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Content

Quality of Information Systems in the Public Administration

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ABSTRACT

After three decades of research on eGovernment, it is now timely to reflect on the direction, how we can use and develop the methodology. Based on related literature it is evidenced that the theoretical background is very important, but the utilization of theories by eGovernment researchers appears to be random. In the academic literature the most popular theory and model is the DeLone and McLean (D&M) Information Systems (IS) Success Model. Based on the IS Success literature, this paper is concerned with the multidimensional model for assessing systems success, particularly with system quality, which should be applied in our future research.

Introduction

Due to the spread of eGovernment new requirements for IT developments and operations are specified at various levels and in different ways. The main goal is to create high quality, customer-centric and secure electronic services to the whole society. The success of IT planning and development is dependent on identifying strategic directions and priority areas with precision, as well as measuring and assessing IT efficiency in public administration.

We do not yet have a good model for eGovernment that provides for benchmarking and metrics. There are many approaches to measuring success of information systems (for example DeLone and McLean IS Success Model (1992, 2003) [2], [3], Technology Acceptance Model (TAM), Diffusion of Innovation (DOI), Unified theory of Acceptance and Use of Technology (UTAUT), and Theory of Planned Behavior (TPB). The theoretical models complement each other and help explain different contexts of this field.

The IS success model has been cited in thousands of scientific papers, and is considered to be one of the most important theories in contemporary information systems research, so it may be a good starting point for my research.

This study is focused on the system quality dimension. Without identifying the main characteristics of quality eGovernment systems, it is not obvious whether eGovernment projects would succeed or not. eGovernment has several aspects,

including social, technical, economic, political, and public administrative. Some of the major characteristics of public sector[1] are following:

- The government's aims are determined by policy and law.
- Governments have to be user-centric, accountable, transparent and reliable.
- The public sector's organizations have generally hierarchical and centralized structures.
- The administration's procedures, processes and tasks are standardized and formalized.
- Information is often fragmented and spread over several databases and governmental levels.
- Budget of public administration is independent from market.

Businesses seek maximum efficiency, but governments seek just sufficient efficiency. The public sector has fewer measures of progress or success than the private sector, but they can use some methods from private sector. According to Homburg, "eGovernment is defined not as eCommerce for government, but rather as a redesign of information relations of a public agency with stakeholders in its environment". Redesign can apply to front office and to back office too [4].

The IS Success Model

DeLone and McLean reviewed the large number of conceptual and empirical studies and they identified six variables of IS success: system quality, information quality, use, user satisfaction, individual impact, and organizational impact in 1992. However, these six variables are not independent success measures, but are interdependent variables in the multidimensional measuring model (see Figure 1.).

In the next years they focused especially on validation and application of their model. In 2003 DeLone and McLean updated their model. They added a new dimension, "service quality", to the original model and merged "individual" and "organizational impacts" into a single variable, "net benefit". So the six major success dimensions of the updated model include system quality, information quality, service quality, system use, user satisfaction, net benefits (see Figure 2.).

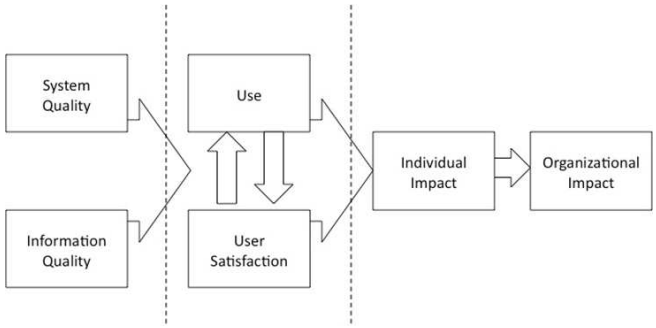

Figure 1: The Original D&M IS Success Model, 1992

The D&M model has also been found to be a useful framework for organizing IS success measurements. The model has been widely successfully used by IS researchers for understanding and measuring the dimensions of IS success in different contexts, including the eGovernment context

