

MEASURABLE CHARACTERISTICS OF INFORMATION PROTECTED BY THE INFRAREDESIGN®

Professional paper

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Abstract

All information necessarily contains a certain value. The full meaning and full value information contains within, but the useful, pragmatic value is determined by user in the moment of perception that is processing. Mere meaning and value of information for users are, from the standpoint of historic development, the reason for protecting information and providing materials and technologies that enable its protection. Paper analyses the process of infraredesign® protection from the aspect of information science and information processing. By exploring the features of infrared-protected objects through their virtual projections and manifestations, authors imply their code specificities and a need for a specific treatment of objects in communication.

Keywords: *protection, infraredesign®, measurability, attribute information, the amount of information*

Introduction

Definition of a certain concept should fulfil conditions that connect it with a closer original concept by simultaneously setting the specific characteristics which provide unique and unambiguous definition. When these conditions cannot be fulfilled, but the concept or phenomenon is recognizable, it is usually perceived as the axiomatic concept. Definition of a concept requires determination of three items: content, broadness and scope. Content settles the important characteristics of concept. Broadness includes lower generic concepts, while scope represents a number of individual realisations connected to the concept. Pragmatic approach is usually applied in concept's definition while it underlines efficacy and availability of concept or a phenomenon. Consequently, a definition can often lose its clarity and unambiguity.

Information can be perceived as a concept that has almost the same number of definitions as it has the contexts within which it can be defined. The concept of information is usually connected to the cognition and knowledge being transferred or received and at the same time to the specific facts or specific circumstances. Though information has characteristics of axiomatic concept, it cannot be completely treated as such. This is due to the fact a strict definition of

information is based upon closer generic concept, while context in which information is defined is pragmatically obtruded by specificities and differences.

Misconception can develop if data or fact, knowledge and/or wisdom are considered as synonyms for information (that usually happens). Therefore it is necessary to consider all characteristics which can express their specific differences. When information is perceived as a product of processed data, no specific definition is required. If information is being organised and its structure determined, one talks about knowledge. Knowledge necessarily assumes certain human activities, so information is given a human aspect. Categorisation and classification of specific information fundus is formed as science, while its operationalisation within concrete context represents a human wisdom. According to this standpoint, information, knowledge and wisdom cannot be seen as synonyms.

When information is materialized and saved in/on a memory unit, it is necessary to consider all circumstances in which it can be used and applied. Protection of information connotes a line of activities that necessarily support materialisation and usage of information. Press connotes a physical materialisation of information. It enables certain forms of protection. Protection of information in forms produced by

infraredesign technology certainly represents a highly reliable protection.

This paper tries to consider an attempt to evaluate characteristics of information in publishing. It is assumed there are characteristics of information in a practical field of developing a carrier of information and these characteristics can be measured.

This paper is especially focused upon physically materialized forms of information. The hypothesis starts with a possibility of developing certain realities and circumstances, while the protection itself is implied.

1. Infraredesign®: characteristics, forms of information carriers and the problem of measurement

When raw data is settled into the specific context it becomes, though not necessarily, information.

However, according to Yuriy Yatsko, information represents the same category as the notion. [6]

This level cannot be materialized or it cannot be materialized to a higher level. On the other hand, data can be materialized. Whether such data can be transformed into information depends upon circumstances in which the whole process of analysis is executed. Operationalisation, materialisation or simply the usage of information is determined by the context of a process itself.

For the purpose of this paper it is necessary to consider the complexity of process in which information is being transferred to data and vice versa. Information necessarily has a source, while the process of using data and information necessarily requires a receiver or user. The whole process makes sense only if the relation source – receiver exists. The process is usually pragmatically defined as communication. Accordingly, message is the assumed form of data or information exchange. More precisely: conceptually the process is materialized as communication channel which corners include the source and receiver of information. It should be underlined that communication channel in human communication is a vis-à-vis type with a possible alternation of channel's corners. The physical dislocation of elements necessarily requires a form comprehensible to the participants of communication. Regardless to the form of communication, the reliable transmission of information and protection are necessary.

