

Methodological Approaches to Evaluation of Information System Functionality Performances and Importance of Successfulness Factors Analysis

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Summary

The necessitate of Information System functionality performances evaluation has emerged from the importance of Information Technology in effectiveness and efficiency of work processes in an organization, causing rapid growth of demands in sense of resources performances in Information System. The main purpose of Information System functionality performances evaluation is upgrading and especially improvement in quality of maintenance.

Key words

information system, knowledge management, information systems performance

1. The meaning and purpose of information system functionality performances evaluation

The necessity to evaluate the functionality performances of Information System has emerged from the importance of Information Technology in effectiveness and efficiency of work processes in an organization, causing rapid growth of demands in terms of resources performances in Information System. Evaluation of Information System performances means evaluation of performances in hardware, software, computer networks, data and human resources. The main purpose of Information System functionality performances evaluation is upgrading and especially improvement in quality of maintenance.

The Information System functionality evaluation represents the procedure of assessing how successfully Information System fulfills its objectives. The process of evaluation includes synthesizing and determining gathered individual scores with the purpose of forming common opinion about the functionality of evaluated Information System. In the process of expressing general opinion professionals usually rely on their individual assessment abilities. Quality assessment and Information System oversights is done with the purpose of organization's Information System

resources preservation and data integrity, in other words preservation of Information System functioning at the desired level of successfulness. The following may be regarded as the most important factors that influence the success of an information system: functionality of Information System; data quality; expected usefulness of Information System; expected usage simplicity of Information System; self-efficiency of Information System user; usage of Information System; influence of information system on individuals; Information System user's satisfaction and organizational factors.

Information System user's satisfaction is often used for the assessment of Information System functionality performances. The relation between Information System user and Information System functionality is very complex, since the Information System user satisfaction depends on interaction between a user and Information System, which determines user's subjective rating on increased quality of his work. Nowadays, experts are using a number of different instruments for measuring the user's satisfaction with the Information System, among which several are particularly emphasized: (a) the relation between user and Information Technology professionals, (b) definition of demands for change in Information System, (c) current and prompt

information, (d) user's level of training for work with Information System, (e) quality of output information, (f) quality of available documentation and (g) user's level of dependence on Information System.

2. Information system functionality performances evaluation

During last decades, a large number of authors have addressed the issue of Information System performance evaluation. Most of complexes and classifications of criteria for evaluation of Information System functionality and successfulness in organization are defined. In this field of interest, several studies stand out, such as DeLone and McLean, proposed by Bailey and Pearson, referred by Avison and Fitzgerald, Burch and Grudnitski. Evaluation criteria of Information System functionality performances referring to the user's satisfaction with Information System in the frame of TQM concept (Total Quality Management) are considered as Information System top validation.

Bailey and Pearson (1983, pp. 519-529) have defined 39 important factors which were used for assessment of user's satisfaction with Information System. Moreover, for each factor they set a criterion for its measuring. According to these authors, factors that influence user's satisfaction with Information System are: response time, accessibility, characteristics of used computer language, realization of users' demands, correction of mistakes, model and data safety, system documentations and procedures, system flexibility and system compatibility; accuracy of output, promptness of output, output precision, output liability, output's due date, completeness and output format, output capacity, top management participation, payment method for expenses of services, user's trust in the system and user participation, user's expectations from support of computer based system, business effects from the support of computer based system and observation benefits, technical abilities of CBIS employees (Computer-Based Information System), position of CBIS employees, schedule of CBIS products and services, necessary time for information system department to fulfill demands, processing period for demands of system alteration, support provided by the salesman, methods and means input/output with CBIS center, user's understanding of the system and provision of user training, compatibility between CBIS and other departments, priorities in resources distribution in CBIS, relations between

users and CBIS employees, communication between users and CBIS employees, personnel control over CBIS and organizational position of the CBIS unit.

De Lone and Mc Lean (1992) attempted an evaluation of Information System successfulness, and proposed 180 traits of Information System, which they classified in six main categories:

- System quality: measurements of Information System itself;
- Information quality: measurement of Information System output;
- Information manipulation: recipients' handling of Information System output;
- User Satisfaction: recipients' response to handling the Information System output;
- Individual influence: effects of information on recipients' behavior;
- Organizational influence: effects of information on organizational performances.