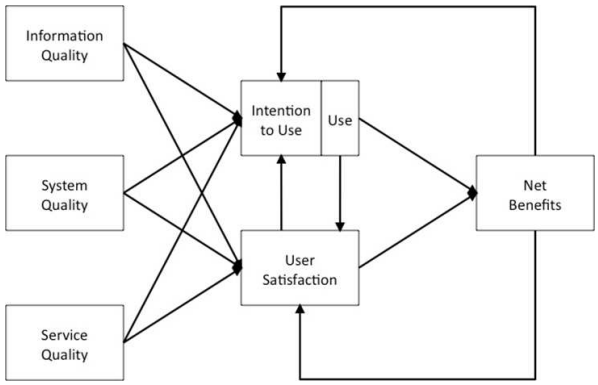

Figure 2: The revised D&M IS Success Model, 2003

System Quality Dimension

Some IS researchers have focused on the processing system itself. Literature does not provide a unique definition of the information system concept. The authors write about the information system as a tool to the service of the organization and of its goals.

Reix (1995) defines the information system as a set of organized resources: material, software, staff, data, and procedures allowing acquiring, treating, storing, communicating information through the organization [7]. Regarding technological progress, information system means computer support with the networking and communication systems (i.e.

[1] In the classic public administration paradigm, the organization of the public sector is based on the following principles: an apolitical public service, hierarchy and rules, permanence and stability, an institutionalized civil service, internal regulation.

architectures client-server, intranet, internet, distributed databases). In order to determine whether there is a problem with IS success or not, first we need to define success for the information systems function. According to the D&M model, technical success is measured by system quality, and researchers should determine the dependent and independent variables associated with technical success.

Researchers tested a productivity model for computer systems, including such performance measures as resource utilization and investment utilization. For example, Alloway developed 26 criteria for measuring the success of a data processing operation. Technical: developing more monitor systems; quality of DP system analysts; technical competence of the DP staff. Security: data security and privacy. Operations: running current systems (costs, ease of use, maintenance); availability and timeliness of report delivery to users; efficiency of hardware utilization; hardware and system downtime; DP profitability from user bill backs and billable time ration. Proportion: sophistication of new systems; increasing the proportion of DP effort expended in creating new systems. Cost/Direction: overall cost-effectiveness; involvement of senior users in DP policy formulation and evaluation. User Relation: user oriented systems analysts who know user operations; appropriate DP budget size or growth rate; communication with managerial uses; responsiveness to user needs; DP support for uses in preparing proposals for new systems.

Table 1. The results of analysis at the individual level and at the organizational level [35].

Relationship	Individual level	Organizational level
System quality → use	Mixed support	Mixed support
System quality → user satisfaction	Strong support	Insufficient Data
System quality → net benefits	Moderate support	Moderate support

