

## STRUCTURAL ANALYSIS OF INFORMATION PROCESSING MODELS ACCORDING TO BOWER AND MAZUR

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**Abstract.** *Information processing models of Bower and Mazur are models that are used in some textbooks for explanation of human information processing. Human information processing approach is of great importance for controlling and managing of the man - machine system. The aim of this research is to give a new consideration about adequacy of the models of Bower and Mazur for explanation of the human information processes, by means of structural and functional analysis of the models. It is pointed out to some shortcomings of the models and to a conditional limitation of the models for explanation of the human information processing.*

**Keywords:** *human information processing, information processing models.*

### INTRODUCTION

The basic purpose of different information processing models is to provide the insight about the ways of processing of different information by human beings, by using the symbolic (schematic) presentation. Although these models are generally formed to explain some specific phenomena about processing of information, some researchers often try to explain almost all occurrences concerning information processing by using one complex model. However, it is not a rare case that some weaknesses of models become apparent by application of a detailed structural and functional analysis (see for example Zunjic and Milanovic, Zunjic 2007, Zunjic 2009).

### THE AIM OF RESEARCH

Models of information processing that are created by Bower and Mazur are the models that are used in some textbooks for explanation of ways of information processing. The aim of this research is to give a new insight about adequacy of the models

of Bower and Mazur for explanation of the human information processes, by means of structural and functional analysis of the models.

### ANALYSIS AND DISCUSSION OF BOWER'S MODEL

Bower's model of Information processing is shown in figure 1. This model of information processing is an example of a cumbersome model, whose complicated structure leads to the situation where loses to a great extent the use-value of the model, because the function of explanation of information processing in such a way becomes virtually impossible (Velickovskij). Such a cumbersome structure is the result of the aspirations of the author to integrate in a single model as many different phenomena related to information processing, in order to get the universal character of the model. A feature that distinguishes this model from other models is the differentiation on short-term and working memory. The basic functions of long-term, short-term and working memory are shown in the figure.

Although the complexity characterizes this model (perhaps excessive), however, by careful observation, can be noticed the basic structural components that also contain other models.

Thus, we can notice the central processing segment whose function is almost identical to the function of the block that relates to the control processes, in the model of Atkinson and Shiffrin. However, Bower's central processing unit does not have a decision-making function, like it, for example, has the central mechanism for decision-making in the Luczak's model. The function of decision-making is taken over by the short-term memory in the Bower's model, based on the information that is processed in the working memory. It can also be noted that auditory, visual and tactile buffer act as sensory

registry, in the previously mentioned models of information processing. Generator of responses in the Bower's model also exists under the similar name in the most models of information processing

(such as, for example, the block of organization of responses, in Schneider's and Shiffrin's model).

