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SECURITY MANAGEMENT IN THE *H-H TYPE* OF THE ORGANIZATIONAL STRUCTURES

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The article is devoted to the problems of the security management for the dispersed organizational structures. The security is one of the system criteria that determine the factual value of the organization, what tends to expose the information and decision-making processes in an article. These processes determine the efficiency of modern business units and directly affect the level of the overall security of dispersed organizations. The security of an organization can be seen in various aspects ranging from the system security (general, global) through the economic security to the information security. The process nature of the relationships between the links of an dispersed structure indicates the need for the creation of the operational security. A particular role is played by the ICT as a strengthening factor for the widely understood potential of the company and its economic security in this area, e.g. in the framework of stimulating processes of a group learning, using of dispersed databases, or verifying generated knowledge in terms of the efficiency and certainty of the decision-making processes in dispersed structures. This article is a kind of an outline of the concept of the new *H-H type* structural solution (the hybrid of the hierarchical and heterarchical configurations), taking the criterion of an information and economic security into an account.

Keywords: Dispersed Structure, H-H Structure, Network, Security, ICT, X-Engineering, Cloud Computing, Knowledge

1. Introduction

The enterprises management is largely related to the implementation of the decision-making functions and to shaping the structural configurations in a way that allows for taking the criterion of their efficiency into an account, while maintaining the given boundary conditions [12]. A solution of a problem sat in a such way requires the use of modern information technology that is conducive to shape the rational dependencies in the spatially and information dispersed structures.

Making the decisions by dispersed units is laden with the large dynamics, resulting often from the need for joining new participants to the network structure and modifying the goals of the organizational system (the newly-configured network). Available and used information and communication technologies can effectively support the decision-making and information processes, resulting usually in shortening the time of each task. A modern business organization requires, first and foremost, the focus on the problem of the security management in dispersed structures and on creation of the value in an organization in terms of the system approach with a particular comply with the requirements of the information security (as one of the dimensions of the general and economic security).

The results of the literature research in an area of the enterprise security modeling lead to the concept of a new structural solution which is a hybrid of hierarchical and heterarchical organizations. Therefore, there are being looked for a substantive basics to the specification of a new structural configuration (*H-H type* configuration) in this study – in reference to the *sustainability paradigm* [6], engraving the role and importance of the operational (and partially the strategic) criterion of the economic security, and taking the changes in the technological environment into an account (in the context of the dynamics of decision-making functions within an enterprise).

2. Dispersed organizational structures and the *H-H type* structure

The security management in the dispersed structures requires an identification of security determinants. It cannot be, in fact, *a priori* said that the hierarchical (vertical) structures guarantee the security of an organization to a lesser extent (both at the micro- and mesoeconomic levels) than the flat structures. Depending on the situational context of the decision-making processes, the business organizations are able to maintain the competitive potential taking a hierarchical structure, or in other situations a network structure. It is rare, in fact, that one of the predetermined activity model is able to ensure the economic security, both in the short and the long time horizon, taking changes in the environment (primarily in the proximal environment) into an account.

The degree of flattening an organizational structure is not a source of increasing the degree of an immunity of an organization to the both kinds of threats: existing in the environment ones (business, demographic, infrastructural etc.), as well the internal organizational mechanisms. Network structures are characterized by a high degree of operational flexibility and are focused on the efficient knowledge management (usually the criteria for selecting a business participant are knowledge and experience) [19]. However, it cannot be assumed that these are the key and sufficient factors to ensure the economic security. Network structures constitute the sources of additional threats to the organizations (the system) that are less clear to observe in the hierarchical structures. In addition, it should not be claimed that the hierarchical structures are the "outdated" solutions, that in the current business environment does not meet the criterion of an efficiency. It must also be noted that the integration of the hierarchical and heterarchical configurations should not affect negatively the degree of the use of the available IT solutions, and it may even increase that degree. It creates a base not only to integrate spatially and thematically dispersed information resources (databases) of co-participants, to use the Cloud Computing technology, or to use the Data Mining tools in a dispersed environment – but also (if not primarily) to verify the degree of usability, reliability and quality of created information and knowledge in an organizational system (e.g. through the implementation of the hierarchical control mechanisms).