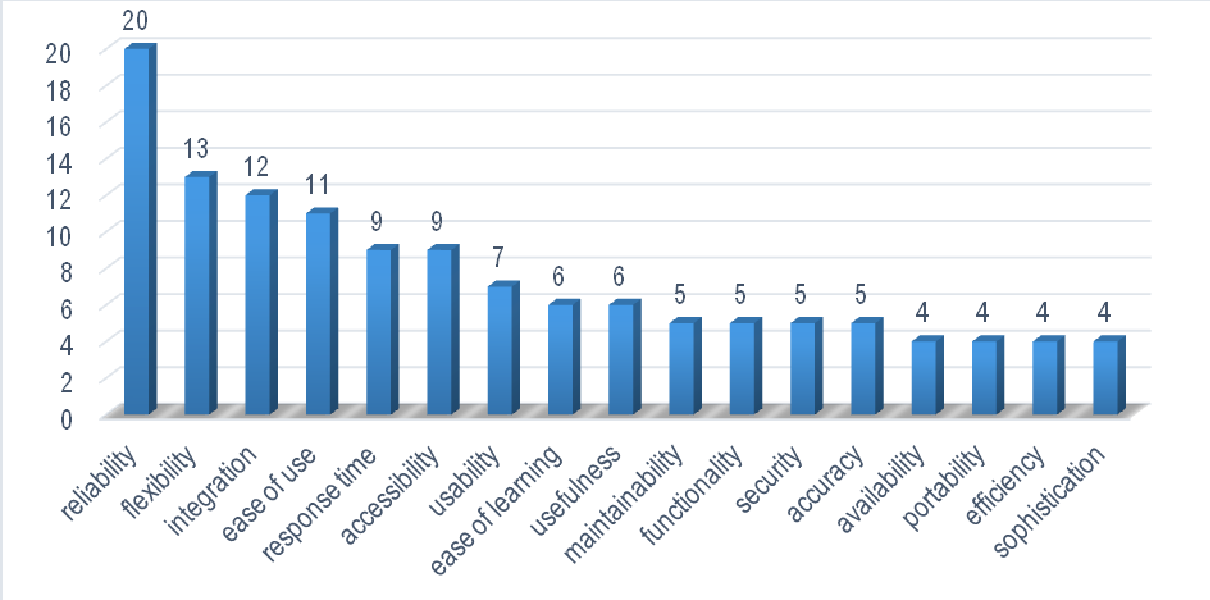

Figure 3: Examined characteristics of System Quality in a Chart (based on 40 empirical studies)

Development: report contents (relevance, currentness, flexibility, accuracy); Training Programs for users in DP capabilities; attitudes of users to DP; developing more exception systems; developing more inquiry systems; developing more analysis systems. Backlog/Process: the new system request backlog; improving new system development: time, cost, quality, disruptions [1]. The 3D model of IS success extends and separates the dimensions to development, deployment and delivery levels of information system, where each level has its own success factors which can be influenced by several exogenous factors..

Detailed items for assessing System Quality are different in the reviewed literature (see Figure 3.).

- DeLone&McLean (1992): data accuracy, data currency, database contents, ease of use, ease of learning, convenience of access, human factors, realization of user requirements, usefulness of system features and functions, system accuracy, system flexibility, system reliability, system sophistication, integration of systems, system efficiency, resource utilization, response time, turnaround time [2].
- DeLone&McLean (2003): ease of use, functionality, reliability, flexibility, data quality, portability, integration, importance [3].
- DeLone&McLean (2003): usability, availability, reliability, adaptability, and response time (e.g., download time) are examples of qualities that are valued by users of an eCommerce system [3].
- Petter, DeLone, McLean (2008): ease of use, system flexibility, system reliability, ease of learning, as well as system features of intuitiveness, sophistication, flexibility, and response time [5].

For the other literature, see Appendix AWhile researchers have suggested several IS impact measures such as individual, work group, organizational, interorganizational, consumer and social impact, they have tested primarily the individual and organizational impact. Lots of empirical studies have examined the relationships between system quality and use, user satisfaction, and net benefit, but just few studies have considered the relationships from an organizational or other point of view (see Table 1.). Governments attempt to increase effectiveness and efficiency by introducing eGovernment. While IS success models have received much attention among researchers, just a little research has been conducted to assess the success of eGovernment systems [6], [8–12]. eGovernment is connecting the government with citizens, businesses, and other stakeholders, via internet. The studies focus specifically on web portal. Researchers can compare eCommerce and eGovernment domain as identical since channel of service delivery is same.

Reviewed studies show that the system quality in eGovernment context has some important characteristics in accordance with ISO/IEC 25000 standards: functionality, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. Each characteristic has some sub-characteristics[2] with measurable attributes. The definition of the qualitative system's indicators lays the foundations for our further empirical research in public administration.

Conclusion, Recommendations

This study aimed to determine some factors of the system success of IS success model. In general, the measure of system quality concentrates on the specifications of a target system, for example on eGovernment's web portal. Actually, the eGovernment service process fits nicely into the D&M updated IS success model and its six success dimensions. However, continued research is needed to investigate and test a comprehensive model of eGovernment systems success based on the D&M model.

Most of the reviewed studies have tested just a few dimensions of model with a few indicators. Typical measures of the system quality in the traditional studies have included system reliability, stability, availability, response time and ease of use, which have mixed the characteristics with sub-characteristics. Further research should share

[2] Sub-characteristics: accuracy, availability, time-behavior, ease of use, integrity, interoperability, modifiability, adaptability and so on.

the tests to front-office and back-office systems and web portal, and they should pay attention to specific sub-characteristics of those systems. The intention to use system depends on user, who may be the member of the government organization's staff or client, and use of the system is determined and restricted by law in the public administration. Researchers should analyze business and citizen's life events as complex services, underlining the need of collaboration between different organizations.

Future research should specifically examine the aspect of the weight between system quality and user satisfaction. The under-representation of the dependent variable net benefit should also be looked into [6]. The identifying and understanding success factors of eGovernment can be significant for reliable and effective eGovernment adoption. It is necessary to my planned empirical test too. Researchers can realize that there is not one solution that would fit every country. The countries are characterized by different political, economic, social and governance contexts, which require different approaches. According to the literature, it is clear, that the IS success model researches are more typical in the developing countries than in the developed ones nowadays, because they want to develop their eGovernment quickly. It may be useful in Hungary too, if we want to develop an efficient eGovernment.

