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THE ROLE OF LOGISTICS INFORMATION SYSTEM IN THE BUSINESS-DECISION PROCESS*

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Abstract: The development of logistics information systems that support decision-making, together with the use of business intelligence, provides assistance and support to logistics managers in the decision process, thereby impacting on the quality of business and productivity. Being better informed and having greater intelligence for decision-making can help to create new value and gain competitive advantage. Logistics business systems in a tourism destination appreciate the importance of information and communication technology in the decision process and seek to develop efficient logistics information systems that will make it possible to take better and more appropriate decisions directly aimed at improving business efficiency and productivity.

Key words: information, communication, logistics information system, information and communication technology.

INTRODUCTION

Clearly, information, as a phenomenon, and communication, as a process,[2] are among the most important parameters of quality for the hotel industry as a service activity. Misinformation about the time of guest arrivals or the fact of not knowing whether all hotel rooms have been booked can have a crucial impact on guest behaviour, and as such they determine the value of services provided by a hotel

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[2] Schertler, W., et al., *Information and Communication Technology in Tourism*, Springer, Wien, 1994, p. 23.

business system. Lack of information and communication can exert a drastic effect on the entire value chain of hotel products and services. All investments in high-quality standards, food and beverages, management systems, staff training and marketing are not worth their while if information is incorrect or if the wrong information is accessed.

Each business system seeks to build an information system that will provide the right information for quick and efficient decision-making. With the gradual introduction of logistics information systems (LIS) into logistics business systems, the problem of differing systems has emerged, where each system has it own databases, while no singular system exists that could enable all the data to be used. The need for fast and efficient decision-making has compounded the problem. Hence, efforts are being made to integrate all data a hotel business system possesses into a single, well-structured system that would enable each employee to access the information required for making the right business decisions on the spot.

1. INFORMATION AND ITS IMPORTANCE TO A LOGISTICS BUSINESS SYSTEM

Derived from the Latin *informare* meaning "to give form to, to shape, to present", the word ***information*** refers to an instruction, message, notification or communication on the course of work or one's action, or it can be a fact about something.

According to *Wahl*, information represents "those sections of news which have the value of novelty for the receiver enabling him to execute his tasks more efficiently"[3] *G.B. Davis* and *M.H. Olson* define information as "data presented in a form convenient to the receiver and having real or substantial value in current or future actions and decisions".[4] In these definitions, no strong distinction is made between the terms "data" and "information", with "information" being defined through the term "data". Some authors clearly distinguish between these two terms. The provision of data does not involve a qualitative and quantitative analysis of the meaning of numerical and other quantities, whereas this is a necessity when compiling information.

M. Varga asserts that information is "a description of one feature of a given object, and in order for this information to be preserved, it must be materialised or recorded".[5] According to D. Roller, information "consists of elements which are called data".[6] In fact, it is through data processing that we arrive at the information needed. Information, that is, a message is a fact with a specific meaning. It brings news, it tells us about something, it removes uncertainty and, in general, serves as a foundation for decision-making.[7] Therefore, the primary attribute of information is novelty. The receiver of information determines its value. The more relevant, accurate and fresh the information we use, the greater its value in decision-making. Gathering relevant

[3] Wahl, M.P., *Osnove upravljackog informacijskog sustava*, Infomator, Zagreb, 1971, p. 15.
[4] Davis, G.B., et al., *Management Information Systems*, McGraw-Hill, Singapore, 1984, p. 45.
[5] Varga, M., *Baze podataka*, DRIP, Zagreb, 1994, p. 2.
[6] Roller, D., *Informaticki prirucnik*, Informator, Zagreb, 1996, p. 7.
[7] Ceric, V., et al., *Poslovno racunarstvo*, Znak, Zagreb, 1998, p. 77.

information provides the required knowledge that is focused towards a specific task or objective that we wish to accomplish.

