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Information Model Development – Attributes and Power of Information

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Abstract: Starting from the general concept of a system-process, which is defined by the quality of relations between individual elements, we can single out attributes whose elements have a dominant character of the information system, all in the projection of the quality of the observed process. In any state of the process, information is undoubtedly significant as a subsystem, whose property cannot be ignored, because it is a dynamic process that bases its dynamism in the time domain. The paper precisely defines the information power model as well as its response to the occurrence of perturbations in a strictly defined time domain, all in the function of one process-event. The described complexity can be a function of horizontal complexity, whereby a hierarchical component is frequently lost, or it can be another component resulting from the overall information process. The paper deals with measurements of the response to an event that took place at the global level, that is, the finals of the UEFA Champions League 2021. A unique functional relationship of power of information in strictly defined marginal conditions was obtained. The paper presents the spectrum of the power of occurrence-opening of the portal of the mentioned event through the functional relationship of the dynamic process. All the described phenomena gave new insights in the development of the information model.

Keywords: attributes speed of information; information; model; power

1 INTRODUCTION

Using scientific methods in studying information systems and their characteristics, and considering other scientific attributes, an appropriate concept of the current information system situation can be defined. Sustainability of the information system depends on its current condition as well as on the initial or null condition. The information system structure is a complex set of state quantities that essentially influence its behaviour. By their nature, the state quantities can be measurable or non-measurable, discrete or continuous, current, past or future, as input and output parameters of the observed information system. The number of state quantities of the observed information system essentially tends towards infinity. For pragmatic reasons, the state quantities will be observed as a finite set – if they are discrete, and information systems have all the attributes of discretion; logic, set theory, design theory, information theory, complexity theory and probability theory. In this paper, a semi-closed interval of values is observed, without studying the state quantities that have properties of continuity. If the information system is observed through the function of time, it can be considered as a dynamic system that strongly changes its states as a function of time. Based on the principles of development, this information system and all the phenomena will be subject to changes, even though a strong reduction of reality was done. The changes in our information system require a change of every component as well as of every phenomenon. Real information systems have the property of inertia, that is, it is impossible to change their state in a very short time. The rate of change, that is, its gradient, changes within wide limits. The reaction time of the information system is called the transient phenomenon of the information system. Historically, information systems had properties that were defined by space and time. Generally, the two most complex systems are biological and information systems. At the moment of designing the state of the social system, the most important thing is its axiomatic definition and that is the implication of its problem with reality. The general concept of the state of the social system has input values (of the past, current and future time) as well as output values (of the past, current and future time), which are connected by a set of mapped functions. Every scientific discipline must primarily start from the definition of the content that is the subject of its study as well as the definition of boundaries of the observed social system. This paper implicitly studies the special state of the social system, or more precisely, it measures the power of information in real time of an even at the global level. According to the logical postulate that each input change must change the parameters of individual elements of the observed system, it is up to the observer to reduce the insignificant responses of the mapped function, using their own scientific backgrounds, and try to bring the activated dynamic value system to a stable state. This algorithm for social systems is most easily implemented if the basic set is broken down into partial subsets and interconnected by internal connections – relations according to the horizontal and vertical principle.

A systematic analysis with the following steps is to be applied:

1. **Problem definition** is an activity of problem transformation in which an unadjusted event is limited to the observed phenomenon, that is, a sports event, whereby the power of information is measured.

2. **Designing the observation subject** – in order for this activity to come to life, the impact of a sudden event, the football competition finals, is reduced to important factors only.

3. **Transformation of the problem into a system** – **model** – on the basis of similarity and analogy, relations are set within the elements of the observed social system. This is the most important moment when the impact of the problem on individual elements of the observed social system is assessed and the final solution is made, aiming to completely

map the input unexpected changes to the output in the social environment.

4. **Testing the obtained results in the designed model** – it is the most criticized process in social systems because it is a consequence of the information credibility and it must contain the basic testing postulates, such as measurability and reliability of the obtained values – results.

