INFORMATION SYSTEMS MANAGEMENT CONTROLS WITH REFERENCE TO GEOGRAPHIC INFORMATION SYSTEMS

KONTROLE UPRAVLJANJA INFORMACIJSKIM SUSTAVIMA S OSVRTOM NA GEOGRAFSKE INFORMACIJSKE SUSTAVE

Stručni članak

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Sažetak

U ovom istraživačkom radu na temu: „Kontrole upravljanja informacijskim sustavima s osvrtom na geografske informacijske sustave“ će se istražiti: (1) upravljanje informacijskim sustavima, (2) geografski informacijski sustavi, (3) informatičke kontrole čija je svrha smanjenje vjerojatnosti neželjenog događaja te smanjenje očekivanih gubitaka do kojih bi došlo kod ostvarenja neželjenih procesa u promatranom sustavu, (4) kvaliteta poslovnih informacijskih sustava koja se očituje u jednakosti s umnoškom razine kvalitete svake pojedine komponente (hardvera, softvera, lajvera, netvera i orgvera) i (5) upravljanje razvojem informacijskih sustava. Navedeno će se istražiti metodom analize sadržaja dok će u radu biti prikazani modeli primjenom znanstvene metode modeliranje te primjenom pravila modeliranja. U radu će se prikazati troškovi GISa koji otpadaju na unos podataka te kakav trošak predstavlja unos podataka. Također, biti će objašnjeni pogledi na informacijske sustave kao pojam a to su: tehnički pogled, društveni pogled, društveno-tehnički pogled i pogled na odvijanje procesa. Ovaj rad u cjelini je razvrstan u tom kontekstu na društveno-tehnički pogled iz razloga što se GIS svrstava prema tehničkom pogledu dok se MIS svrstava prema društvenom pogledu.

Ključne riječi: IS, SoIS, Informatičke kontrole, MIS, GIS, modeli.

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Abstract

This research paper on the topic: "Information systems management controls with reference to geographic information systems" will explore: (1) information systems management, (2) geographic information systems, (3) information control aimed at reducing the probability of an adverse event and reducing the expected losses that would occur in the occurrence of undesirable processes in the observed system, (4) the quality of business information systems is manifested in equality with the product of the level of quality of each individual component (hardware, software, hardware, netware and orgware) and (5) management of information systems development. This will be investigated by the method of content analysis, while the paper will present models using the scientific method of modelling and the application of modelling rules. The research will present the costs of GIS that fall on data entry and the cost of data entry. Also, views on information systems as a term will be explained, namely: technical view, social view, socio-technical view and view of the process. This paper as a whole is classified in this context on the socio-technical point of view for the reason that GIS is classified according to the technical point of view while MIS is classified according to the social point of view.

Key words: IS, SoIS, Information controls, MIS, GIS, models.

1. INTRODUCTION

This research paper investigated: information systems, i.e. information systems management, geographic information systems, information controls aimed at reducing the probability of an adverse event and reducing the expected losses that would occur in the realization of undesirable processes in the observed system, the quality of information systems equal to the product of the quality level of each individual component (hardware, software, lifeware, netware and orgware) of each information system and management of information systems development. This will be investigated by the method of content analysis. The scientific modelling method was also applied, which created a model for presenting the process of data collection

in GIS through five stages. All stages are explained in detail according to the steps.

2. INFORMATION SYSTEM

It is common knowledge that the information data system is a picture of the process from objective reality, which means that in objective reality (real system) we monitor processes and collect, record and store data on their execution (process execution), time and resource consumption in order to improve the process or eventual reengineering of business processes as needed or, ultimately, in order to outsource business processes (BPO). An information system is also a set of related parts (software, hardware, people, procedures, information and communication networks) that aim to obtain and transmit information and data for the functioning, planning, decision making and / or management of a business organization (Pavlić, 2017).

Information systems (IS) involve a variety of information technologies (IT) such as computers, software, databases, communication systems, the Internet, mobile devices and much more, to perform specific tasks, interact with and inform various actors in different organizational or social contexts. Of general interest to the field of IS are therefore all aspects of the development, deployment, implementation, use and impact of IS in organizations and society. However, the information system field is not primarily concerned with the technical and computational aspects of IT. What matters to IS instead is how technology is appropriated and instantiated in order to enable the realization of IS that full fill various actors' – such as individuals, groups or organizations – information needs and requirements in regards to specific goals and practices. While this is widely recognized in the information system community, the term 'information system', which is foundation to the IS field, is rarely explicitly defined and examined, and is typically taken for granted (Boell and Cecez-Kecmanovic, 2015). The present review of IS definitions shows that information systems are complex phenomena and that different approaches to conceptualizing IS allow for different angles of seeing, understanding and researching these complex phenomena. Grounded in the hermeneutic review of different definitions of IS in the literature we discerned four major views of IS: a technical view, a social view, a socio-technical view, and a process view, each underpinned by