Information as a resource possesses specific features:[8]

1. Information is an inexhaustible resource (unlike matter and energy, it can be used without constraint).
2. Usage does not destroy the contents of information (information content is completely independent upon the intensity of usage; it remains the same if it is used once, never or multiple times).
3. Information can endure a multitude of consumers simultaneously (information can be used by an unlimited number of consumers at various locations).
4. The value of information does not diminish with usage (information stored in an information base may be used once or any number of times, without any change to its usage value and exchange value).
5. The usage value of information increases with use (by satisfying a growing number of consumers, information enhances its usage value).
6. Using information consumes little energy (unlike conventional work methods, energy consumption diminishes).
7. The use of information is not harmful to the environment (its usage does not result in any adverse effects for the environment).
8. The capability of people is the only constraint to using information (it is available to the extent to which people are capable of using it).

The study of information consists of three related parts. *Syntax* deals with the formal and quantitative aspects of information; *semantics* explores the contextual aspect of information and its meaning, while *pragmatics* examines the importance of information, that is, its value to the user.

In the literature, information is distinguished as a separate category. However, the primary attribute of information is its novelty, and from this aspect, information can be exposed to deterioration, that is, to the loss of its value through an aging process or to the loss of novelty, its prime feature.

In general, **various classifications of information** exist. It may be classified according to:[9]

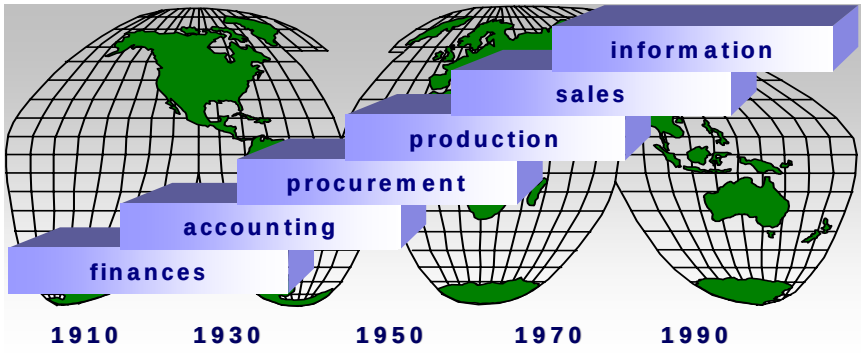
- *The material form in which it occurs* (documents, communications, signals, scientific analyses, etc.)
- *The flows to which it refers* (in technology, statistics, accounting, finances, designing, etc.)
- *The timeframes within which it is collected* (periodic, operative, current, long-term, non-periodic, etc.

[8] Sehanovic J., et al., *Informatika za ekonomiste*, Sveuciliste u Rijeci, Fakultet ekonomije i turizma Dr. Mijo Mirkovic u Puli, Pula, 2002, p. 21.
[9] Batarelo, Z., Prikazivanje rezultata poslovne analize i poslovno odlucivanje, *Poslovna analiza i upravljanje*, No. 2-3, Zagreb, 2003, p. 32.

- *Whether it refers to past or future events* (the former can further be classified as events that will not be repeated, might be repeated or will surely be repeated; the latter, as events that are deterministic and all those that are probable)
- *Whether it relates to concurrent events or to events that are interdependent although not happening at the same time* (events that take place concurrently, that are directly interdependent or events that are in no way directly interconnected)
- *The source from which it obtained* (scientific and technical information, and market information)
- *The level of processing* (primary information – created through direct observations such as watching, listening, etc. Its carriers are original records, images, etc.; secondary information – created through the various processes of transforming primary information).

"Information about money is more important than money itself".[10] Timely and accurate information and the knowledge resulting from it are a primary business resource in logistics business systems today. Information on previous business can help in making a good analysis, while new and fresh information is essential in making future business decisions. Figure 1 illustrates how the focus of business had changed in the last century in advanced countries (USA). To this can also be added a commitment to customer/consumer-oriented processes and an integration of all functions, which became especially popular in the early 1990s.

Figure 1: Business focuses in the twentieth century



Source: After: Srica, V., et al., Put k elektronickom poslovanju, Sinergija, Zagreb, 2001, p. 10.

