifactor mathematical programming. It needs solving by reducing one or a set of single-factor problems. In a situation where one individual makes the decision (individual decision making, IDM), it is necessary to take into account all the partial criteria, and the generalized quality functional becomes the following:

$$F(ST,FR,SH,BF) = \lambda_1 ST + \lambda_2 FR + \lambda_3 SH + \lambda_4 BF,$$

$$\sum_{i=1}^{4} \lambda_i = 1, \quad 0 \le \lambda_i \le 1, \quad (6)$$

where F is an additive utility function, which is seen as a set of characteristics of the e-project; α_i stands for the weighting coefficients, $i = \overline{1;4}$.

The overall solution of the tasks developed from (1) through (6) can be made in a sequence, with the primary necessity to determine the weighting coefficients a_i of the additive utility function (6). The numerical values of the weighting coefficients are found by an expert method, such as a method of analysing hierarchies. The problem is further solved by integer linear programming methods.

5. Discussion of the results of modelling e-governance evaluation at the national level (the example of the "Electronic Ukraine" programme)

The basic model developed for evaluating e-government contains significant epistemological potential for measuring the progress level in the implementation of e-government projects. This model enables the explication of global indices at the national level and takes into account the specific parameters of e-Ukraine (the development level of online services, telecommunications infrastructure, and human capacity). Moreover, the parameters for assessing the level of management efforts to develop e-Ukraine have been outlined by integrating the indicators of management maturity into a multi-criteria model. It primarily concerns such a group of stakeholders as civil servants.

The inclusion of the project management focus in the model of assessing the national programme "Electronic Ukraine" has allowed obtaining an analytical tool – a multi-criteria evaluation model for decision-making in the management processes concerning the monitoring of the "Electronic Ukraine" programme. Besides the structural modelling, it is suggested that the use of mathematical modelling can help coordinate various information groups (e-government sub-indexes).

The developed tools are essential for further improvement of the system of monitoring e-governance evaluation, the analysis of the national e-readiness data for the successful implementation of e-government policies, and ensuring maximum coherence with the international assessment system of e-governance. The suggested model allows government institutions to plan and develop sustainable "road maps" to improve the dynamics of implementing national target programmes and to take higher positions in the UN ranking (including the UN Global E-Government Development Index). In addition, the proposed analytical tools will be useful to expand the investment content of the e-Ukraine programme. Since a multi-criteria assessment of e-government programmes enhances the transparency of each e-programme, it makes the electronic reform open to investment from international organizations whose financial support sustains development projects (in particular, the Municipal Governance and Sustainable Development Project (UNDP/MGSDP) [24] supported by the World Bank, the European Bank for Reconstruction and Development, etc.).

However, the authors' approach needs developing and improving, especially due to the difficulty of measuring the e-readiness of a country by a number of sub-indexes. The UN also recognizes the problem and admits that the approach to developing international statistics is still rudimentary [4].

The present study, which logically continues previous scientific research [25], has outlined the analytical and instrumental perspectives of subsequent work on implementing e-governance evaluation at a local level (in particular, in the regional programme "Electronic Kharkiv" [26]).

6. Conclusion

The undertaken analysis of developing e-government global indices has shown that the approach to determining the ranking of countries by calculating the average value of three sub-indexes contains uncertainty. The extrapolation of the UN method onto Ukraine has revealed absence of a balanced interdependence of the three basic sub-indexes – OSI, TII, and HCI – because over the last decade the TII has demonstrated progress, the OSI – regression, and the HCI – invariability. A conclusion can be made on the necessity to evaluate the dynamics of the "Electronic Ukraine" programme by introducing weighting coefficients for the e-governance indices and sub-indexes.

The importance of the OSI index has been emphasized in the context of its specific evaluation in the form of online service stages. The project management maturity model (PMMM) has been considered as a conception basis for improving the set of evaluation proceedings. In order to improve the contents of monitoring the state programme "Elec-

tronic Ukraine", we have developed a multi-criteria model for decision-making within the evaluation of e-projects.

The process of selecting e-government projects should consider the following e-readiness indices: evaluation of the ICT environment, e-readiness of the main stakeholders (government) to use ICTs, and use of ICTs by stakeholders. The suggested system of measuring progress in the implementation of e-programmes includes sub-indexes that attract the stakeholders' attention not only to the individual values obtainable from achieving the objectives of a programme but also, in the case of Ukraine, to the possible progress of the country in its promotion through global indices.

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