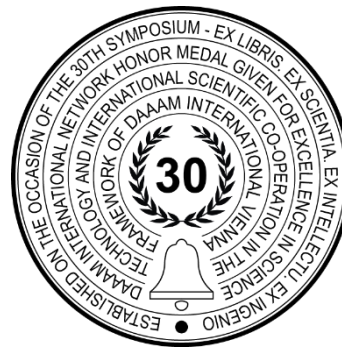# INFORMATION ECOLOGY, INFORMATION HYGIENE, AND ASSESSMENT OF INFORMATION VULNERABILITIES IN ORGANIZATION

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Abstract

The article tries to approach information hygiene as a tool that will make it possible to achieve higher efficiency in obtaining information through an appropriate knowledge and work regime arrangement. To put it into context, he points to the current state of society. In particular, he is concerned with the excess of information and the resulting problem with information vulnerabilities in the organisation, demonstrating the necessity of changing information habits. It deals with information hygiene mainly from the point of view of implementation by the user himself. It points out some negative phenomena that can occur when working with information. The article attempts to outline a new method for evaluating the information environment in an organisation from the perspective of information science. The article further deals with recommendations to organise the work regime better.

Keywords: Information ecology; information hygiene; information vulnerability; information.

1. Introduction

One of the essential entities is organisations and their information environment. The vulnerability of the information environment has become a topical issue in recent years. The prerequisite for ensuring a clean information environment is the identification of vulnerabilities in the information environment based on the given setting of the organisation itself. The information environment is an integral part of the social environment. Its structure, determined by the basic social levels, consists of the human factor, which is the originator, mediator, and user of the communication process, as well as the information and communication processes themselves, within which specific information goals are realised, certain information flows are ensured, and various information products are created. All this is provided by one particular material-technical base: information institutions, libraries, information technology and computer technology. [1]. The field of technology is vast. It contains many types of technology that enable human activities that were once impossible. However, with the rapid onset of technology, the volume of information that a person has to process also increases.

The rapid increase in information is called the "information explosion" and is described as "an extreme increase in the supply of available information." [2]. Davenport [3] evaluated a new way of looking at information management in a changing world that considers the information environment, which he called information ecology. According to him, "an information ecologist can mobilise not only architectural designs and information technology, but also information strategy, policy, behaviour, support staff, and work processes to create a better information environment.

A vital premise of the information ecology, defined as "the complete information environment," is that organisations must focus beyond "mechanical engineering" beyond information technology. Evaluation is an essential tool for improving management. Through organisational evaluation - commonly known as evaluation - the organisation's effectiveness is measured in terms of its functioning, problems, and results in terms of behaviour and social system - it evaluates economic impacts, impact evaluation, essential evaluation, analytical evaluation, and operational evaluation. [4] The heuristic method evaluates the usability of the user interface of the system without user involvement - the evaluation of the information system means the evaluation of performance in the areas of hardware, software, computer networks, data, and human resources [5], the evaluation of text documents and information resources assesses the extracted structured sources of information that are collected in text documents, and information about sources that indicate their reliability and relationships between them [6], website evaluations [7], among others.

The search for literary sources brings us an evaluation of organisations from a complex point of view, information systems, text documents, and information sources, which somehow evaluates the information environment but does not focus more closely on the evaluation from the point of view of information science of our described vulnerabilities - information overload,

The search for literary sources brings us an evaluation of organisations from a complex point of view, information systems, text documents, and information sources, which somehow evaluates the information environment but does not focus more closely on the evaluation from the point of view of information science of our described vulnerabilities - information overload, information smog, information waste, information fragmentation. Such an approach still needs to be improved. This often-neglected area can result in poorly done work, the breakdown of the organisation's processes, or significant financial losses. Based on the mentioned and other shortcomings of the current state of the problem, the need for a conceptual assessment of the vulnerability of the organisation's information environment was evaluated.