In business management, there is a clear need for the continuous inflow of information. Information can be categorised with regard to its ***impact on business operations and decision-making***. The following table illustrates some of the features of information with regard to types of decision-making.

[10] Srica, V., et al., *Informacijskom tehnologijom do poslovnog uspjeha*, Sinergija, Zagreb, 2000, p. 4.

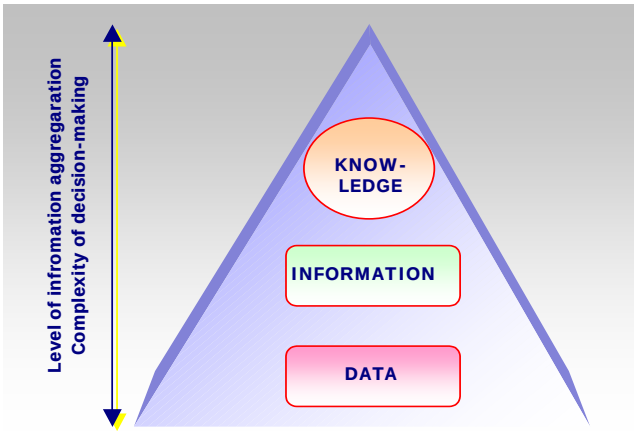
Table 1: Characteristics of information and types of decision-making

Feature	Type of decision-making		
	OPERATIVE	TACTICAL	STRATEGIC
Timeframe	✷ past	→	✷ current and future
Expectations	✷ predictable	→	✷ uncertain
source	✷ mostly internal	→	✷ mostly external
Aggregation level	✷ detailed	→	✷ concise
Frequency	✷ daily	→	✷ periodic
Structure	✷ highly structured	→	✷ non-structured
Accuracy	✷ highly accurate	→	✷ moderately accurate

Source: Lucas, H.C, Jr., Information Systems Concepts for Management, McGraw-Hill, New York, 1994, p. 41.

Logistics managers of all levels make decisions based on the information available to them, and it is very important that they are able to judge which is the "right" information. Even the most experienced managers may find it difficult to judge what data is needed to solve a specific problem. Logistics managers at the lowest decision-making level require a greater quantity of information, whereas top-level managers need only synthesised information. In terms of quality, information needed ranges from information on daily activities, relating to operative decision-making, to valuable information that can be a basis in devising a business system's strategy. Of vital importance is information pertaining to demand and guest needs and wants. New technologies and a modern business approach make it possible to develop entirely new logistics products, which impose standards within the industry and help to gain advantages over rivals. *The focus of attention is on information and its value in business and decision-making, with technology being only an inevitable medium.*

Figure 2: Logical hierarchy of data, information and knowledge



Source: After: Panian, Z., Odnosi s klijentima u e-poslovanju, Sinergija, Zagreb, 2003, p. 193.

The interrelationship of data, information and knowledge is one of logical superiority and subordination. *Data is located at the bottom of the logic hierarchy; information, in the middle; and knowledge, at the top (Figure 2*). Bringing something

new and adding value, information is designated for decision-makers, whereas data refers to something that is already known, with no value added. Information is the basis on which knowledge is built. Knowledge also possesses value because, as it accumulates, human capabilities grow. Logistics business systems that are fully capable of perceiving and understanding the characteristics, behaviour and preferences of their clients can be said to possess client knowledge. However, knowledge can be possessed only if one possesses information that reflects a specific whole. The hierarchy does not necessarily need to be bottom-up, that is, starting from data. Values and benefit can be imposed at every hierarchical level.

Logistics managers use information as a *resource, asset or commodity*.[11] Information can serve as a *resource* (similar to money, raw materials or equipment) or input in the production of output value. It has an indispensable role in providing services to clients. Information can also serve as an *asset*, the property of an individual or logistics business system that contributes to creating output. Logistics managers may treat information as a strategic means in generating competitive advantage. Logistics business system can buy and sell information, making it a *commodity*. With the modern economy increasingly becoming a service economy, many logistics business systems are making fewer distinctions between products and services, while adding information to products and creating new value in this way.