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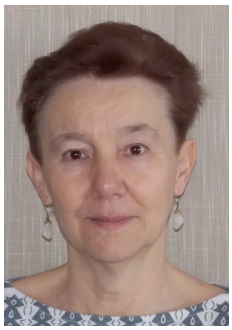
Appendix A: Measures

Sources	Description of Measure(s)
Abugabah et al. (2009)	Response/turnaround time, Accessibility, Flexibility of systems, Integration of systems, Error recovery, Security of data, Reliability, Correctness, System ease of use, System usefulness
Bailey and Pearson (1983)	Convenience of access, Flexibility of system, Integration of system, Response time, Language
Barti and Huff (1985)	Realization of user expectations
Bejjar and Boujelbene (2013)	Integration, Correctness, Response Time, Reliability
Belardo, Karwan, and Wallace (1982)	Reliability, Response time, Ease of use, Ease of learning
Conklin, Gotterer and Rickman (1982)	Response time
Edward et al. (2005)	Flexibility, Interoperability, Function ability
Franz and Robey (1986)	Perceived usefulness
Gable et al. (2008)	Data accuracy, Data currency, Database contents, Ease of use, Ease of learning, Access, User requirements, System features, System accuracy, Flexibility, Reliability, Efficiency, Sophistication, Integration, Customization
Goslar (1986)	Usefulness of DSS features
Han and Lim (1997)	Simplicity of use, Accessibility, Accuracy, Flexibility, Reliability, Efficiency
Hellstén and Markova (2006)	Ease of use, Ease of learning, Convenience of access, Realization of user requirements, Usefulness of system features and functions, Data and system accuracy
Hiltz and Turoff (1981)	Usefulness of specific functions
Jalal and Al-Debei (2012)*	Ease of use, Reliability, Flexibility, Interactivity, Searchability, Security, Accessibility, Integration
Jeo and Lee (1997)	Convenience, Reliability
Jung and Jung (2005)	Ease of use, Usability, Esthetics, Functionality, Certainty, Answerability, Accessibility, Stability, Convenience, Sympathy
Kim (2007)	Convenience, Simplicity, Accuracy, Reliability, Speed, Availability, Stability, Compatibility, Accessibility
Kim (2007)	Speed, Reliability, Availability
Kriebel and Raviv (1982)	Resource utilization, Investment utilization
Lehman (1986)	I/S sophistication (use of new technology)
Liu and Arnett (2000)	Rapid access, Quick error recovery, Security, Correct operation & Computation, Coordination Balanced payment,
Mahmood (1987)	Flexibility of system
Morey (1982)	Stored record error rate
Park et al. (2004)	Speed, Stability, Obstacle
Rivard et al. (1997)	Namely, Reliability, Portability, User Friendliness, Understandability, Effectiveness, Maintainability, Economy, Verifiability.
Sedera et al. (2004)	Ease of use, Ease of learning, Use requirements, System features, System accuracy, Flexibility, Sophistication, Integration, Customization
Sørum et al. (2012)*	Easy to use, Intuitiveness and clarity of navigation structure, Visual design, Download time, Accessibility requirements, Secure use, Integration with internal data feeding and processing, Integration with external data feeding and processing, Use of updated technology
Srinivasan (1985)	Response time, System reliability, System accessibility
Teo at al. (2008)*	Ease of use, Response time, Usability, Integration
Wang and Liao (2008)*	Website design, Reliability, Response time, Usability, Adaptability, Trust, Usefulness, Availability, Maintainability, Navigation
Wixom and Todd (2005)	Accessibility, Timeliness, Flexibility, Integration, Reliability
Zaied (2012)	Reliability, Usability, Adaptability, Trust, Maintainability
ISO/IEC 9126 Series of Standards	Functionality, Portability, Maintainability, Efficiency, Usability, Reliability
ISO/IEC 25000 Series of Standards	Functional suitability, Portability, Maintainability, Performance efficiency, Usability, Reliability, Compatibility, Security

*: web portal.

❖ Allocating Time-Bound Tasks



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