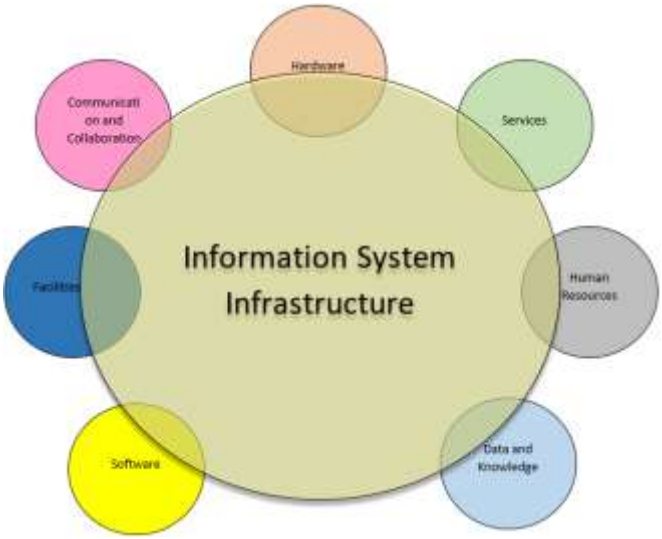
a specific set of assumptions. Information systems (IS) is an integrated environment of the hardware, software, peoples which mainly functions for the purpose of collecting and processing data to valuable information by applying a list of procedures on data collection, thus information is derived from data by IS procedures, and clears the difference between data and information. The data are raw materials and the information is the resultant data of processing (Hasan, 2018).

The notion of System of Information Systems is networks of agents interacting in a specific technology area under a particular institutional infrastructure for the purpose of creating, diffusing, and utilizing technology focused on knowledge, information, and competence flow. SoIS is the specific clusters of the firms, technologies, and industries involved in the generation and diffusion of new technologies and in the knowledge flow that takes place among them (Saleh and Abel, 2015).

Based on the definitions provided we can summarize the features of SoIS as follows:

- SoIS addresses the impact of the interrelationships between different SoS.
- SoIS is concerned with the flow of information and knowledge among different information systems.
- SoIS is responsible for generating information from the emergent SoS.
- Information interoperability is a key issue when designing a SoIS (Saleh and Abel, 2015).

Figure 1. Model Information System Infrastructure



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Information system infrastructure consists of the integrated environment from the hardware, software, human resources, services, data, knowledge, facilities, and communication all these components are considered a base platform that information system uses to achieve the organizational goals, the figure one show the main components of IS infrastructure.

3. MANAGEMENT INFORMATION SYSTEM

Before the 1980s, the information system is usually classified as a system for data processing or computing system governing (MIS). System data processing was oriented toward conquest, processing, booking (storage) data, while MIS (Management Information System) is directed towards utilization of data to create information governance. Computer system helps decision makers in two ways: (1) Assist managers in the decision making process by providing the necessary information and (2) information system in some cases may even take decisions independently in situations that are repeated when the deployment's process does not change, i.e. in this case differ only incoming variables. Today, the term generally refers to the system that provides periodic information on events common and predictable business. This system creates input information regarding the normal

business activities for middle level managers and top that (top managers). They also called other management report systems (Berisha-Shaqiri, 2014).

In addition to increased information records, information needs and associated difficulties, there arises the problem of delegation of authority and responsibilities. The common models are: Basic Information System: The basic functions of the company such as procurement, technical, sales, finance, legal, security, geographic and management functions will not change. However, the introduction of an MIS will facilitate fantastic improvement in the information communications network (Netware) (Asaolu, Sosimi and Akano, 2010). The objective of developing or improving a management information system can be stated as below:

- To provide the type of information environment that will integrate the basic operating functions and
- To provide management with access to information relative to complex activities in decentralized organizations (Asaolu, Sosimi and Akano, 2010).

Management information systems are a kind of computer information systems that could collect and process information from different sources in institute decision making in level of management. Management information systems Provide information in the form of pre specified reports and displays to support business decision making. The next level in the organizational hierarchy is occupied by low level managers and supervisors. This level contains computer systems that are intended to assist operational management in monitoring and controlling the transaction processing activities that occur at clerical level. Management information systems (MIS) use the data collected by the TPS to provide supervisors with the necessary control reports. Management information system is type of information systems that take internal data from the system and summarized it to meaningful and useful forms as management reports to use it to support management activities and decision making (Salem et al., 2014).