2. COMMUNICATION AND ITS IMPORTANCE TO A LOGISTICS BUSINESS SYSTEMS

The concept of ***communication*** is closely linked to the concept of information. It is a process no less important than information itself. With information becoming a commodity in great demand, its simple and reliable transmission has become a key area of interest of many, and not only computer professionals. Parallel with the progress of civilisation, new ways of transmitting information were increasingly developed. Communication refers to the transmission of data and information from one point to another.

As a process, logistics communication is a component part of the overall management process. At the same time, management implies communication between the source of information (management subsystem) and the recipient of information (the subsystem being managed). The fundamental elements of a communication model are a source of data or information, an emisor, a transmission channel, a recipient and a destination (*Figure 3*). At the very beginning of the communication model is the source of information from where a message travels to the emisor. The emisor transmits a signal that travels to the recipient, during which time it is subject to interference or noise. A transmission channel is an element of the communication model that transmits encoded signals from a source to a recipient. The recipient decodes the signal received and sends it to its destination, thus ending the communication process.

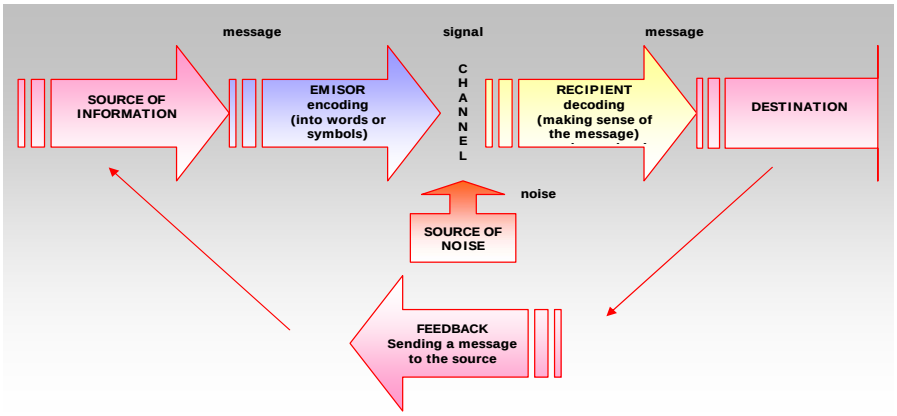
Logistics management is greatly preoccupied with communication, and in a logistics business system, special attention is focused on communication. Messages are

[11] Srica, V., et al., *Informacijskom tehnologijom do poslovnog uspjeha*, Sinergija, Zagreb, 2000, p. 6.

conveyed not only in words (oral or written) or images, but also through body movement, intonation, attitude and behaviour, attire, and other conscious or spontaneous gestures.[12] With regard to the participants of the communication process and the way they interact, a distinction can be made between the following *communication levels*:[13]

- Intrapersonal level – communication "within" an individual;
- Interpersonal level – communication between two or more individuals (a small group);
- Multipersonal level – communication within a group (between groups and large organisational units;
- Open-system level – a group or organisation communicates with its environment;
- Technological level – the hardware and software of communication (application of information and communication technologies).

Figure 3: Communication process



Source: Author's elaboration

The efficiency of communication depends not only upon the structure of a logistics business system, but also upon the rules of interaction between its subsystems. A feedback loop also exists, because the logistics business system undergoes change and is transformed under the impact of change to the communication process. For a business process to flow properly, lines of communication need to be established because it is along these lines that orders and tasks are transmitted, negotiations take place, responsibilities are allocated and decisions, made. In a logistics business system, lines of communication can be *vertical* (top-down) enabling goals to be set; the action needed to achieve these goals, defined; and authorities and responsibilities, issued and delegated. *Horizontal* communication exists between participants within a hierarchical level (strategic, tactical, operative), whereas diagonal communication emerges when a problem is transferred from a horizontal line of communication to another hierarchical level.