For the purpose of this paper, it should also underline that communication represents historical category. Historical aspect is visible through a temporal change of forms and modalities but also the conditions of change that require certain technical solutions.

Clearly, speech and letter are historical categories articulated as a need to determine communication as a process. It should also be mentioned that both corners of communication channel should necessarily apply the same “language” or otherwise use moderators or translators.

Subsequently, information and data in communication channel should be considered as the exchanging substance. That form is usually named a message. Message prepared in such manner usually has certain characteristics.

Though communication is temporarily placed within frames of information technology, computers and Internet, it is not a necessary precondition. On the contrary, ICT is just one form and possibility of communication. Written or published form of message is precursor and contemporary of ICT so it does influence its development. The influence is mutual. Communication in a virtual environment reduces a need for “hard” forms of data and information carriers. Still, when printed forms are required, communication should be supported by some “hard” material form.

This paper considers printed information and infraredesign® form of its protection. It is therefore needed to specify the most important characteristics of information due to its protection as additional characteristics and information and communication as a process in which information is being consumed. Nevertheless, simple definition of information characteristics isn't sufficient when its value is being determined. All characteristics that define information should be measurable.

This is the main issue of this paper.

The literature provides rough or more profound raster of information characteristics. The Johnstone High School [1] for instance considers information from the standpoint of substance which usage provides value. Besides these characteristics, some additional can also be considered [7]. These are:

- Accessibility/Availability – reflected in an easy approach to information and its simple usage. Information is available in the moment it is required (it implies its care)

- Punctuality – information can be checked and proved, without inconsistent meaning for its user. A level of punctuality depends upon circumstances and it can vary.
- Integrity – refers to punctuality and comprehensiveness of information and its accuracy in relation to the system of values and expectations.
- Reliability and objectivity – user should have confidence in source and content without verification. These characteristics are strongly connected to information punctuality.
- Relevance and adequacy - relevance is determined by the purpose of information and so is its adequacy. The user requires and specifies both characteristics.
- Conciseness/the level of specificity – form and mode that is simple and can be easily modified.
- Mode of presentation – standardized form which user can modify.
- Agility – information should be agile and purposeful. The importance of information is determined by its agility.
- Value of information – the importance of information has characteristics of relativity but it sets the value of information.
- Price of information – modality of providing the information sets its price.
- Completeness – it should encompass all aspects required.
- Effectiveness – information is relevant for the system and can be temporarily delivered as correct, consistent, usable and complete.
- Efficacy – information can be used with optimal allocation of resources.
- Confidentiality – information is protected from an unauthorised approach.
- Compatibility – information is compatible with legal regulation and contractual obligations of user.

Obviously, the list of characteristics isn't final and some additional characteristics can be added if these are important for the present circumstances.

It is important to mention that a group of characteris-

tics or attributes, as it is defined by information science, can be described in terms of logical variables of Boolean type with no changes caused by more delicate raster. In other words, information is correct or incorrect, but the circumstances can make information even partially correct so characteristics can be ranged.

The price and value of information can be analysed from the economic aspect. These two characteristics are usually perceived as synonyms which is wrong. Information's value is equal to the price the decision maker is willing to pay for it before making a final decision. That is also the maximal price someone is willing to pay knowing the actual value of uncertainty before making a decision on planned actions. [8]

Information has absolute and relative value. Relative value is set by user upon circumstances in which he uses the information. The relative value of information is actually set by the level of information's usability. One can define a ratio: Relative value of information = level of usability x absolute value of information

The price of information is economic category. However, setting the price of information as unphysical category can be problematic since each economic category usually connotes its monetary equivalent.

Even if this is possible, the question remains: the price of information is monetary equivalent of which information's characteristics? Quantity of information isn't a relevant indicator of value and reliable modality to set information's price, but it does represent a measurable size.

2. Semiotic aspect of Infraredesign®

When a product – in a material form – is developed by using infraredesign® technique, two important facts should be considered. These are:

- Protection achieved through double layers (multiple layers)
- The necessary material form of product

The concept of product is conditionally used for the purposes of discussion and it represents a form in which information is saved, while material form indicates physical realisation or materialisation of information. Material realisation is media that carries information and it represents message in a communication channel. It also represents an important

tool that must be recognized by all participants of communication. If information is formed in a visually clear manner, obviously a specific form of customization will be shaped.