The model of the *H-H structure* is developed for the specific circumstances and the specifics of the organizations' approach to achieving the objectives by the same company. Under certain conditions, the *H-H structure* can be successfully adapted and states the starting point for efficient business activities. The *H-H structure* differs from other structural configurations in the framework of the approach to exploit the potential of ICT solutions, mainly for the creation of the market position of an organization with the use of the Cloud Computing technology and Integrated Management Information Systems (IMIS). The primary benefit of an integration of hierarchical and heterarchical configurations, on the side of the first one, is to support processes of control and automatic switching to the mode of "one decision-making unit" in a situation of the external or internal (i.e. the business-natured) threats. At this point, it is observed the activation of the *Central Decision-making Unit* (CDU), as well the implementation of the tasks that require focusing the decision-making processes in one unit, or the need for the reallocation of the production capacities [30]. The network structures, in turn, give the opportunity, first of all, to free shaping the dependencies on the teams, e.g. in terms of choosing business participants, taking the criterion of knowledge into an account, and focusing on the creation of new knowledge in the system. There is visible the temporal nature of this structural type's functioning and of its openness on the communication with the environment, based on the platform of the Internet in this case [5, 13,

19, 21]. Therefore, the *H-H type* structure is able to exploit the potential of dispersed information resource management with an exposition of an information security. It can be assumed that the *H-H structure* is a specific class of a learning organization with a strong support of the planning and control functions.

3. The concept of X-Engineering and integration of dispersed structures

A reflection of the systemic perception of the security management processes in the spatially and information dispersed organizations is the concept of X-Engineering. Its main determinant is based on such functional assumptions of an organization, that will make it easier to connect to a multi-faced business relationships by a given business unit [3, 29]. This is a management concept adapted to the organizational changes at the micro- and mesoeconomic abstraction level. Narrowing the analysis spectrum solely to the environment of a single organization (also a spatially dispersed one) it may be noticed a necessity to implement the market relationships in a set of the internal customers (according to the process management model [29]). Turning on the mesoeconomic area, the special role is played by the relationships between co-participants in the network [29]. Therefore, it can be assumed that X-Engineering strategy is the premise for the transition from the hierarchical organizational model, the flat heterarchical model etc. into the *H-H model*. The particular importance in this concept is ascribed to the processes of enlarging the business activities by the possibility and potential of the external units, also with a regard to the implementation of planning and control functions. The X-Engineering triangle assumes, in fact, an integration and development of areas such as: processes, proposals and participations – with the proviso that participations of the external units, the extent of their interference in the organization's environment, as well their contribution in the form of information and knowledge resources is precisely defined [3]. In such a situation, it is difficult to talk about a balance (equivalence) of all the elements that make up a dispersed structure. The effect of primacy always occurs in this case. This phenomenon can be thought of as a permanent feature of the heterarchical structures [17, 20].

The concept of X-Engineering exposes the need for an operational integration of the activities conducted in an organization on the base of information and communication technologies [3, 29]. Bearing in mind the ICT solutions, there should be noted a special role of the transactional IMIS class systems, and the Business Intelligence systems (including the Data Mining systems). However, it should be noted that one of the ICT infrastructure's element, responsible for the integration of the dispersed structures, is an environment of the Internet [8]. Contemporary trends in the development of the IMIS suggest a raise in a significance of the Internet environment as a basic platform for the information exchange between processes'

executors in an organization. The IMIS are equipped with advanced analytical modules and adapted to carry out the process reengineering [29].

The examples of the evolution of the On-line transaction processing class systems (OLTP) can be both systems supporting manufacturing processes, such as the ERM class systems, e.g. EERP (*Extended Enterprise Resource Planning*), eERP (*electronic Enterprise Resource Planning*), @ERP (*active Enterprise Resource Planning*) [29], as well the DEM class systems (*Dynamic Enterprise Modeling*) [29], or the systems supporting the Customer Relationship Management (CRM) – which reflect the possibility/potential of Web 2.0 technologies, e.g. PRM (*Partner Relationship Management*), SRM (*Suplier Relationship Management*), VRM (*Visitors Relationship Management*), eCRM (*electronic CRM*), mCRM (*mobile CRM*) and ERM (*Employee Relationship Management*) [2, 16].