2. Information ecology

The German philosopher Rafael Capurro was the first author to deal with information ecology in a broad (mainly political) context. In his view, information ecology has a social, historical, and linguistic dimension. Information ecology takes care of and protects the information environment of the organisation and the system of interconnected social, cultural and political subsystems. The information ecology approach in an organisation affects what information will be produced, stored and accessed. It focuses primarily on the human element and not only on technology. Continuous development and changes in the organisation's environment are also considered. [3]

2.1. Knowledge society

Today, the knowledge society is an internationally recognised and promoted concept, according to which the further development and improvement of society must be supported by the fact that all people are educated throughout their lives; lifelong learning becomes part of the way of life. Let's look at the historical experience with the practical application of knowledge and information to make technical, economic and social decisions. The example of the decision-making of the mentioned King Solomon can illustrate the fact that such decision-making and management was and is considered wise, where not only information and knowledge contribute to the probability of a correct decision, but also actual emotional agencies such as feeling love, hope, faith, desires, motivation, common good, etc.

Therefore, the ability to harmonise informational and emotional agencies and select them for vital decisions about one's behaviour and the behaviour of surrounding systems is needed. Suppose we do not behave arbitrarily towards the physical environment of the world around us. In that case, we should also set certain limits and rules for maintaining the purity of the information environment. We live within the framework reserved by our European culture. It includes caring for the soul of the individual and our living space, and now it should also be caring for the quality of the information environment. [8]

2.2. Virtual smog

It comes to the words of the German philosopher Martin Heidegger, who observed that technology shortens distances but does not bring new closeness. The younger generation, in particular, lives partly in the virtual world, which is formed in an information environment rich in valuable components and polluted by dangerous information smog. There is talk of the need for a new kind of literacy that will eliminate the problem of "digital dementia".

We can consider the elements operating in the information environment as agencies. It is the term of the world-renowned professor Miloslav Jokl, who used it to denote the components of the microclimate, influencing its quality. Agencies have their sources, fields of transmission and effects, which in the information environment correspond to, for example, sources of news, social networks and the impact on users.

The influence of agencies is understandably increasing due to the rapid development of information and communication technologies. This is because telecommunications and media data formats converge, in which information agencies have unprecedented influence. It is vital to try to maintain the quality of these elements so that they serve people healthily. [9]

2.3. Information agency

In the information environment, we encounter agencies at different hierarchical levels. Essential elements at the lowest level are signals in the form of elementary information constructs. Data can already form a message at the next level, carrying information. An even higher level is knowledge. A separate area then consists of emotional agencies.

The individual levels deserve a more detailed explanation. A signal is a change or a sequence of changes in the states of state variables in the information environment. According to the physical nature of agency, we are talking about acoustic, optical, mechanical, electrical, chemical and other signals used by living beings or machines to process data, information and knowledge.

Data and databases represent sets of interpreted and uninterpreted data about the state of objects. This means that the possibility of emerging different interpretation models over the same collection of shared data can already be expected at this level. The concept of information is usually related to removing uncertainty (or increasing the orderliness of the system). Therefore, we can understand information, for example, as a message that brings the possibility of reducing uncertainty in the description of states and ongoing processes and a stimulus to changes in order in real-world systems or consciousness.

For example, we can state that a high level of information is contained in a cathedral building with an astonishing arrangement of elements and architectural signals. An example of the highest level of data is the organisation of the human genome, the manifestations of viability and the growth of the order of living organisms. Report usually answers questions: when, where, who, what, in what relationship, how long, how high, etc. [9]

2.4. Knowledge and emotion

A particular category of information agency is knowledge that answers more complex questions: how, why, with what perspective, in what causal relationships, where is the cause, what will be the consequence, how to formulate models of objects and processes on things, etc. It is the ability to assign, sort and filter data, data and information displays of probable states of items and their state transitions.

It is a question of whether any of the scientists in the field of computer science today have seen a computer cry. Perhaps such a question sounds naive, but it doesn't have to be so innocent in artificial intelligence. In any case, living beings sharing the information environment of the near and far surroundings show changes in the state of their consciousness and changes in the conditions of characteristic state variables and their arrangement in response to some types of agencies from the psychosocial component of the information environment.