[12] Zugaj, M., et al., *Organizacija*, Sveuciliste u Zagrebu, Fakultet organizacije i informatike, Varazdin, 1999, p. 468.
[13] Srica, V., et al., *Menedzer i informacijski sustavi*, Poslovna knjiga, Zagreb, 1994, p. 31.

Communication in logistics business systems is formalised through information logistics systems. To transform information into real benefits, a logistics business system must train its managers how to understand, analyse and use LIS for improved and more efficient decision-making. What is crucial is not the availability of information or the use of modern ICT in business, but rather the ability of a logistics business system to aid them in making better decisions. Creating management information involves a considerable cost, and information that is not used represents idle capital that diminishes LIS performance. Therefore, using information is as important as the ability to create information. Evidence to this effect is provided by logistics business systems whose ICT projects have failed, despite substantial investments, because they did not know how to manage their information.

The transition from experiential to information-based decision-making and management is not an easy one, as it entails a radical change in the information culture of logistics business systems. For this change to take place, the logistics staff in contact with IT must embrace all relevant socio-technological knowledge, the appropriate structural mechanisms need to be put in place, and a climate created that supports IT usage.

3. *LIS* OBJECTIVES AND FUNCTIONS IN A LOGISTICS BUSINESS SYSTEM

The International Federation for Information Processing (IFIP) defines an information system as follows:[14]

> *An information system is a system that gathers, stores, safeguards, processes and delivers information vital to an organisation and society in a way that makes this information accessible and serviceable to whosoever wishes to use it, including the management, clients, staff and others. An information system is an active social system that may, but does not necessarily need to, use information technology.*[15]

Based on the knowledge of logistics, systems, information, information technology, informatics, and information systems, a ***logistics information system*** (LIS) can be defined as follows:[16]

> *A logistics information system is a system of mutually and purposefully connected and inter-impacting subsystems and elements, that through the use of human elements, material and technical elements, intangible elements, transmission elements and organisational elements, enables data collection, data processing, data and information storage, and the provision of data and information to logistics subjects as the producers of logistics products.*

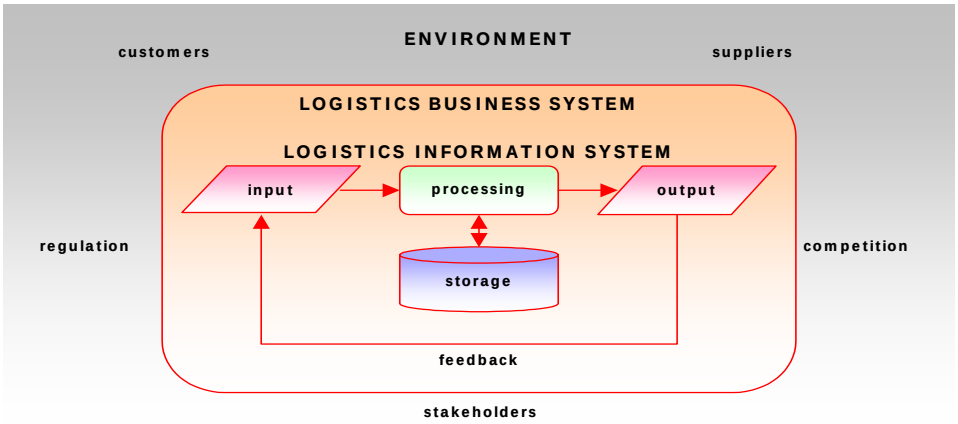
To prevent information from becoming a multiplicity of incoherent knowledge and to enable it to be accessed when needed, information is organised in a coherent, meaningful unit – an *information system*. Where this extends to information flows within a logistics business system, a logistics information system emerges, the primary function

[14] After: Ceric, V., et al., *Poslovno racunarstvo*, Znak, Zagreb, 1998, p. 32.
[15] In this paper, the term "information system" refers to an *ICT-supported information system*. ICT is daily gaining the attribute of a prime mover and carrier of the advancement in the economy and society at large. Today, it is extremely difficult or almost impossible to gain a competitive advantage on the tourism market with the application of ICT.
[16] Zelenika, R., *Logisticki sustavi*, Ekonomski fakultet u Rijeci, Rijeka, 2005, p. 262.

of which it is to make information available to all levels of logistics management and to the environment of a logistics business system. At the same time, it has the task of identifying the information needs of users; capturing, recording and retrieving data; planning information flows; transforming data into information, and providing this information to users.