It is worth to note that not only the OLTP class systems support the security management in the dispersed structures. Among the Business Intelligence class systems (the analytical processing), there can be indicated e.g. the dedicated analytical devices, the DPA (*Decision Process Automation*) and IPA systems (*Intelligent Process Automation*). The IPA tools are also common termed as the BAM systems (*Business Activity Monitoring*), which differ from the classic Business Intelligence systems. The BAM systems, in turn, represent the core of systems based on the Balanced Scorecard (EPM – *Enterprise Performance Management*). These systems are defined as the BPM class systems (*Business Performance Management*) or CPM class systems (*Corporate Performance Management*) [7]. There is also worth to note the possibility of the implementation of the Corporate Business Intelligence Portals at this moment. There should also be highlighted the e-Business Intelligence systems and the EIP systems (*Enterprise Information Portal*), which are called the real-time BI systems in this case. There should also be mentioned the *enhanced Data Warehouse* (eDW), which gathers data from Internet and filters it into the Data Warehouse, and also searches for data by DW mechanisms, as well the *enhanced Knowledge Warehouse* (eKW) [7]. Not without a significance is also the cloud processing technology. The evolution's directions of the IMIS class systems and their impact on the economic security management in the dispersed structure are presented at the figure 1.

The application of the concept of X-Engineering as an integrating element of the area of an economic security management in the dispersed business organizations, as well the integration of the decision-making processes, and the processes of knowledge creation imply the information asymmetry phenomenon [28, 29]. This is the attribute that fits the foundations of the *H-H model* of a structural configuration and simultaneously is a response to an increase in the importance of the security of the information resources as an important component of the overall security of an organization. It should be noted, however, that the provision of an

information security is not a sufficient condition to ensure an economic security. The complementary factor is also the continuity of implementation basic, auxiliary and management processes (mainly in terms of creating a network of subcontractors and functioning of the internal customer mechanism) [9, 31]. On the other hand, it must be remembered that the maximization of an economic profit function does not state *ex definitione* an economic security.

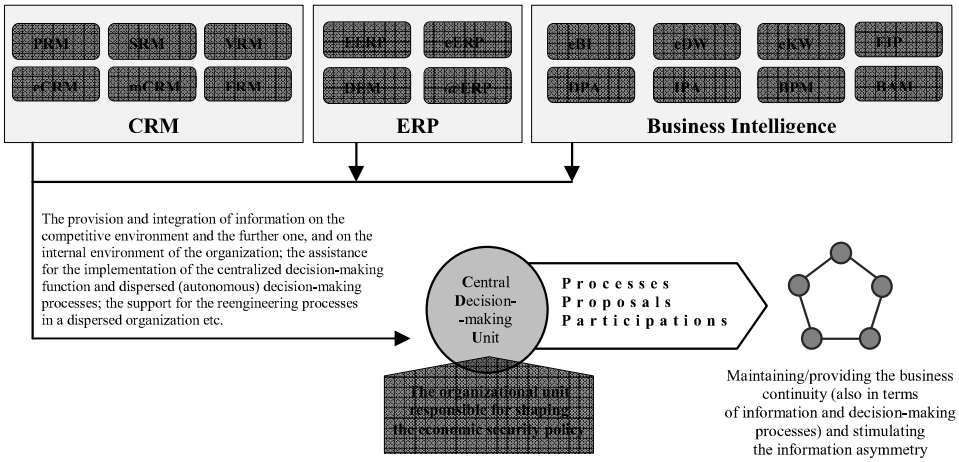

Figure 1. The directions for the evolution of the IMIS class systems and their expected impact on the security management in a dispersed structure. Source: own preparation

4. Information security in creation of the potential of business organizations

An information security as one of the dimensions of general and economic security, affects to a large extent on the state of the business continuity of the organizational system [31]. An information security is largely dependent on an ICT infrastructure used in a dispersed organization, as well on the nature of the managerial solutions, with a particular regard to the human factor and the organizational culture, and more concretely – the value system, the degree of confidence in a team, the activities geared for a cooperation and the criterion of knowledge [6, 31]. In general, the sources of an information security, especially in a virtual environment, are dichotomous-natured, i.e. determined by factors of the trust and the applied IT technology [23].