Emotional agencies often stimulate support for the function of knowledge systems, especially in the stages of interpretation, which are essential for the intelligent design to make decisions about further changes in its state. An illustrative example is how King Solomon makes decisions in the well-known biblical story when two women argue over a child. Solomon wants to find out who the birth mother is, so he orders the child to be cut into two equal parts, after which the birth mother asks that the child's life be preserved even at the cost of giving it to another woman. The birth mother's emotions lead to solving the puzzle. [10]

2.5. Information hygiene

While abroad, in connection with the issues of information overload, internet addiction and security, they are spoken of as separate, interconnected areas to varying degrees. In the Czech and Slovak environments, the umbrella concept of information hygiene is gradually adopted for these topics. This term is a set of preventive measures enabling efficient work with information and preventing information overload. Information hygiene also includes the prevention of a situation where, on the other hand, we do not receive some information, i.e., the ability to search for information is part of information hygiene. [11]

2.6. Impact of reality

In 2018, the International Data Corporation predicted that the world's data volume would grow to 175 zettabytes by 2025. About five quintillion bytes of data are generated every day. The data the world will create in the next three years will be more than all the data made in the last 30 years. Interestingly, only about 0.5 per cent of all data generated is analysed and used. Our media consumption across all channels and formats is estimated to take more than 13 hours daily. Losses that are a direct or indirect result of information overload are estimated to be approximately \$650 billion annually. It's the cost of interrupting productivity. In a company with 1,000 employees, all workers waste about 655,000 hours per year searching for information for their work. [12]

3. Vulnerabilities in an unhealthy information environment

Security plays a significant role in society. One of the critical elements of an organisation is its information environment. In an organisation, security ensures the protection of conditions so that it can perform its intended function. A prerequisite for ensuring safety is the identification of vulnerabilities in the information environment relative to the security environment and the organisation itself. We can talk here about a new concept - information vulnerability - as a vulnerable point, weakness or unintentional imperfection that can be exploited to threaten to cause damage or loss. Vulnerability itself is not the cause of harm. A vulnerability is merely a condition allowing a threat to affect assets. Vulnerabilities arising from various sources must be taken into account.

3.1. Information overload

Decision-makers need more cognitive ability to process information. Information overload occurs precisely when the amount of information exceeds this capacity. If informants are calm, the quality of their decision-making may improve. The problem of information overload arose during the Renaissance and the Industrial Revolution. However, with the information age and access to automated and efficient data collection that provides more information, the severity of this problem is increasing.

3.2. Information multitasking

Some people take great pride in their "multitasking" abilities. Especially women, who are said to be successful because the two hemispheres of their brain are more closely connected. If a person is constantly bombarded with information from different sources simultaneously, he cannot properly concentrate on any of them. It also affects short- and long-term memory and flexibility in solving new problems. Statistically, such people change jobs less often, even if they feel bored in their current job and it does not fulfil their career or financial dreams.

3.3. Inefficient way of working with information

The human brain works with information non-linearly, using connections and the ability to see links in the larger whole. Being able to process accurately and quickly find a large amount of information at any time is an increasingly important skill in the work of all executives. The most important thing is to be able to orient yourself, to choose an excellent source of information, and to satisfy the needs related to the performance of the task or the solution of the assigned task.

3.4. Little motivation to process information

A feeling of threat causes low motivation or demotivation, it manifests itself mainly by focusing on one's problems, limited concentration on receiving new information, on performance, inability to think creatively and find solutions, searching for an "escape" from the environment of receiving, processing and remembering information.

3.5. Information fragmentation

The fragmentation of information that only provides a partial context of events and their interrelationships, generated by many different sources of information, leads to a fragmented perception of reality for many people. This may be the reason for their childish view of reality. Especially nowadays, this damaging phenomenon is more visible and noticeable.