However, it has been noticed that these six categories refer only to systematic aspects of Information system successfulness, while overlooking the human aspects. This oversight can be solved with factors proposed by Bailey and Pearson, which cover both of these aspects. They combine the first five dimensions suggested by DeLone and McLean, leaving out organizational influence. Additionally, they include human aspect in Information System successfulness, such as Information System quality of service and conflict resolution between the users and Information Technology professionals. Information System quality of service includes the following: improving users' system knowledge, role and competencies of Information Technology professionals and efficiency of services. Resolution of conflict includes: competition between the users and Information Technology professionals for the organization's resources, assignment of information resources to users, communication and relation between users and Information Technology professionals, control of Information Technology professionals, and the organizational position of the Information Technology Department.

Li (Li & Cheung, 1987, pp. 15-28) argues that Bailey and Pearson's list of factors presenting 39 criteria for Information System quality, are in line with identified dimensions of DeLone and McLean (1992). The flaw is that they have left out the dimension of "organizational influence", which is due to a fact that users of all levels are more

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concerned with the influence of Information System on personal performances, rather than to the performances of the organization as a whole. Therefore, they propose to add performances that should correct this overlook to the Information System performances influencing the quality of organizational functionality. "Re-done" method looks as follows:

1. Information System Performances: response time, accessibility, characteristics of used computer language, realization of user's demands, correction of mistakes, model and data safety, system documentation and procedures, system flexibility and system compatibility;
2. Information performances: accuracy of output, promptness of output, precision of output, reliability of output, arrival of output, output completions and output format;
3. Information manipulation: output capacity;
4. User satisfaction: top management participation, payment method for expenses of service, user's trust in the system and user participation;
5. Individual influence: user's expectations from support of computer based system, business effects from the support of computer based system observation of benefits;
6. Performances of service: technical abilities of CBIS (Computer-Based Information System) employees, position of CBIS employees, schedule of CBIS products and services, necessary time of information system department for fulfillment of demands, processing time for alteration of system demands, support provided by the salesman, methods and means of input/output with CBIS center, user's understanding of the system and providing training for users;
7. Conflict resolution: competencies between CBIS and other departments, priorities in resources distribution of CBIS, relations between users and CBIS employees, communication between users and CBIS employees, personnel control over CBIS and organizational position of the CBIS unit.

Therefore, seven more factors for evaluating Information System successfulness have been added to the 39 factors defined by Bailey and Pearson. These seven factors are: user's attitude toward usage of CBIS (follows into group of

"conflict resolution"), clarity of output, transparency of output (goes into group of "information quality"), productivity of tools supporting organizational structures (follows into group of "user satisfaction"), improvement of productivity thanks to CBIS, efficiency and effectiveness of system (these factors go under the group "organizational influences"). The number of factors for measuring successfulness of information system has increased to 46, which cover all eight categories.

Avison and Fitzgerald (1995) state the following criteria for the assessment of information system quality: acceptability, availability, cohesiveness, compatibility, documentation, learning simplicity, economization, efficiency, development speed, flexibility, functionality, implementation ability, low juncture, maintaining easiness, portability, reliability, sizeable, safety, simplicity, confidentiality, promptness and visibility.

Finally, we would like to point out one more methodological solution. Starting from previous approaches and criterion classification for information system functionality performances evaluation, a group of domestic authors have suggested their own method and classification, presented in table 1 (Balaban, Ristić, Đurković, Trninić, & Tumbas, 2006, p. 469). This method maneuvers with 22 criteria (traits) of the information system which are measured with a five-degree numeric scale of Likert type.

Table 1 Criteria for evaluating the performance functionality of information system