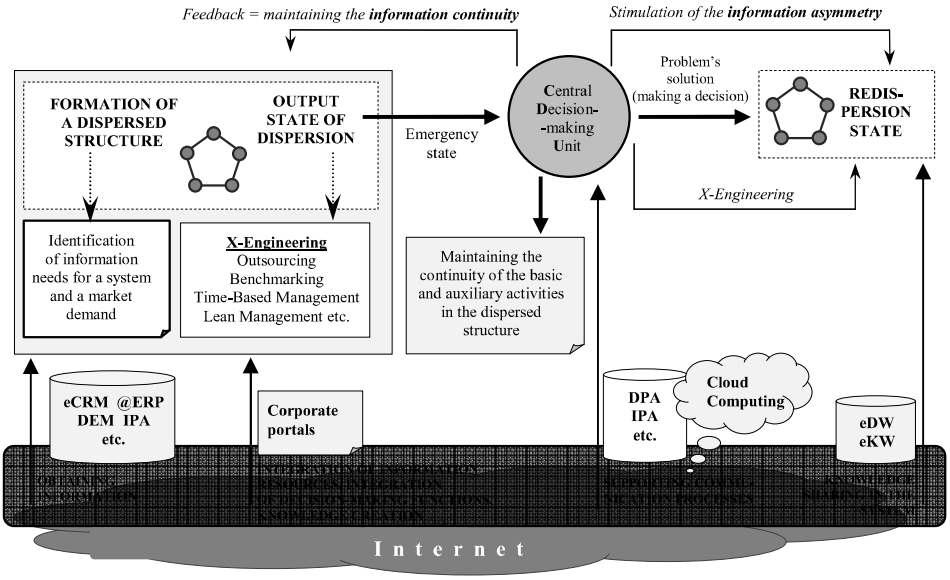

Figure 2. The emplacement of the X-Engineering concept in the information and economic security creation in a *H-H type* organization. Source: own preparation

An information resources management in a dispersed structure boils down to a skillful use of the potential of the Internet environment (and also intranet and extranet). Thanks to the possibility of obtaining, processing, sharing, sending and collecting data in a virtual environment, there is a base for the integration of data and information resources in a case of information security management. The basic technologies applied in an information security area are e.g. systems as follows: eCRM, @ERP, DEM, IPA, and the corporate portals, the CAx modules, the Cloud Computing technology, as well the eDW and the eKW (fig. 2). In this case, an information security comes down to providing the valuable resources (including new knowledge) to the units in a dispersed structure. The phenomenon of a knowledge creation has also the links to the feedback mechanism (stimulated by the CDU), mainly in the field of the correctness and suitability of created information, and the quality of data obtained by the various participants (fig. 2).

Each time movement of the *H-H structure* to a new state of dispersion requires setting up the assumptions (or bringing them up-to-date) for the procedures of an information asymmetry, e.g. about an access of the end users to data and information [28, 31]. It should also be noted that the CDU is primarily responsible for the security management of analytical data – and for the security of transactional data should be responsible the business units that make up a dispersed structure, as well the CDU in the emergency sates of the business activities.

5. Cloud computing in strengthening market position

The needs for a reorganization of a dispersed structure and a redefinition of the system[1] and elementary[2] usability functions (fig. 3) does not need to mean the organizational and technological difficulties. The one of the possible solutions is to apply the technology of the Cloud Computing (CC), which reduces the need for an expansion of each organization's ICT infrastructure, and there can even be acceptable (as well advisable) an abandonment of that kind of infrastructure in managing information and economic security in a short- and long-time horizon [1, 11, 22]. To the basic services in the Cloud Computing technology are included: SaaS (*Software-as-a-Service*) – an access to the various applications, e.g. an *online* archive, an email account, or spreadsheets and Web forms, IaaS (*Infrastructure-as-a-Service*) – an access to the *storage*-type infrastructure, PaaS (*Platform-as-a-Service*) – an access to the entire platforms for applications' development, i.e. servers, databases etc., and CaaS (*Communication-as-a-Service*) – an access to the communication platforms) [1, 15, 24].