When managing information systems, it is necessary to carry out IT controls that are built into the mechanisms of information systems, i.e. enable its smooth operation and mitigate or reduce IT risks (Spremić, 2017). Reducing information risks increases the security of information systems. The goal of the management part of the information system is to present the

necessary information to everyone who makes decisions (managers, experts). Thus, decision-making is decentralized and democratized because an increasing number of participants are involved in this process. Although the task of the organization's management is to make business decisions, the fact that in the business system decision-making takes place on a daily basis at all levels of decision-making, individually or in groups, cannot be ignored (Panian and Ćurko, 2010). Decision-makers often make decisions in disadvantage circumstances, such as lack of time or lack of expertise, and their cognitive abilities are also limited (Panian and Ćurko, 2010). The umbrella standards of strategic management of business information systems fully connect business and information systems, primarily because they "cover" many areas in which this compliance is achieved (Panian and Ćurko, 2010).

The structure of MIS consists of three essential components specified as management, information, and systems, which all connected for the purpose of supporting the entire organization parts by the information. Hence, MIS is defined as a system that provides the information for decision making by using organization databases (Hasan, 2018).

4. GEOGRAPHIC INFORMATION SYSTEM

A geographic information system (GIS) is a computer system for capturing, storing, querying, analysis, and displaying geographic spatial data. Geospatial data describe both the location and attributes of spatial features. A GIS comprises the components of hardware, software, data, people, and organization. Prompted by the introduction of personal computers (PCs) and graphical user interfaces. Now GIS is an indispensable tool in resource management, emergency planning, crime analysis, public health, land records management, precision farming, and many other fields. Geospatial data are spatially referenced and can be either vector or raster. Common GIS operations include data acquisition, data management, data query, vector data analysis, raster data analysis, and data display. An important trend is the integration of desktop GIS and web and mobile technologies, which has already led to the development of location-based services, collaborative web mapping, and volunteered geographic information (Chang, 2019).

GIS is a system for storing, verifying, retrieving, integrating, displaying and analysis the spatial data of the planet Earth. (Heywood, Cornelius and Carver, 2006). GIS organizes spatial data into thematic layers, which provides the "reader" with a selection of data needed to perform a particular project or task. (Pavić, 2012). For the needs of GIS, data collection is performed, on the basis of which modelling, analysis and presentation of data is performed. The development of GIS can be divided into four phases: (1) data collection and data entry into GIS, (2) thematic modelling (overlapping GIS layers), (3) spatial operations such as spatial analysis (4) display, i.e. visualization (www.pmf.unizg.hr, 2022.). Data collection consists of five stages: (1) planning, (2) preparation, (3) digitization and transmission, (4) editing and updating, and (5) evaluation (Figure 2).

Figure 2. Model of data collection process in GIS through five stages

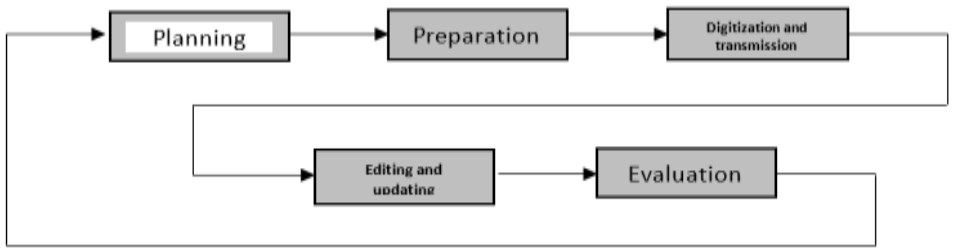

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Figure two shows the GIS data collection processes through five stages. Data collection from primary sources is performed by directing measurement of objects and their characteristics. In this way, raster data is collected, while, for example, vector data is collected by geodetic surveying or using a GPS system. Raster data is collected by scanning and vector by digitization and vectorization. Entering data into the GIS is the longest and most expensive part of the GIS process. According to the data published on the website of the Faculty of Science, University of Zagreb (www.pmf.unizg.hr), from 60% to 85% of GIS costs are data entry, which is a one-time cost (www.pmf.unizg.hr, 2022). The cost-effectiveness of data entry depends on data reuse and also data entry into GIS requires maintenance. The data entry methods are: (1) data collection method and (2) finished data transfer (download) method (www.pmf.unizg.hr, 2022). If you

want to create a spatial database in GIS, you need to decide whether to create your own database or transfer data from spatial databases created by other organizations or combine data collected (www.pmf.unizg.hr, 2022). Layer overlap methods are simpler methods of spatial analysis, in which merging geometric and attributive data into two or more layers create a new value that facilitates spatial decision making. Spatial analysis as the third phase in the development of GIS is the process of searching for geographical patterns in data and searching for connections between objects and spatial overlapping of two or more layers and creating new layers, changing geometric data and attribute data. The fourth step in the development of GIS is visualization, i.e. geographical visualization or representation. Geographic visualization is the application of any graphic representation whose main purpose is to improve the understanding of spatial relationships, concepts, conditions, processes. (Toskić, 2013). Geographic visualization is a synthesis of scientific visualization, cartography, satellite imagery analysis, statistical analysis of spatial data and GIS to develop the theory, methods and tools for visual research, analysis, synthesis and presentation of geographic data. Geographic visualization extends from traditional oriented static forms of data storage (classic maps and globes) to interactive tools displayed on the graphical interface (Toskić, 2013).

