"Quality and Evaluation of Information Systems in Institutional Organizations"

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1.   Introduction

The factors affecting the success and efficiency of information systems are always an important and critical aspect for the structure, proper operation, and improvement of the produced services and products of an organization for its end users - both for the internal ones (employees) and for the external ones (public).

At the present, the need to create suitable parameters, assisting in evaluating and measuring the successful operation of an information system in an organization is constantly growing. The purpose of the specific thesis is, firstly, to introduce us to the environment of the organizations' information systems, while also providing us with a complete and extended presentation of their operations, processes, infrastructures, and factors of success. Through **Systems Theory**, we shall examine the analysis and design for an information system, while identifying the quality parameters necessary for measuring its success.

In addition, we shall employ the model for measuring quality for an information system called: "*DeLone & McLean Information Systems success model*". We shall see what each parameter of the above model examines, by investigating concepts such as system quality, information quality, user satisfaction, effect of quality on users and organization. At the same time, we shall develop an application for evaluating the quality of an information system, the so-called: "*Organizational Memory Information Systems Quality*" which builds on the success model of DeLone & McLean. The main objective of this thesis is to reach into a fruitful discussion regarding quality in the operation, infrastructure, and provided services of institutional organizations. Moreover, we shall focus on the usefulness and importance of measuring factors regarding efficiency for an information system, as this procedure is used by modern Society of Information, in order to be transformed to Society of Knowledge.

1.1.   Definitions and Concepts

In an attempt to define the concept "Information System", we could say that it is the mechanism providing the means for collecting, storing, producing, and distributing information serving the information needs of an organization, while supporting its operations, both at managerial and operational level, at planning and decision-making level for the organization (Avital, 2003). The **Theory of Information Systems** began developing during the '50s, in the field of Positive Sciences and it is defined by certain features, presented below (DeLone and McLean, 1992):

- ❑   Division of systems into categories, in order to expand and control their specific features.
- ❑   Dealing with a system as an ensemble in order to resolve its problems.
- ❑   Development of models for the analysis of a system's operation, and
- ❑   Dynamic intervention to the system (what is it and how it operates).

At the same time, an **Information System** usually has certain **components** that are discernible features of the system; these are (Kiountouzis, 2002):

- Inflows (material, information, human resources, resources, etc),
- Conversion procedures (planning, organization and control mechanisms, production operations, research and development, etc),
- Outflows (services, products, ideas, etc).

In addition, the IT system of an organization is divided into subsystems; we can examine each of them as an independent and separate system. Each subsystem is further divided into other smaller ones, thus creating a hierarchical structure, containing in level subsystems that are independent and operational, closely connected and cooperating with the respective subsystems of the upper and lower level. The analysis and design methods for an IT system are one of the most critical stages for developing and operating it.

1.2. Analysis and design of IT system

The proper development and smooth operation of an IT system depend heavily on certain specific stages, which are applied in order to perform its analysis and design. Firstly, the principle is set, in accordance to which the objectives of the system are determined; these are related with its points of reference, the initial needs for analyzing it, the evaluation of possible solutions and the analysis of possibly existing systems. This is followed by pilot research.

Then, the needs of the system are defined and its specifications are set. The system is designed, by creating the logical and physical model, while selecting the respective software and computer systems.

Then, the application of the above follows, starting from training employees and allowing them to practice on it, and by creating a database and installing the fallback system.

In the final stage, the procedures include the assessment of the system, as well as its monitoring, maintenance, and development within the institutional organization.

1.3. Evaluation and quality assurance of the information system

When evaluating an IT system, we usually deal with organizing and managing an organization, while also dealing with its users. The term *"users"* refers to personnel, researchers, producers, suppliers, and retailers of the system; i.e. all the internal and external users of the organization.

The parameters used in order to evaluate an IT system are the following:

- the components of the system,
- information processes,
- services and products
- information operations,
- the entire information system, and
- its environment.

The usefulness of this procedure is significant, since by applying it the system may provide better products and services, while justifying its present status and understanding its operation. In addition, the above verify the fact that the resources of the system are used in an efficient and effective manner, while the supervising competent authorities and its users are convinced that the benefits provided by the system are the ones that should be provided to the institutional organization.

The entire assessment procedure contributes to taking the right decisions, ensuring system quality, and estimating the extent to which any problems possibly affecting the system can be resolved. Moreover, through the above it is possible to define the needs of different user groups, plan public relations and make the information of the organization publically available, while the participation of users to the management and operation of the IT system is evident (Segars and Grover, 1998).