Holistic observation of information or their carriers demands understanding of semiotic characteristics of message. Semiotic analysis equally considers semantic, syntactic and pragmatic characteristics of information. This paper analyses all three mentioned areas. Still, it is necessary to divide shape or form from content. Insisting on detachment is necessary due to the fact form itself can be carrier of information. To paraphrase: Pear doesn't contain information upon apple though both can be yellow!

In *infraredesign®* technology a colour has especially important meaning. From the information science' point of view a colour can be the main carrier of information. To put it in a real time environment, red colour on traffic lights has its own meaning. When colour is the carrier of information, its perception is relevant. Scanning of *infraredesign®* objects in a certain way can lose this form of information. From technical aspect such information isn't lost but its reproduction demands a specific procedure, thus completely protecting the information.

If information management is settled in infrared segment of spectrum, then the concept of information is limited to the colours used in printing and editing. The paper [3] explains mathematical models which explain concrete processes in application of colours visible in infrared segment of spectrum. The historical aspect is better explained in [4] on examples of graphics and editions made by *infraredesign®* technology. This technology prints two pictures, one visible under the IR (infrared light) while other is visible in daylight. Paper [5] offers more detailed information upon theoretical basics of infrared systems.

3. Measurability of information's characteristics with *Infraredesign®*

Infraredesign® technique is a stenographic procedure with a possible broader application. This technique is used in press preparations for objects made of two pictures respectively two texts or generally two objects A and B. One of these objects, for instance A, is visible in day light, while object B can be seen under

the infrared light. The issue of quantifying and qualifying information that such object/form/message contains primarily refers to the measurability of characteristics or attributes that describe it. Though measurability requires established system of measures, it is not relevant for this paper while it demands a broader approach. Hereafter, the authors elaborate on the attitude relevant for information evaluation.

Let us assume the object A+B is developed through *infraredesign®* technique and is available. The following issues should then be considered [9]:

- What is the correlation between object A and object B, that is, are they mutually dependent?
- If the quantity of information carried by object A – $Q_i(A)$, and quantity of information carried by object B – $Q_i(B)$, how relevant is total information, respectively, is the ratio $Q_i(A) + Q_i(B) \leq Q_i(A+B)$ relevant if the expression A+B represents *infraredesign®* print?
- In case of any transformation that isn't related to *infraredesign®* is the quantity of information carried by object visible under the infrared light lost?
- What should user know or possess in case of disposing the object A+B?

Objects can be, though not necessarily, mutually dependent. If information carried by objects can be connected since they are supplementary or complementary, then the objects are mutually dependent, and they make unity. When object B has exclusively protective role, then they are not mutually dependent, respectively object A can be protected by any object of the B type. The reason of their dependence isn't relevant for this paper, but if it influences or conditions the measurability of certain characteristics, then it should be observed.

Paintings 1. and 2. display the works of art of the academic painter Nada Žiljak. In nature these are double paintings. One of these is made by colours visible under the infrared light. The author can connect contents of these two paintings through the artistic expression. The content should be carrier of message or information. Hence, painting can but not necessarily make an item. Physically, these are an item since they are painted on the same media. Semantically, they are divided and make an independent artistic expression of the author, so they can be observed as such.



Figure 1. Pictures visible under the infrared light

Assume the complete quantity of information $Q_i(A+B)$ is relevant for user. However, any transformation of objects A+B which doesn't connote *infraredesign*[®] also implies a partial loss of information. This applies to information carried by object visible under the infrared light.

If objects are mutually dependent, the user will be deprived of information carried by the object B. The question remains: if there is a connection, can the remaining part be used for specification of information missing thus providing any form of reconstruction? If the objects aren't connected in described manner, then the object A has executed its protective role. All this becomes exceptionally relevant in virtualisation of objects and their transmission to the digital forms.