The four *basic functions* of a decision-oriented information system are *(Figure 4*):
- *Data acquisition,*
- *Data processing,*
- *Data and information storage,*
- *Data and information provision to users.*

Figure 4: Basic LIS functions



Source: Author's elaboration

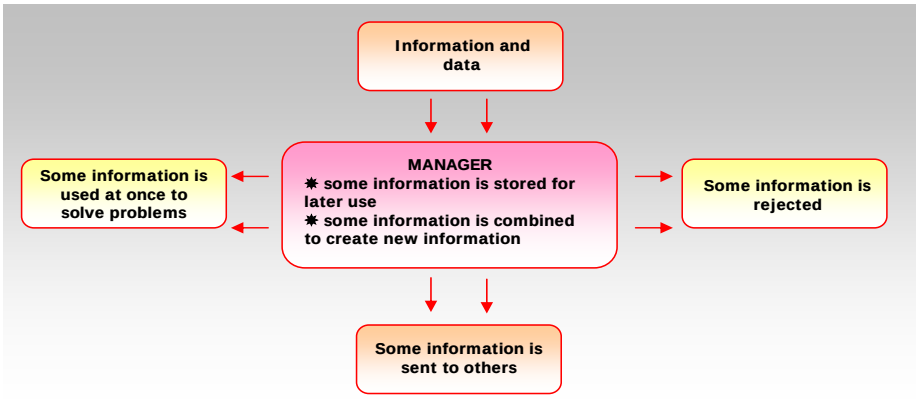
Through *data acquisition*, descriptions are obtained of the state of those system parts in which measurable change is expected[17]. This function involves analysing data sources, making preparations, and collecting and entering data. *Data processing* represents a change in algorithm form of LIS data content as a presentation of change taking place within a logistics business system. Data is processed in accordance with user needs. *Data storage* follows to secure the required integrity of data content on selected carriers and to ensure communication in time and space. Data content is *distributed* to users according to usage criteria for individual logistics management levels for the purposes of management, decision-making and control. Usually, logistics managers of various levels (from lowest to highest) are considered to be the sole end-users of information and the sole decision-makers, indicating that a logistics information system is oriented to logistics management and needs to meet its requirements and demands. This, however, dismisses the fact that other employees also make decisions daily as well.

For LIS to perform successfully, it must be coordinated with the decision-making system across all levels; with each following acquisition, it should seek to

[17] Hutinski, Z., Ucinkovitost ulaganja u informacijsku tehnologiju, Zbornik radova, *Hotelska kuca '96.*, Sveuciliste u Rijeci, Hotelijerski fakultet Opatija, Opatija, 1996, p. 236.

encompass all preceding types and quantities of information; and upon data processing, it should be capable of providing feedback to all from whom data was collected. This means providing "*the right information at the right time to the right place within a logistics business system*" at the least possible cost. In this way, specific decisions can be made regarding the management of various resources of a logistics business system to achieve the greatest efficiency and highest profit possible. *Figure 5* illustrates the relationship between logistics management and information.