1.3.1 Success and efficiency parameters for the information system

The parameters used in order to assess success and efficiency for an IT system can be divided in the following three levels (DeLone and McLean, 1992):

1. **The Organization Level** (strategic objectives, operating costs, system availability, response times, incomes and expenses from new products and services).

2. **The Level of processes and/or operations** (reduction of cost for specific operations, reduction of time in separate processes, completion of operations, lower cost and time in regards to general practice), and

3. **The User level** (user satisfaction, system usefulness and functionality).

1.4. Information System success model by DeLone & McLean

One of the most efficient and widely used and tested tools for measuring quality for an information system is the information system success model created by DeLone & McLean. Through the specific model, critical factors are examined, which are interdependent and interact with each other. These factors investigate concepts such as system quality, information quality, user satisfaction, as well as the effect of quality, both to the user, as well as to the organization (Mamma, 2004). The specific model can be represented as follows:
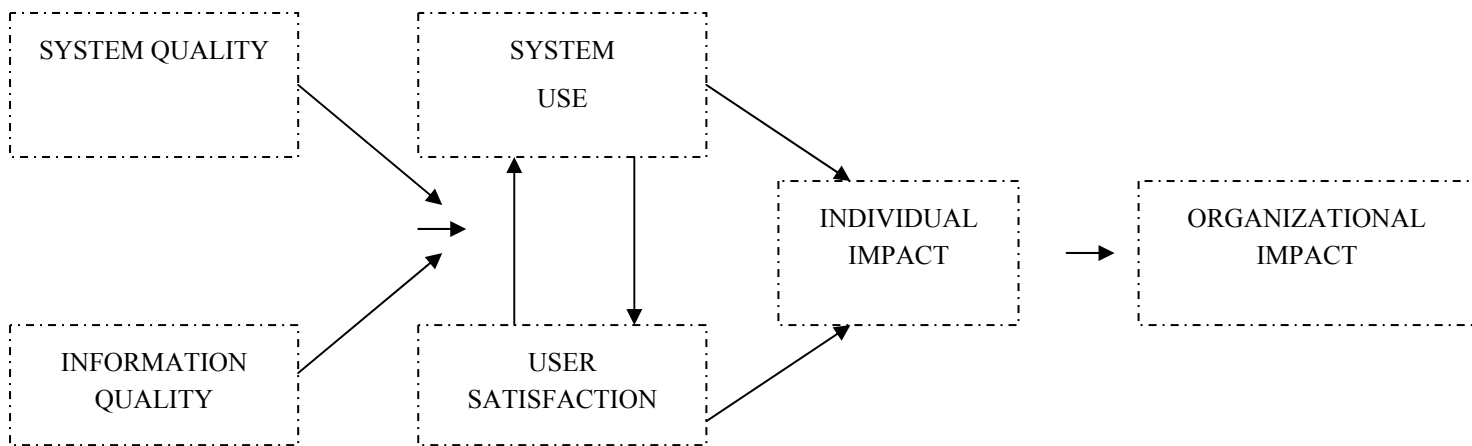

Table: 1 – DeLone & McLean I/S Success Model

By starting to analyse the aforementioned concepts, we may observe that:

- ❑ **System Quality** describes how "good" is the information system in regards to its operational features.
- ❑ **Information Quality** describes how "good" is the information system in regards to its outflows. Certain factors which relate to the quality of information are, among others, the following:
  - importance
  - relativity
  - usefulness
  - precision
  - completeness, and
  - information content

At the same time, information quality has a significant effect on the use of the information system.

❑ **System Use** refers to the use and exploitation of outflows from the information system.

❑ **User Satisfaction** measures how the users perceive the system while using it, and is considered as an important parameter for measuring the success of an information system. The result from both uses is equal and important, regardless of the efficiency of the system itself.

❑ **Individual Impact** refers to the impact of the use of an information system on the performance of duties by a person within their work environment. According to DeLone & McLean (2002), this impact could be a strong indication that the information system offers to the user a better understanding of the content of their decisions, an improvement in regards to their decisions about productivity, a change in their operations, as well as a change in understanding the importance and usefulness of the organization's system.

❑ Finally, **Organizational Impact** examines how the results of the individual impact affect the operation of the organization, while also measuring the efficiency of the organization as an ensemble, a complete entity.

The success and quality model of DeLone & McLean is a widely acknowledged and used model, on which several other models assessing the success of information system have built on. One of the most successful ones is the "*organizational memory*" information system model. In order to understand it properly and use it correctly, we shall start by defining it.