Figure 2. Pictures visible in the day light (paintings on the same carriers as those on painting 1.)

Displayed paintings imply a possible separated display or separated preservation of both objects, though with a specialized equipment. From the pragmatic point of view a question is raised: can user recognize he owns the object A+B if he doesn't own equipment and can he thus receive the full information? Painting 3. displays equipment that can be used for observing the object A+B. When lighted by the infrared lights, paintings allow reflection on the screen of equipment which is sensitive to infrared lights so the object B

can be seen, respectively painting made with colours sensitive to the infrared lights. However, though both paintings are made in colours the picture made in object B loses information upon the sort of colour while it is reflected in grey shades thus making it visible in virtual shapes. If colour has some semantic characteristics, then these characteristics may be lost. Naturally, this isn't relevant if the purpose of B type painting is solely to protect the object of A type.

Microsoft owns (for devices) software for the infrared detection [4]. What is the correspondence between these devices and equipment displayed on painting 3. is beyond the scope of this paper, so reader should make his own conclusions. If we observe the quantity of information carried by paintings 1. and 2. as measurable size in computer frames, then format actually has an important role. Different formats make a visible difference in size of files. Painting 1. has 1,1 Mb while painting 2. has 1,4 Mb. Obviously this parameter cannot be used in a more meaningful manner, but it can be registered as additional characteristic in object's description. The paper [tiskars] elaborates also electronic types of *.bmp, *.tif and *.gif. The results of measurements indicate similar differences.



Figure 3. Device for scanning the objects designed according to the *infraredesign*[®] rules

From the aspect of steganography, information upon preparation mode of the objects type A+B can be important only for those users who need this kind of protection. User who only accepts given objects doesn't necessarily have to be introduced with the forms and shapes of protection. Protection is needed to eliminate material and nonmaterial consequences of the possible misuse of the protected object. Therefore, the consumer of object A+B doesn't require data on form and mode of protection, either individually or as a part of other object or product. If a need for protection of this type is primarily protection of

economic resources possessed by user, providing information isn't necessary if it doesn't cause damages. This protection is used for preserving the product's originality.

4. Conclusion

Objects made by infraredesign® technique may produce an effect of secrecy and conspiracy for user. The circumstances of the first contact are usually accompanied by effects of impression and thrill. The fact is such performance achieves protection and prevents any kind of misuse. This is exceptionally important in protection of gills and personal documents which can be made by such technique. Pragmatic side of usage is protection of vital and economic interests of user. In such circumstances, as long there is a need for making documents or generally objects of this type, such preparation of documents will remain

without any flaws. A great success with such technology can be obtained in any situation, that aside the primary protection, can apply infraredesign® rules in preparation of materials, data and information in a modality that will provide user with much more than information and qualitative protection of material.

This paper tried to present an approach to infraredesign® as a modality for preparing objects which carry certain information from the aspect of theoretical postulates of information science. Though the purpose of this technique primarily has economic meaning, a broader analysis is needed especially in the area of communication, specifically shaping, transferring and protecting the information.

Described characteristics do not necessarily have to be measurable, but they can contribute to making a comprehensive picture on value of certain information.

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MJERIVA SVOJSTVA INFORMACIJE KOD INFRAREDESIGN® ZAŠTITE

Sažetak

Svaka informacija nužno sadrži određenu vrijednost. Puno značenje i punu vrijednost informacija sadrži sama po sebi, ali korisnu, pragmatičku vrijednost određuje korisnik u trenutku poimanja, uvjetno rečeno obrade. Upravo značaj i vrijednost informacije za korisnika, povijesno su razlogom i povodom za zaštitom informacije i iznalaženjem materijala i tehnologija kojima se informacija može zaštititi. Rad razmatra proces infracrvene zaštite s aspekta informatike i obrade informacija. Istražujući svojstva infracrveno zaštićenih objekata kroz njihove virtualne projekcije i manifestacije autori ukazuju na kodne specifičnosti istih i na potrebu specifičnog tretmana takvih objekata u komunikaciji.

Ključne riječi: zaštita, infraredesign®, mjerljivost, svojstva informacija, količina informacije

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