Concept of information business systems in the modeling the matrix of digital economics

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Abstract. The present study investigates the concept of information business systems and other categories of e-business in the entire structure of digital economics. The hypothesis is based on the trends of actual theories concerning the change of the business management paradigm aimed to the transition to Industry 4.0 and identifies the role of the developed classification of information business systems and the matrix of digital economics as tools for modernizing and adopting the newest management techniques. Here we report that we compiled the matrix of digital economics that allowed us to rank such economic categories as 1) economics 2) digital (=electronic) economics 3) net economics 4) e-business and information trade 5) information business systems. To carry out the fundamental analysis of information business systems with the analysis-by-synthesis method, the classification of information business systems was developed, which assists in widening and explicating the category studied and in representing the main components of information business systems offered in the authors’ formula.

1. Introduction

1.1. Relevance of the research topic.

Nowadays a large number of private firms, large holdings and companies are emerging in Russia, but the management methods used by many domestic businessmen are still rooted in the period of the centralized economy. To achieve the world-class competitiveness, domestic companies should study management methods that are consistent with current market conditions used by the leading corporations in the developed countries.

Up-to-date effective business management methods require the collection, analysis, processing and safe storage of data on the entire financial and business activities of the company and modifications of the internal and external environment which somehow or other have a great impact on the system and business management in general. Only if there is absolute, reliable, operational and objective information, it can be declared the ability to make reasoned and relevant administrative decisions while managing the production, economic and financial-economic activities of enterprises as well as while collaborating investment and signing contracts with business partners. All represented business infrastructure is impossible without the use of information business systems (IBS).

The research is aimed to identify the main economic categories of electronic infrastructure in the matrix of the digital social-financial system of the real sector.
1.2. Scientific polemics and the research issues level

The theory in the field of IBS is presented in the works of the following authors: V.V. Vershanskii [1], M.I. Lugachev [2], E. Hardcastle [2], M.K. Wyrwicka, B. Zasada, B. Mrugalska [4]; information and communication technologies (ICT) that are an integral part of IBS have been studied by S. Levius, M. Safa, K. Weeks [5], K.K. Ganju, P.A. Pavlou, R.D. Banker [6], M. Iansiti, K.R. Lakhani [7], X. Tang, J. Wu [8], I. Luzyanin [7], A. Petrochenkov [10]; new trends in the digital economics have been researched by C.S. Teoh, A.K. Mahmood [11], M. Pacquola [12], G.V. Yefimova, S.M. Maruschak [13], A.A. Khatchaturian, K.S. Khatchaturian [14].

More detailed information concerning the scientists' works and definition evolution is presented in the Table 1.

Table 1. Definitions in establishing terminology related to IBS

| Scientist            | Year | Definition                                                                                                                                 |
|----------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------|
| O.V. Yefremov        | 2006 | An information system is an interconnected set of tools, methods and personnel used to store, process and release information in order to achieve the intended objective [15]. |
| P.S. Belyaev         |      |                                                                                                                                              |
| E. Hardcastle        | 2008 | The role of information systems is to provide information to the management which ensues the ability to make decisions in the interests of the managed organization. [3]. |
| A.I. Steshin         | 2013 | Information system is an interconnected collection of data, methods and procedures of the data domain, computer equipment and software used for storing, processing and issuing information in order to achieve the goal by all interested user groups [16]. |
| M.I. Lugachev        | 2015 | IBS are a complex of information technologies, functional subsystems and their interaction management for providing information support processes and making decision for social and economic tasks and business tasks [2]. |
| R.A. Khatsukova      | 2017 | Information systems represent a set of methods and tools that ensure the implementation of the intended complex of operations in the management and decision-making process [17]. |
| E.T. Shafieva        |      |                                                                                                                                              |
| P. Sharma            |      | IBS represents a set of interconnected procedures that use the IT infrastructure in the business sector to generate and distribute the necessary information. Such systems are created to support decision-making by goal-oriented individuals [18]. |

The analysis of the definitions presented in the Table 1 leads to the conclusion that all scientists realize IBS as a set of methods, procedures and tools but each of them understands in its own way the purpose of IBS in economics. For example, E. Hardcastle reports that IBS are necessary to provide management with all information required [3]. However, A.I. Steshin holds the opinion that IBS are used to store, process and issue information to all interested user groups [16]. We shall define our understanding of IBS in the results part of the present paper.

2. Methods

We applied a general scientific methods of cognition to obtain a result of studying the theoretical and practical material. At the first stage there were used the analysis, synthesis and comparison; as a result of the presented tools, we proposed the definition in the problem of comparing the main categories of the digital economics. At the second stage, the matrix of e-economics was developed by using modeling processes and graphical decompositions. The third substantiates the relevance and validity of the information business systems as the basic element of the digital economic system.
3. Results

On the base of theoretical analysis and definitions of the term IBS (Table 1) we concluded our definition: IBS means a set of methods, procedures and tools of the data domain that uses IT infrastructure to provide management with information resulting in the opportunity to make the relevant management decisions in the interests of the company.