2. "Organizational Memory" information system

The "**O**rganizational **M**emory **I**nformation **S**ystem - **OMIS**" is the system operating as the means through which the "memory" of an organization is transferred from the past in order to support its operations in the present and future (Jennex, 1998). It comprises two levels, directly related to its structure. In accordance to the **first level,** there are four subsystems, which come from four effective operations. This is presented in the following table:

Operations	
1. Completion =	Information' management and coordination in the organization
2. Adjustment =	Organization's ability to adjust itself to changes within its environment
3. Goals' success =	Organization's ability to set up goals and promote their success
4. Preservation of cooperation =	Organization's ability to preserve employees' cooperation

The **second level** deals with the operations of the memory of the information system. The *"memory operations"* refer to acquisition of knowledge, maintenance of memory, search, and, obviously, recovery. At the same time, the "organizational memory" information system has **three basic parts,** which define an organization's internal operations and procedures. These specific parts are the following:

❑ **Printed documents:** these are wide references (procedure documents, technical standards, personnel reports, etc) of the organization, located at central depositories, like a central collective library. A significant section of these documents are the log files regarding changes and repetitive procedures of the organization, which show the development and progress of the organization in time.

❑ **Documents in computers:** these are files stored in organized data systems and their information refers to the personnel.   In addition, they include procedures and protocols through which the information systems have been structured, while also stating the rights of access to data, as well as the formats of system inflows and outflows.

❑ **Personal memory:** this includes all types of documents kept by an individual in an organization. Indicatively: files, personal notes, written reminders, etc. These are not based on a specific format. The personal memory of every employee is defined by what's important to this individual and reflects the experiences of the employee in regards to the organization.

The organizational memory information system is an expansion of the success model created by DeLone & McLean, with certain small differences (Iivari, 2005). These differences result because they serve the operational needs of the specific organization using the information system, thus rendering it more effective for organizing.

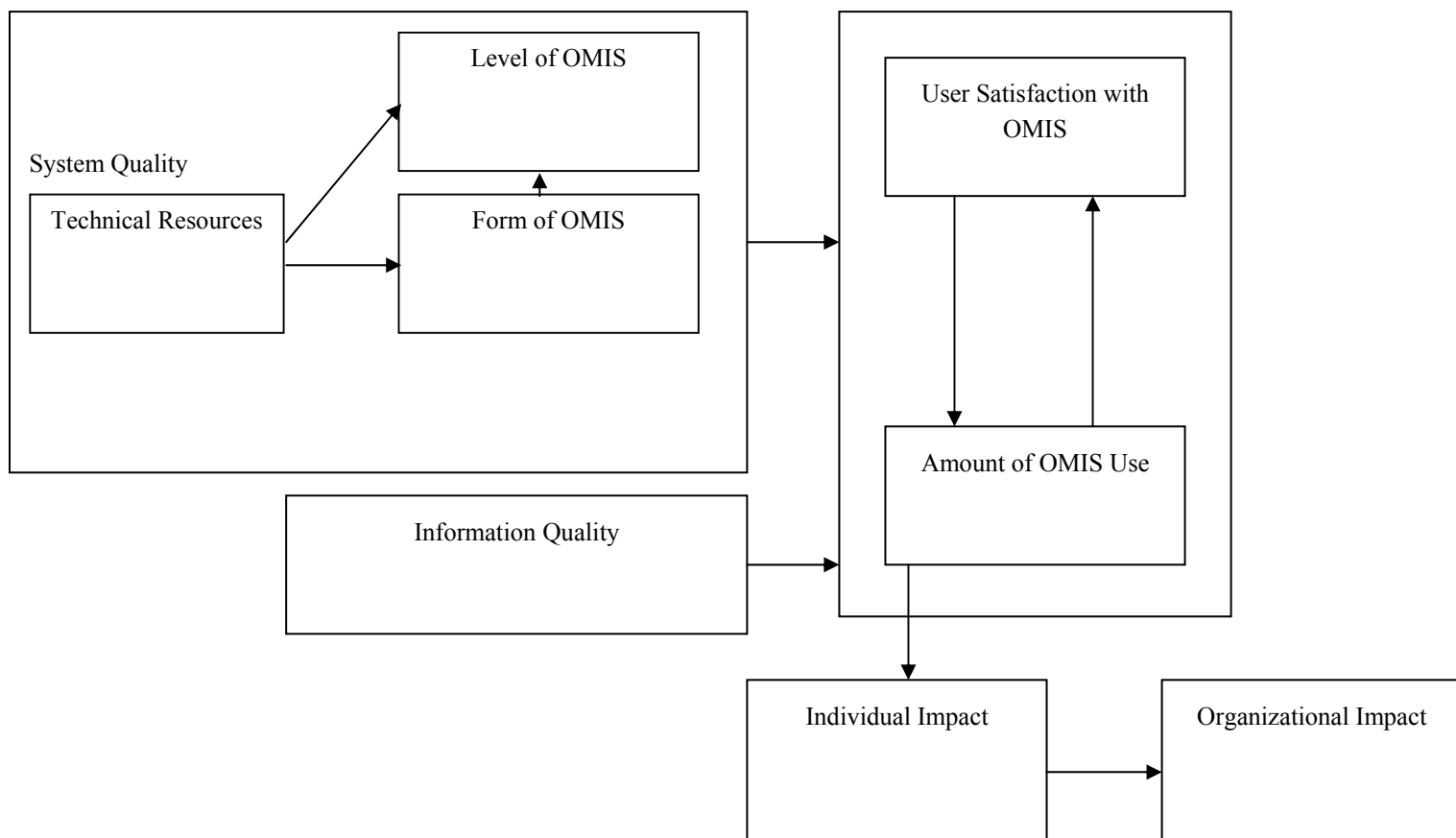The small differences are noted in the following diagram:

Table: 2 – Organizational **M**emory **I**nformation **S**ystem - **OMIS**

By analysing the specific diagram, we observe that **System Quality** has three separate components, which are interdependent and interact with each other. These components are:

1. **Technical specifications:** these define the capability of an organization to develop and maintain an organizational memory information system.

2. **OMIS level**: this refers to its capability of transferring past information in order to support current activities of the organization.

3. **OMIS type**: this refers to the extent at which the system has been automated and completed.

In regards to **User Satisfaction** and **System Use**, we observe that these two parts belong to a wider relation of interdependence.

Starting the development of the present thesis, we had stated that the various models examining the success of information systems are used so we can measure efficiency, quality, and effectiveness for an information system (DeLone and McLean, 2004). As a result, based on certain characteristic traits, each section of the specific model is separately measured and examined.

Beginning with **OMIS System Quality**, we could say that this measurement is performed on the basis of its first section, the system's technical specifications. As a result, the following are examined:

- the capabilities of the system (fast and high level infrastructure, strong application development, network abilities, knowledge of requirements by users),
- user abilities (high level of computer skills, efficient personal computers, knowledge about using the organization's memory),
- the experience of the crew developing and maintaining the computers supporting the entire system,
- the skills of the final users of the organizational memory information system,
- the level of hardware, and
- the capabilities of the departments' operation system.

Then, based on the level of OMIS memory operations, we examine the following:

- knowledge acquisition,
- maintenance of knowledge,
- search operations,
- recovery operations,
- memory filtering, and
- memory investigation.

Finally, based on the OMIS type, we measure:

- the availability of past material in the automated system,
- the possibility of searching for it, and obviously
- the capability of recovering it.

Afterwards, we move on to **OMIS Information Quality**, measuring factors such as:

- information importance,
- usefulness,
- accuracy,
- completeness,
- content, as well as
- quality of the product bearing the information.

Then, the **OMIS System Use** is measured, by using the following five criteria:

- number of tasks performed in the system,
- actual use of system on a daily basis,
- frequency of system use (e.g. hourly, daily, monthly, etc),

- number of application suites used, and, obviously,

- level of use for the information system.

User satisfaction in the **OMIS system** is assessed based on the following:

- how the users understand and perceive the system,

- the quality of products provided (content, accuracy, format, ease of use, product timeliness) and finally

- the provided services.

Then, in regards to **Individual Impact**, this is assessed based on the following:

- productivity of each individual,

- number of tasks required by each individual,

- time required for completing tasks, correctly from the first time,

- complexity of a task assigned to an individual, and

- completion of tasks of high priority.

Finally, the **Impact of the system on the Organization** is assessed, based on the following factors:

- efficiency of the entire organization, examined as a complete entity,

- its capacity to assess problems,

- its capacity to provide solutions to problems identified and located, and

- achievement of the organization's ultimate objectives.

3. Conclusions

In conclusion, we could claim that the effort to include every possible parameter and element leading to the assessment and proving, at a greater or smaller degree, of the efficiency, quality, and success of any information system model incorporates numerous aspects and is composite and complex. This is due to the nature of the information system itself that is under assessment.

The effectiveness of an institutional organization is improved by increasing the effectiveness of an organizational memory information system. This concept can be applied to the entire content of an information system, thus proving that the organizational memory information system can be effective, of quality and successful.

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