No.	Criteria	Agreeing completely		Disagreeing completely		
		5	4	3	2	1
1.	Users (and managers) perceive IS as satisfactory	5	4	3	2	1
2.	IS is approachable to users whenever and wherever they need it	5	4	3	2	1
3.	IS is compatible to other parts of organization	5	4	3	2	1
4.	Existing good documentation that describes IS and formal procedures for usage	5	4	3	2	1
5.	Good user's training for usage of IS	5	4	3	2	1
6.	IS can be easily altered and adapted to new conditions and demands	5	4	3	2	1
7.	High compliance between user's demands and IS abilities	5	4	3	2	1
8.	No large amount of effort needed for maintaining satisfactory functioning of IS	5	4	3	2	1
9.	Appearance of mistakes is minimized	5	4	3	2	1
10.	Usage of IS is very simple	5	4	3	2	1
11.	High safety of data and the model in IS	5	4	3	2	1
12.	IS in very good manner provides achievement of business and organizational goals	5	4	3	2	1
13.	IS helps organization to achieve high benefits with relatively small investments	5	4	3	2	1
14.	Detail check can be done in IS in order to minimize operational mistakes and dissatisfaction of user	5	4	3	2	1
15.	Clarity of IS output information is high	5	4	3	2	1
16.	Output information of IS are consistent	5	4	3	2	1
17.	Output information of IS are accurate enough for their purpose	5	4	3	2	1
18.	Necessary output information of IS are prompt	5	4	3	2	1
19.	Content of output information of IS is elaborated enough	5	4	3	2	1
20.	Output information of IS are very important for solving business problems and achievement of organizational goals	5	4	3	2	1
21.	Presentation of output information of IS is in appropriate form	5	4	3	2	1
22.	IS in great deal provides information necessary for decision making in managing organizationstrategically	5	4	3	2	1

3. Importance of information system successfulness factors

Regardless of the number of criteria stated, all authors agreed that requests for maximization of all named criterions would be without ground and that the relative meaning of individual criteria depends on specific situation, in the sense of identifying relative meaning of information system successfulness factors, in any described method. Pearson (1977) has conducted research in practice and determined that, for groups of interest in the organization the most important factors are those presented in table 2.

Table 2 The most important factors for performances (successfulness) of IS

Groups of interest			
Organization's Management	Users	IT professionals	IS M anagement
Output accuracy	Output accuracy	Competencies of top managers	User's expectations from computer support
Output liability	Competencies of top managers	User's trust in the system	User's participation
Output promptness	User's trust in the system	Output accuracy	Business effects of computer support
Understanding of user's needs	Output promptness	Output promptness	Understanding of user's needs
User's trust in the system	Output liability	System and procedures documentation	Communication between users and IT professionals
Most important factors of performances (successfulness) IS			

With detailed result analysis of this empirical research, it can be noticed that five most important factors of information system successfulness mentioned by the information system managers are mostly consistent with those mentioned by user manager. However, there are two exceptions: Factors of relations and communication between users and information technology specialists have been rated as more important than the factor of understanding of user's needs, while the user managers have rated the opposite. Factor "providing training for users" has been pointed by the user managers as less important than the factor of output size and the factor of business effects from computer support, while information system managers are pointing out the opposite. Attention should especially be devoted to the fact that the factor of relation between user and information system specialist has been rated as the third most important factor of successfulness by the information system specialists, and as irrelevant by the staff of information systems and users, which points to the possibility of a problem in the assessment process of information system successfulness between the information system

manager and other users connected to the information system.

Analysis of the factor of discrepancies in the information system successfulness between IT specialists and users, in sense mentioned above, leads toward several conclusions:

- First of all, it has been shown that seven new factors of information system successfulness are very important and should be included in the instrument for measuring the level of information system success. Those factors, together with 39 factors listed by Bailey and Pearson, cover all 8 dimensions of information system performances.
- Second, there are no important differences between grading importance by information system managers and information technologies specialists. The same conclusion can be drawn from grading importance by user managers and users. Also, it has been shown that there are significant discrepancies between information system manager and user manager, but there are significant differences in importance ratings of information technology specialists and information system users.
- Third, five most important factors of information system successfulness pointed out by information system managers are almost identical with the ranking of the most important factors of information system successfulness according to information technologies specialists, users and user managers. The main difference lays in the factor of capabilities of the top management. Users see it as the most important factor for information system successfulness, while managers think of it as moderately important. Consequently, top management must show enthusiasm and support to information technologies specialists, how they would use possibilities of information system for their managerial process. Only through that effort can the user be encouraged to use more functions of information system. This could, in return, increase the application of information system in their everyday work and improve possibilities for success of information system.
- Fourth, both user managers and information system managers think that "chargeback"

method and competition between information technologies specialists and users are two least important factors. Although it is obvious that these two factors are irrelevant for the level of information system success, they are irreplaceable because excessive "chargeback" can influence user's satisfaction with information system and turn away users from information system services. Moreover, unfair competition can influence organizational equality in resources distribution and hence jeopardize relations and communication between users and information technology specialists.