3.6. Chaotic arrangement of information

The problem is when the worker gets lost in the flood of documents and information. They need help finding the content they need or which document version is correct—the absence of knowledge when required.

3.7. Verification of information

Much information appears in the information space. They are attacking us from all sides, and it is challenging to navigate them. Some information has a subliminal effect on us without us being aware. An important people skill is to be able to resist influences and to be able to filter out information. In other words, be able to distinguish between those who are severe and those whose intent is to manipulate.

3.8. Unavailability of information

The absence of information can cause stress and uncertainty and create room for speculation.

3.9. Misunderstanding of information

Misunderstanding can be understood as something often unelected, something we need to be aware of. We have limited means of language and communication to convey what we think and imagine. The transmission of information always involves communication noise. An important aspect is also the information literacy of the individual.

3.10. Communication barrier

In the communication process (i.e., mutual sharing - communicating/receiving information), there are sometimes unavoidable obstacles, i.e., communication barriers. They interrupt successful communication. Communication barriers are as varied and enduring as human communication itself. In some situations, the blocks may be so severe as to cause armed conflict.

4. Method of quantifying and evaluating information vulnerability

Vulnerabilities arise due to undesirable information effects (information overload, information smog, information waste, information fragmentation, information credibility) on people in the organisation. Weaknesses or unintentional imperfections weaken or limit a person's quality of work and lead to damage or loss. Vulnerabilities arising from various sources must also be taken into account.

To reach the primary goal, you will need to complete the objectives using the following methods:

4.1. Detection of vulnerabilities:
- Input information about the organisation;
- Questionnaire survey (qualitative assessment) - deduction of specific vulnerabilities;
- Questionnaire survey (quantitative assessment) - information overload;
- Checklist – detection of deficiencies in the information environment;
- Observation - evaluation of the situation at the detected critical point;
- Creating a list of unnecessary information.

4.2. Compilation of a catalogue of information vulnerabilities, verbal evaluation and quantification

vulnerability name	vulnerability description	degree of worker influence	user impact rate	frequency of appearance	level of threat	level of threat
insufficient informational education	The organisation needs to organise additional training and courses on using digital technologies for its employees. Employees depend on their options, the time to complete a task increases, and productivity in other tasks decreases.	50 %	10 %	medium	1	20 %
chaotic arrangement of information/information sources	The worker has no order in his documents and cannot organise work with information/documents. Time increases when searching for information/documents.	50 %	40 %	medium	2	30 %
information overload	The worker is overwhelmed with information when serving multiple users simultaneously (personal, telephone, e-mail contact).	60 %	80 %	high	2	40 %
unavailability of information (missing orientation/information system)	The organisation's absence of an information/orientation system causes complications, especially for users from the public, who need to receive the correct information in time.	10 %	80 %	high	3	80
…	…	…	…	…	…	

Table 1. Sample catalogue of information vulnerabilities.

The catalogue of information vulnerabilities will describe not only vulnerabilities but also the degree of threat to the employee of the organisation and the degree of danger to the organisation's user (if it is an organisation that works with users / the public). These data will be determined by an expert opinion based on the information found from the local investigation. The overall degree of threat given in percentages will also be provided by an expert assessment based on the already assessed effects of the worker and the user and the basis of information from the local investigation. The resulting coefficient n for the organisation's vulnerability will be determined based on partial vulnerabilities n_1, n_2, n_3, ..., n_x. The following formula will be used to calculate the overall result:

$$n = \frac{n_1 + n_2 + n_3 + n_x}{n \times 2} \times 100$$

4.3. Compilation of evaluation criteria for the evaluation of organisational vulnerabilities

For the expert assessment, the evaluation method on a scale of 1-4 will be chosen, and vulnerability values, percentage expression of the problem, and finally, verbal expression will also be assigned to this scale.

| Degree | Abbreviation | Vulnerability | Expression in % | |
			from	to
1	L	low	0 %	25 %
2	M	medium	26 %	50 %
3	H	high	51 %	75 %
4	C	critical	76 %	100 %