5. **Implementation of the selected designed model** – real-time to the social system and its application through an additional factor, which is the final response of the social system as a complex dynamic and discrete system to a random variable of unknown aetiology. [1-4]

2 INFORMATION MODEL DEVELOPMENT

Modelling is one of the general scientific methods. The modelling method can be applied in all scientific research. Therefore, if a person realises that some information takes place in space and time, their desire is to master the information, in the context of predicting the course and time of the process they are observing. Conclusion by analogy belongs to the basic type of indirect reasoning. The essence of this way of reasoning lies in the assumption that two phenomena are similar in some attributes. Therefore, the observer may conclude that the other attributes are similar as well. In order to fully understand the modelling programme, we need to master the cognitive process. The assumptions of the cognitive process are the following: connecting similar attributes, environment, knowledge, information and perceptions. All these properties cannot be implemented into the cognitive process by the observer without emotions. Abstract reasoning is a series of related thoughts that have a sequence towards a specific goal, for the purpose of solving a problem. Abstract thoughts, regardless of their origin, intuitively and discursively must have a logical basis. The process of reasoning is the last stage in a series of defining the cognitive process, preceded by understanding and judgment. When defining an information model, we must start from several types of reasoning - three-ductive, deductive or inductive. Analysing the power of information through its appearance, we come to conclusions by analogy or similarity. Powerful information phenomena in space and time are impossible to understand and model without knowing the basic postulate of information flow (the power of information). The following figure shows the original form of an information flow model as well as its result (the power of information). In science, in addition to physical analogy, economic, biological and linguistic analogy are often used. Therefore, we can say that Titus Lucretius Carus (99 BC-55 BC), using linguistic analogy and poetic intuition, connected space and time based on the theory of relativity. [5]

Poetic thought gave depth to the struggle between the real and the imaginary world. This example cannot be explained in depth if we do not have enough information regarding time, speed and quantity.

The power of the information process is based on knowledge and memory at the time of observing the subject event. Interaction and understanding of the whole process leads to the judgment and conclusion, controlled through the cognitive process. Therefore, it can be concluded that the power of information depends on three key attributes, namely: the quantity of information, speed of information and the observed time-moment.

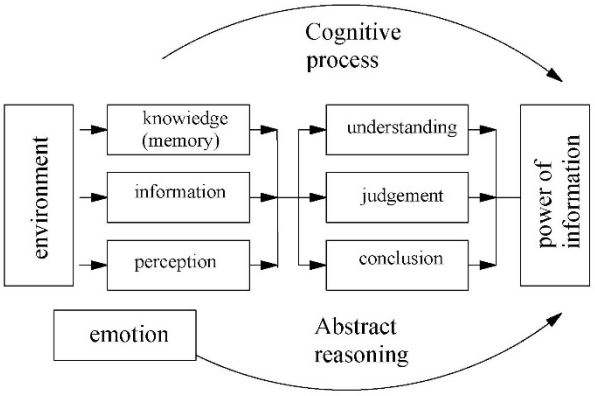

Figure 1 Information model / attributes /

The logical basis for modelling a social model is making conclusions based on similarity and analogy. The essence of conclusion is making an objective decision based on new judgment, all in line with the established boundary conditions of the observed social model. In order for the observed model to exist in the real world, we must start from the object of conclusion, the process of conclusion and the axioms with rules on the basis of which the conclusion is made.

On the example that follows, in the context of structure, similarities and analogies, we can set up information models that have in-depth properties of isomorphism or homomorphism. The power of information has unambiguous properties of isomorphism as a piece of information enters the space of observation, and has all the dynamic properties that such an isomorphic model can possess in the observed space. A general question may be asked: where is the end of a particular piece of information? A piece of information appears in the observed time, it has its lifespan, it asymptotically approaches one constant and remains in the observed space forever. The presented model of the information, cognitive process is an abstraction of a special kind, that is, it is a link between abstract and theoretical reasoning and objective reality. In other words, it is a means by which the regularities and relationship in objectively existing information systems are defined. An information model is at a higher level if it contains more isomorphic elements, that is, it reflects a higher level of information reality when the presentation of information power is more transparent. Information power (P_i) is the function of speed (v_i), quantity (q_i) and reliability (p_i).

$$P_i = f(v_i, q_i, p_i) \tag{1}$$

Fig. 1 shows that it is impossible to complete the cognitive process, that is, abstract thinking with the current power of information, and all implemented in the

environment, without a strong emotional component of the observer of the information process.