The CC technology is focused on minimizing the costs of operational activities of a dispersed structure, e.g. in terms of shortening the communication time between the co-participants, reducing the costs of maintaining and developing an infrastructure, the data processing [22], increasing the enterprises' flexibility [1, 15, 26, 27] (and, thus, of the whole organizational system in terms of regarding the data and information processing in the Internet environment [27]). The CC technology allows also to increase the performance and efficiency with limited production capacities and the time to react to the occurrences identified in the environment of the private, public, social, or hybrid clouds [1, 15]. Therefore, it can be assumed that Cloud Computing is a technology which advancements the strengthening of the market position of an enterprise, as well an entire dispersed structure, e.g. in terms of supporting the Business Continuity Management and increasing the efficiency of knowledge creation. The Cloud Computing gives the ability to scale/diversify the products or activities, according to the demand expressed by the customers [1, 14], facilitates the collaboration within the spatially dispersed structures, and increases the flexibility of the data processing in the cloud.

[1] Marked at fig. 3 by the symbol $U_{syst}(t)$ – as a time function.
[2] Marked at fig. 3 by the symbol $u_n(t)$ for each element/participant in the network structure (spatially and information dispersed) – as a time function.

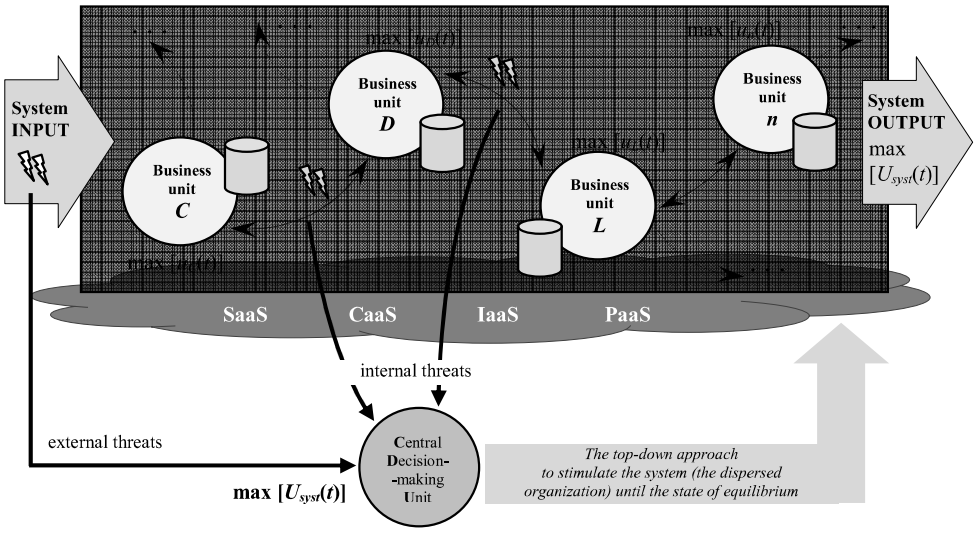

Figure 3. The Cloud Computing technology in strengthening the market position (by maximizing the utility functions) of the spatially and information dispersed *H-H structure*. Source: own preparation

The CC technology is a specific link between the needs of the customers (the internal and external ones), as well the other enterprises. Therefore, this technology is applied in the processes of maximizing the utility functions of different classes of stakeholders in dispersed structures (fig. 3). An important role in strengthening

the market position of a spatially and information dispersed organization is the CDU, which directly uses the Cloud Computing technology, applying it only to communicate with the co-participants in the framework of cooperation proposals' notification, as well with the external customers (as an optional feature of the CDU in the *H-H type* structure). The CC is primarily a technology dedicated to dispersed structures, supporting the operation of the elementary business units, e.g. in an area of the use of professional solutions of the IMIS class as a CC service. The CDU in a situation of emergency (internal- or external-natured) takes over the decision-making function and reorganizes the triad: processes, proposals, participations (as already mentioned), using e.g. the Expert Systems, Executive Information Systems, Artificial Intelligence Systems, or Data Mining systems.