In general, the IBS can be represented as follows with modernizing the equation previously proposed by M.I. Lugachev, the professor of MSU:

\[ \text{IBS} = \text{Business processes} + \text{Algorithms} + \text{ICT} + \text{Information} + \text{Personnel} \]

Let us consider IBS in the overall matrix of the digital economics. We determine the place and role of the main digital categories in the Figure 1.

![Figure 1. Matrix of digital economics.](image)

Here is the legend of the Figure 1: (1) – principles of agents’ interaction (algorithms, methods, tools); (2) – indicated the conditional agents’ interaction; (3) – other components of e-business; B – business, C – customers, G – government; B2B – business to business, B2C – business to customers, B2G – business to government etc.

The presented scheme allows to use the IBS for interactions between the agents of information business that is defined as a kind of business based on the information trading. IBS is also used by the agents of digital economics (digital economics is an economic activity in which digital are data one of the key production factors).

According to the suggested scheme, information business (IB) is included into the net economics but the agents not being involved in the information trading can interact with the IB or digital economics agents, so this interaction generally produces profit for both parties.
Present study has revealed that IBS themselves include IT-tools because it is necessary to distribute, proceed, use and store the data by the agents of every category.

IT represent one of the main components of e-business. Moreover, the matrix includes such categories as Internet, data bases and data banks, computers and software, information systems and other electronic instruments that further the organization and realization of business processes, business information and commercial transaction exchange.

According to the given matrix, all the categories described above are involved in digital economics.

To realize the place of IBS in digital economics, it is essential to consider the classification presented in the Table 2.

We have created the classification of IBS (presented in Table 2). In accordance with this classification, IBS are classified upon 6 indicators and are divided into 33 units. The presented classification is to divide into 6 indicators:

1) on the scale;
2) on the type of the solvable tasks;
3) on the supported concepts (standards) of management;
4) on the level of the corporate governance;
5) on the kind of the objects of managing;
6) on the attended data domain.

| On the scale | On the type of the solvable tasks | On the supported concepts (standards) of management | On the level of the corporate governance | On the kind of the objects of managing | On the attended data domain |
|--------------|----------------------------------|---------------------------------------------------|----------------------------------------|---------------------------------------|----------------------------|
| Single-user  | Systems of Electronic Data       | Material Supply Planning                           | Knowledge Management Systems           | Automated Information Systems for Organization and Economics Management | Automated Information Systems for Organization and Economics Management |
|              | Processing                       | Production Capacity Requirements Planning          | Decision-making Support Systems        | Automated Information Systems of Process Control | Automated Information Systems of Process Control |
| Group-user   | Information Management Systems   | Continuous Informational Acquisition and Life-cycle Support | Office Automation Systems              | Electronic Processing Systems of Management Systems | GIS |
| Corporate-user| Office Automated Systems         | Manufacture Resource Planning                      | Transaction Processing Systems         | Management Information Systems        | Automated Design Control Systems |
|              | Decision-making Support Systems  | Work flow                                           | Management Information Systems         | Executive Support Systems             | GIS |

There exist many different classifications of IBS in the modern science. For example, V.A. Grabaurov suggested to classify IBS on 4 levels:
- strategic level;
- functional level;
- knowledge level;
- operational level [19].

Nowadays it is used to distinguish as well Management Information Systems (MIS) and Business Intelligence (BI): MIS is the type of the business automation system that allows to integrate and
summarize within the framework of an adopted development strategy or concept under consideration the information required for making a management decision [20].

BI includes the business intelligence systems. Many companies dispose row data that could help to answer many questions but only the small share of these data is commonly used while making a key decisions. Decisions with BI ensure converting row data into information that helps to make strategic business decisions [21].

MIS and BI systems enable to follow-up life-circle of every ware produced with realizing where, in what segment the enterprise gains the maximum profit, which product is worth to concentrate on and what could be outsourced.

4. Conclusion
The study of the presented scientific work topics resulted in the following scientific achievements. The authors have precisely defined the term IBS. The paper presented the matrix of digital economics with the detailed definition of place and role of every scientifically new economic category and with distribution of such conceptual terms as: economics, digital economics, e-business, net economics, information business, information business systems. Recent work also demonstrated IBS classification on 6 indicators with comprehensive subleveling depending on such features as scale, standards of management, solvable tasks, level of the corporate governance, kind of the objects of managing. The results gained could significantly update and adapt scientific representation of new digital economic categories and would subsequently become the basis of new development and trends in the area of IT, digital economics and information market.

5. Future directions of the research
After studying the main categories of modern economic systems, the detailed introduction of the other basic terms of the digital economics seems to be wise. From the practical point of view, it is necessary to study on the example of IBS GROUP Company the issue of IBS on adapting and updating the business taking the digitalization and globalisation trends into account [22, 23].

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