Table 2. Degrees of vulnerability and expression of exposure. [13]

Degree	Verbal expression
1	The vulnerability does not represent a particular security problem for the organisation. The operation of the organisation is not threatened. Special measures should be kept secret. They can be consciously accepted.
2	Vulnerability represents a security problem for the organisation. The organisation's operation is not significantly threatened, but the issue must be addressed and solved.
3	Vulnerability represents a security problem for the organisation. The organisation's operation can be threatened. The issue needs to be solved and given long-term attention.
4	Vulnerability represents an acute security problem for the operation of the organisation. The function of the organisation is threatened. The issue must be resolved and eliminated.

Table 3. Degrees of vulnerability and verbal expression. [13]

4.4. Catalogue vulnerability assessment and overall assessment

The result of the coefficient for calculating the vulnerability of the information environment in the organisation will always contain a verbal evaluation and possible recommendations for improving the organisation's operation. Because it is always an environment where the main point is the person with their personality aspects – cognitive and social, it is necessary that the result, which objectively does not correspond to the current state of the information environment in the organisation, is corrected by an expert view with justification.

5. Principles of information hygiene environment

When our brain is overloaded, we make the mistakes above, get stuck in the middle of the thought process, ignore our surroundings, and forget important things on the agenda. Among other things, our ability to plan or deal with emotions can also be reduced. It can directly or indirectly lead to a deterioration in our overall well-being and performance at work. It can also directly lead to job error rates and threaten to cause financial damage to the organisation. From a human perspective, this could lead to chronic information syndrome or a total psychological breakdown. In the event of discovering or indicating any of the listed information vulnerabilities, it is necessary to change the style of work or life and apply the principles of an information-hygienic environment.

5.1. Create a list or outline of all tasks

To grasp and better plan tasks, you need to set priorities. That's precisely what these lists are for.

5.2. Let go of non-essential tasks

If you don't want to give them up, it's a good idea to write down the tasks you completed and the time you spent on them. It will help to place value on the work and realise that the time spent on these tasks stays the same. In the future, it will also improve the ability to plan.

5.3. Setting specific short-term goals

It is most effective to divide the task into short-term intervals, e.g., after 15 to 20 minutes.

5.4. Stop multitasking

Better to do only one or more tasks at a time, such as answering an email while sitting in a meeting. It will be more efficient if one does the tasks in sequence, one job at a time.

5.5. Don't be interrupted at work

There will be an increase in performance, and stress will not appear. It's better to check your inbox at intervals, such as once an hour or every 30 minutes, if you're worried about not responding quickly enough. It is a good idea to avoid constantly picking up new e-mails. Limiting visual and audio alerts such as pop-ups and notifications is advisable. Instead, set specific times to check them manually.

5.6. Tailor your breaks to the task at hand

If a person wants to regulate his information load effectively, it is advisable to take breaks that are different from work, i.e., they activate other parts of the brain. If one spends the day running a workshop and talking to people, a break is to read, listen to soothing music, or go for a walk. If, on the other hand, you sit at a computer all day, your break should be active. Move your body and socialise.

6. Conclusion

This article can be a first step towards a descriptive, conceptual analysis of the current state of information behaviour. Existing definitions and issues in the information ecology field and the relationship between these fields were analysed, and a brief body of knowledge was created for ongoing research. Many factors influence the collection and use of information, and other activities, such as information avoidance and manipulation, also change the role of chance in information gathering. Sufficient attention still needs to be paid to information barriers that may arise and changes in information needs. Quantifying and evaluating vulnerabilities is the basis for further research of various information activities in the organisation. This article discussed only selected main chapters of the field of information ecology, following on from psychology and providing a basis for further research. The benefit lies in evaluating the vulnerabilities of the information environment in organisations to increase the quality of information processes and information flows to minimise weak points and subsequent damages and losses (material and financial) for organisations.

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