- Fifth, users and information technologies specialists as groups have different opinions about ratings on several factors of information system successfulness. On the one hand, users and their managers assign more importance to output results (services) of information system such as: noticed usefulness, form of output, business effects of computer support, than information technology specialists. On the other hand, it has been shown that managers and specialists for information technologies are more concerned with the environment of information system services (such as: relations between users and information technologies specialists and processing of system alterations demands) than are users. In order for information system to be successful, the management of information system should understand and manage these differences. Also, they should pay more attention to ends of services rather than the middle of the information system during the planning of resources and formulation of strategies for development and successful functioning of information system.

Ratings of noticed importance individual factors for information system successfulness vary from person to person because everyone has a different level of measurable standards and level of personal importance. The process of ranking is a way to eliminate such individual differences. It generates order which presents relative levels of importance. Information system management should use only the order by importance of successfulness factors of information system to identify relative meaning of one factor among others. It is shown that the order of importance gathered from users is different from the one gathered from information

technologies specialists. Such differences emphasize that undertaken process for information system evaluation, partially differentiates between information technology specialists (especially information system managers) and users. Information system management should periodically conduct a survey of the importance of information system successfulness factors noticed by information technologies specialists and users, in order to overcome the differences in importance order between these two groups.

The process of rating information system successfulness in an organization means gathering grades with questionnaires on the importance and satisfaction of 46 information system successfulness factors from each and all functional areas, from users as well as from information technologies specialists. Questionnaires should consist of two separate parts: one for grades of importance and other for grades of satisfaction. The first one gives the opportunity to information system management to assign priority corrective actions and to distribute resources of information system. For example, if one assumes that there are two unsatisfied factors of information system successfulness, successfulness IS-1 and successfulness IS-2, and that successfulness of IS-1 is ranked as more important than successfulness IS-2 (under the assumption that other factors are equal), first first it requires undertaking action and directing resources of the information system towards increasing the satisfaction level of successfulness factor IS-1, and then successfulness IS-2. Similarly, if we have two factors of information system successfulness with the same importance and negative satisfaction, the factor with less satisfaction must be prioritized and receive more resources. The second gives to evaluator of information system successfulness the opportunity to identify individual unsatisfied factors of information system successfulness and to inform information system management.

In order to receive truthful answers, appraisals should be conducted by an independent evaluator and the participants must stay anonymous, except for the identity of their functional areas. Knowing the functional area of every participant, information system management can easily evaluate the level of dissatisfaction within any individual functional information system and in line with that take direct action toward solution. Moreover, participants should know as little as possible in which manner information system management uses assessments of information system

successfulness in order to manage their projects and resources, otherwise participants could start to manipulate the evaluation of information system successfulness in order to withdraw indirect attention of information system management to themselves. In order to avoid such events, they should determine a detail check and verification of unsatisfactory factors of information system successfulness.

Assessments of information system successfulness should be gathered periodically from each and all functional areas in organization. In order to get final grade on information system functionality performances in organization, gathered results must be processed statistically. For the analysis of gathered data, the following statistical procedures are commonly used: arithmetic mean, standard deviation for each point, Interco relation of points, multiple regression of points, liable scale, variance analysis, factor analysis, cluster analysis of variables (Word method), components analysis, method of multidimensional scaling (squared Euclid discrepancies), and others. Such information would provide the information system management with the opportunity to oversee the total information system quality (across the whole organization), so as to compare qualities between the different functional areas of information system and to review improvement process of functional or integral information system. Furthermore, the management of information system is provided with a/the pattern of constant changes for understanding information system success inside each functional area. Such information is vital for information system management in shaping the future of information system in organization.

Additionally, the application of instruments for measuring successfulness and functionality of information system in an organization has several implications for managerial process and development of information system. Every new information system manager must be trained to interpret the assessments of information system successfulness, which he receives through periodical survey of all users, and also know how to develop strategies for solving problems revealed by users. Information system management must be included in those marks, to the level on which every one of them can use grades of user satisfaction for identifying areas of some problems, as well as to analyze grades of importance in order to assign

priorities to activities of development or maintenance of information system.

Finally, performances that have influence on the success or failure of information system are often argued in literature. They can be classified in eight different dimensions so they include not just the system aspect but also ...the human aspect of information system successfulness. Opinion analysis of users, information technology specialists and managers reveals that there are no significant differences in order and importance of information system successfulness factors between information technology specialists and information system managers, as well as between users and user's managers. However, the order of factors by importance is significantly different between information technology specialists and users. Therefore, the most important information system successfulness factors are identified.

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