5. CONNECTION OF GEOGRAPHIC INFORMATION SYSTEM AND MANAGEMENT INFORMATION SYSTEM

Chapter five shows the interconnection of information systems (Figure 3), the interconnection of Management Information System (MIS) and Geographic Information System (GIS). Business systems management manages all parts of information systems (Figure 3), including geographic information systems (GIS) using information system elements such as: (1) Hardware, (2) Software (Dataware), (3) Netware, (4) Lifeware and (5) Orgware. Also, depending on the authorizations and access rights from GIS (when viewed as an application module), data and other information systems can be accessed using Netware.

Figure 3. A model of showing the connectivity of information companies within an organization

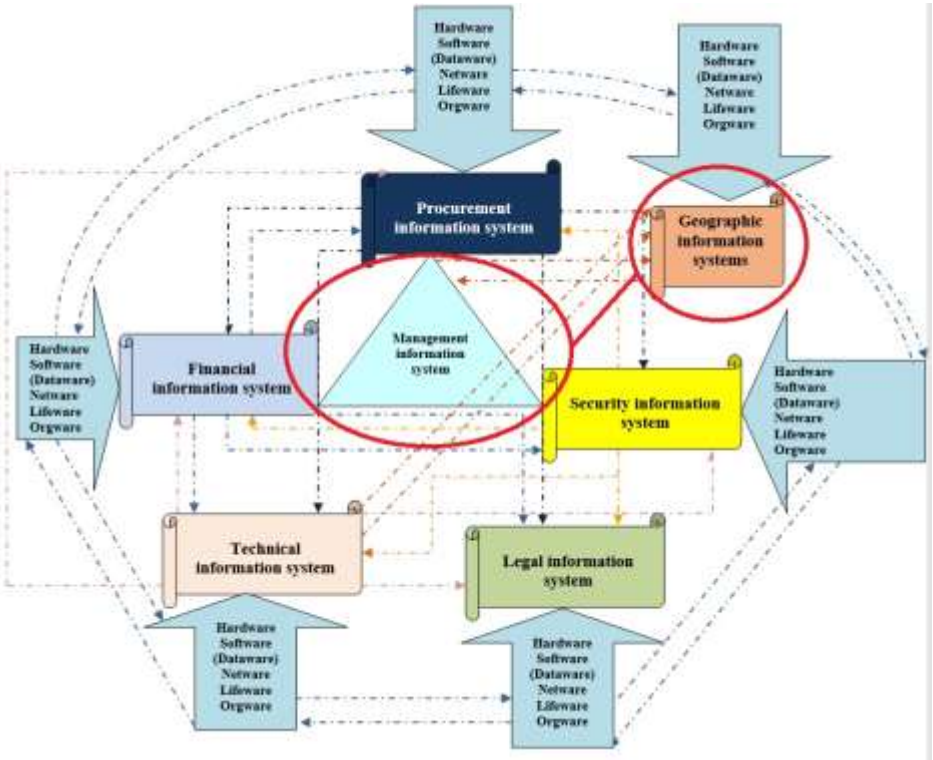

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Figure three show a model of information systems connectivity within a particular organization. It also shows all the elements of the information systems of the observed company. Each of the information systems and / or subsystems, depending on the level from which the information system is observed, has all the elements of information systems. Also, software or software within information systems is divided into system software related to operating systems and application software related to application programs used installed within the operating system.

6. CONCLUSION

In this research paper on the topic: "Controls of information systems management with reference to geographic information systems" are described by the method of content analysis terms: (1) information system, (2) information systems management and (3) geographic information system and are (4) the processes of conducting IT controls in order to reduce IT risks are shown, which also increases the security of information systems. Also, the paper presents models such as the model of information systems infrastructure (which is important for MIS (information systems management)) and the model of the process of data collection in GIS through five stages where the scientific method of modelling is applied.

In conclusion, we also point out interesting information that from 60% to 85% of GIS costs or our data entry, which is a one-time cost. As mentioned in this paper in the second chapter, there are four views of the information system as a concept and they are: technical view, social view, socio-technical view and the view of the process.

This paper as a whole is classified in this context on the socio-technical point of view because GIS (geographic information system) is classified according to the technical point of view while MIS (information systems management) is classified according to the social point of view.

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