The Central Decision-making Unit stimulates dispersed business units (participants) to take new actions (improving-, mending- and innovating-natured ones), and indirectly it specifies a new data processing rules based on the potential and possibilities of the CC technology. The individual business units continue to have an access to their own databases (e.g. in the form of the information "islands") in a state of emergency, what gives them the ability to maximize their own utility function – what also indirectly affects the enhancement of the security and the market position of the entire network structure. What more, the Cloud Computing technology effects in concentrating by an organization on its core business activities (i.e. their specialization), using mechanisms of the economies of scale (through an increase in a productivity), as well as increasing the transparency of the system operation/organization, and in supporting the processes of business activities' controlling [10]. It is also worth to notice that the flexible and efficient implementation of business projects in a dispersed environment, e.g. in network or virtual structures, requires the use of Web applications and services[3] [24, 25].

The computing in a cloud in a spatially and information dispersed organization is connected with formation of the specific risks, associated e.g. with the necessity of an additional geographic dispersion of services and data stored in a cloud, as well with ensuring the security of confidential data collected and processed on the external servers [4, 25]. However, while a data loss is not a threat to the enterprise (by SLA agreements guaranteeing the time of services' functioning at 99.999%, as well by making the backups [26]), there may appear a risk of the temporary loss of access to the important classes of operational data in that kind of situation. Making a decision with the use of the CC technology's potential in managing an economic security of a dispersed organization by stimulating the competitive potential might also be a major source of the risks (mostly of the decision-making nature, while not necessarily of the technological one), of which an organizational system (and especially the CDU) should be aware.

[3] For example the Web Services standards, using e.g. the Cloud Computing technology and SOA (*Service Oriented Architecture*).

6. Conclusions

The network structures are neither a *sine qua non* nor a sufficient condition for ensuring an economic security in an operational mode in a dispersed environment. Thus, there is a need to integrate the hierarchical and heterarchical (H-H) structures what represents a new approach to provide and maintain the desired level of a security of an organisation at both a micro- and mesoeconomic levels. Providing and maintaining an economic security in spatially and information dispersed structures should be identified with actions aimed at adapting to changes and proactive stimulating desired changes in an organization and their environment – in order to maximize the elementary and system utility functions. Therefore, the role of the CDU is special and important from the perspective of ensuring and maintaining the desired level of an economic security.

It should also be added that the main dimension of an economic security is not only the continuity of the basic and auxiliary processes (that generate a value in a dispersed system), but also the continuity of information and decision-making processes, with a particular regard to the information asymmetry phenomenon in the area of transactional and analytical data management, as well the creation and verification of knowledge in an organization. An economic security can be seen through the prism of the learning processes in a business unit (also in a network structure), not only on a base of their own (individual/single) experiences, but above all on a base of the multidimensional operational interactions with entities in an environment (according to the assumptions of the X-Engineering concept). An organization's security is also determined by the degree of its openness to the potential of the external units.

Not without a significance is also the fact that an economic security management requires the cybernetic frame. The dispersion state (i.e. the state of the secure and stable implementation of an economic security policy, including the areas of creating the added value and maximizing the utility functions) cannot fully meet the complexity and instability of both a dispersed structure and its environment. Therefore, the justifiable activities seem to be the specification and description of the *controlled system* (a network of the business units) and the *controlling system* (in a form of the Central Decision-making Unit). This dual nature of the decision-making functions is an attempt to increase the operational flexibility of a dispersed structure under the conditions created by ICT, notably in the field of a communication in the Internet environment (the Cloud Computing), as well of the processing and integration of transactional and analytical data. It should be mentioned, however, that currently available and developed ICT technology can be an important source of threats in ensuring and maintaining an economic security for an entire dispersed system, as well for its individual components.

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