3 ANALYSIS OF THE OBSERVED INFORMATION EVENT

On 29 May 2021, a global event took place, that is, the UEFA Champions League final in 2021 was played in Porto at the stadium Estádio do Dragão. The measurement of information flow was performed by registering the number of openings in a certain time interval. A time interval of 120 minutes was chosen for the analysis. The beginning of the match was chosen as the boundary condition for the start of the measurement, which took place at 9 p.m. CET. The following web portal was used: https://www.vecernji.hr/sport/uzivo-od-21-sat-finale-lige-prvaka-1496367.

This portal gives public access to the number of active page openings in a unit of time. The units of time is one minute. The precise data for the observed interval are shown in the chart in Fig. 2.

If we start from the fact that the speed of opening the mentioned portal is also an attribute of the established model of information flow, we can conclude with a high degree of certainty that the power of information P_i has a dynamic character. The dynamic character of information power also reveals all the complexity of the observed social model.

The results are shown in the chart in Fig. 2.

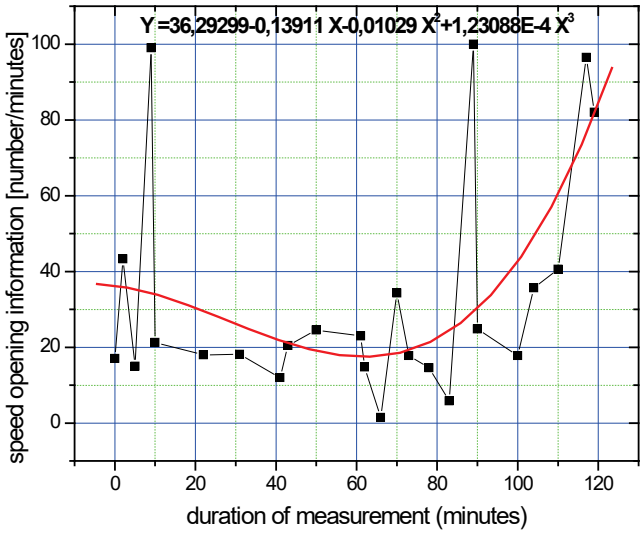

Figure 2 Speed of opening the portal in the observation period

The measurement of the described event on the web portal started on 29 May 2021 at 9 pm CET and ended at 11 pm. The results are presented in the chart, which shows an extreme speed of 100 pieces of information per minute in the 9th minute of the observed event. It is the moment at which a turnaround in the football match happened – one of the teams took the lead. The second peak happened in the 89th minute due to the fact that at that moment, the football match ended in terms of active play. In the further course of the measurement, an increase in the speed of opening the portal is noticeable, as a result of the power of information that are determined by the final result of the observed measurement.

Fig. 2 shows an approximation by third-degree polynomial, whose coefficients are given above the approximated curve. It can be concluded that certain properties of information power fully confirm the hypothesis that information power is a function of quantity, speed and time.

At the moment of measuring, that is, at 9 p.m., the number of openings was 350, and at the time of completion of the measurement of the defined time interval 3 370 openings. The total measurement interval ended on 30 May at 2 p.m. and the total number of openings was 10 700. By analysing the attribute of the established model, it can be undoubtedly concluded that social information models are complex models that can be simulated only if input information has high reliability. It is impossible to analyse a social model while reducing the attributes of the model; in other words, to transform properties of isomorphism into homomorphism.
The measurement of results was performed in the interval from (0 to 1,060) minutes. Discrete data were approximated, all with the aim of confirming the thesis that the speed of access to the page is not constant. [6-8]

4 CONCLUSION

1. A general model of information process can be established that contains all the key attributes of the system theory, namely the influence of the environment as an attribute of space, the influence of information flow rate in the observed space and the influence of quality (reliability) of information as a modern sociological phenomenon.
2. The paper defines a special form of information model that has been tested on a significant global event.
3. Studying the obtained results of the research and the measurements, it can be concluded undoubtedly that the power of information changes in the process of occurrence of an event, that is, it is a function of time and as such contains all the dynamic attributes of occurrence.
4. In the observed event, as regards the spectrum – density of information, we can precisely define the moment at which a significant perturbation occurred – the opening of the defined portal (9th and 90th minute), in light of the events in the process of the described measurement (the change of result and the end of the match)

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