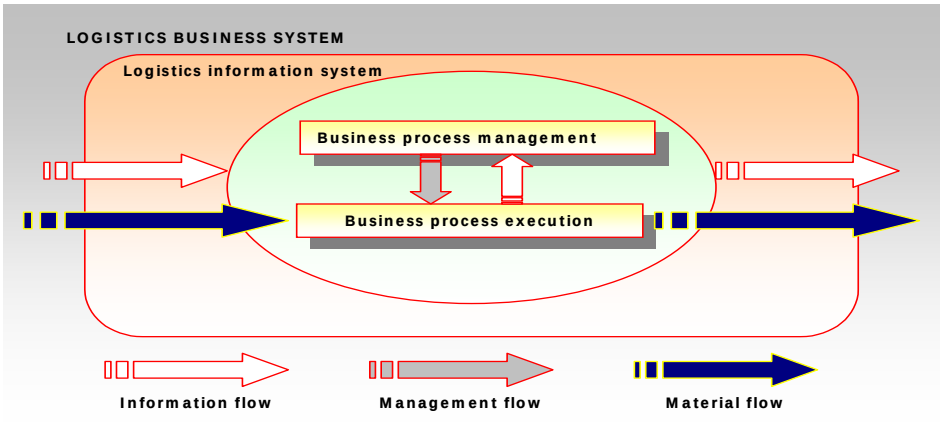
Figure 5: The logistics manager and information



Source: After: Sikavica, P., et al., Poslovno odlucivanje, Informator, Zagreb, 1994, p. 183.

A logistics information system operates within a business system, and this makes it a subsystem. It collects information from external or internal sources, uses established information activities to process this information, and then presents the processed information either to the logistics business system or to the environment.

Figure 6: IS operation within a business system



Source: After: Ceric, V., et al., Poslovno racunarstvo, Znak, Zagreb, 1998, p. 32.

The ***objective of a logistics information system*** is to enable communication within a logistics business system, as well as communication between the logistics business system and its environment, and to bring together the operating and management subsystems in a coordinated whole by providing the information required. This information is used in:

- Carrying out business processes, and
- Managing business processes *(Figure 6).*

The task of a logistics information system is to secure the information needed for carrying out a business process, that is, for performing the basic activities of a logistics business system. By using IT in building a logistics information systems, the business system is automated making its performance more effective and efficient. Each logistics business system seeks to build it own logistics information system as a basis for fast and efficient decision-making, that is, for transforming information into decisions.

The *basic information subsystems of a hotel* exert a sort of dominance over data processing with regard to the areas that they cover. This dominance is reflected in the fundamental types of information subsystems (accommodation subsystem, food and beverage subsystem, hotel-maintenance subsystem). A primary task of these systems is to collect, process and disseminate information at the level of transactions performed. In analysing data from the standpoint of *decision-support information systems*, it is necessary to have full access to data and to be able to acquire data at the level of the entire hotel business system, without dividing it into information subsystems. Only these types of systems are capable of providing the right information to the decision-maker – the hotel manager – by analysing data from internal databases, as well as from other sources (external databases). In addition to aiding the early diagnosis of problems, these systems also serve as a starting point for detecting guest preferences within market segments and the propensity of guests to buy a hotel product.

4. CONCLUSION

A logistics information system stores data and information on activities and what is required for their performance, as well as data and information on the past states of the system. It is a subsystem of a hotel business system and has a substantial impact on how this system is structured and how it functions and behaves. The role of a logistics information system is derived from the fact that it depicts the hotel business system and contains an account of the business decisions and transactions made within the hotel business system. The primary function of a logistics information system is to provide support in managing the hotel business system.

A logistics information system should be built as a subsystem of the integrated information system of a hotel, as a systemically developed and arranged whole of organisational rules with regard to the carriers of logistics tasks, their intercommunication, and the methods and procedures used in processing and transmitting information to ensure that logistics processes are efficiently carried out along the entire supply chain of a company.[18] The integration of different information systems has

[18] Zekic, Z., *Logisticki menadzment,* Glosa d.o.o., Rijeka, 2000, p. 55.

become a matter of strategic importance to the operation of a modern hotel facility, with special emphasis being placed on the connectedness of the supply chain with the planning and execution of production and the sales and provision of services to the end-user.

Hotel managers must understand the role and importance of logistics information systems in business decision-making and recognise ICT as a strategic resource enabling the long-term growth and development of a hotel business system and ensuring competitiveness on the global tourism market.

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