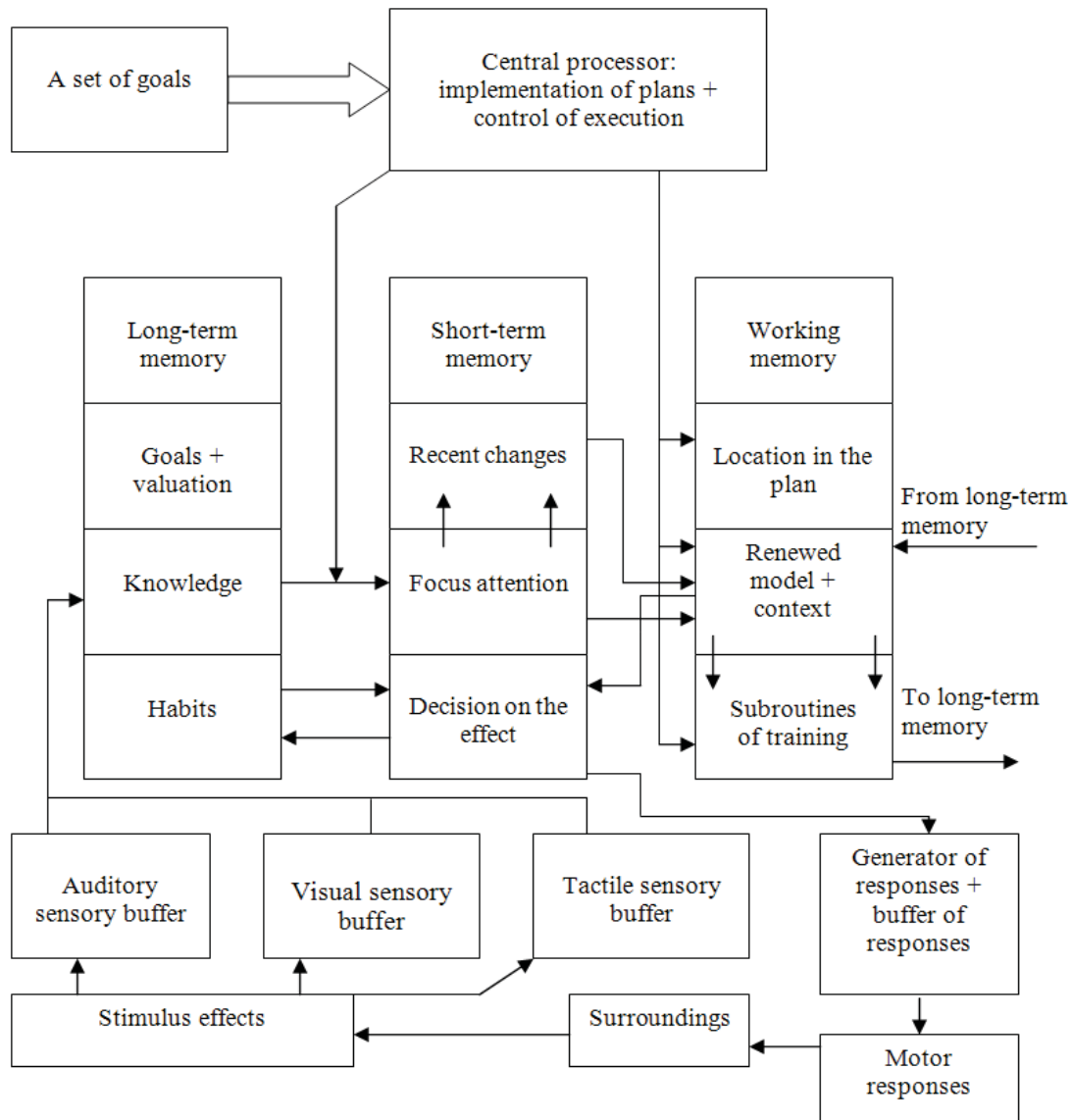


Figure 1. Model of information processing according to Bower (Velickovskij).

Despite the complexity that it possesses, Bower's model is not without shortcomings. From Figure 1, we notice that the information from the sensory register goes first to the long term, and only later to the short-term memory. This concept is in contrast in relation to most models of information processing, which explicitly show the memory components (as it is the case with the models of Atkinson and Shiffrin, Wickens, Haber and Hershenson). In addition, it is well known that upon the receipt of the stimulus an information retains only a few seconds. If the long-term memory is responsible for this process, then its name certainly should be changed. From Figure 1 also can be noted that there is no flow of information from any memory (or other

components within the model) to the central processor, so it is not clear how an information is processed in that block, when it previously not arrived for processing.

Bearing in mind that the response generator receives information only from short-term memory, where, moreover, creates a decision, Bower's model can be classified as a single-channel model of information processing.

#### ANALYSIS AND DISCUSSION OF MAZUR'S MODEL

Mazur's model of Information processing is shown in figure 2. After registering, the information is sent from the receptor to the correlator, which has

multiple purposes. Generally speaking, in this block, with already memorized information incoming information compares, whereby after the registration and processing of such information, it incorporates in the memory fond, for a longer or shorter time.

Homeostat is a block whose function consists in determining the usefulness of received information, for the person who participates in the process of information exchange with environment.

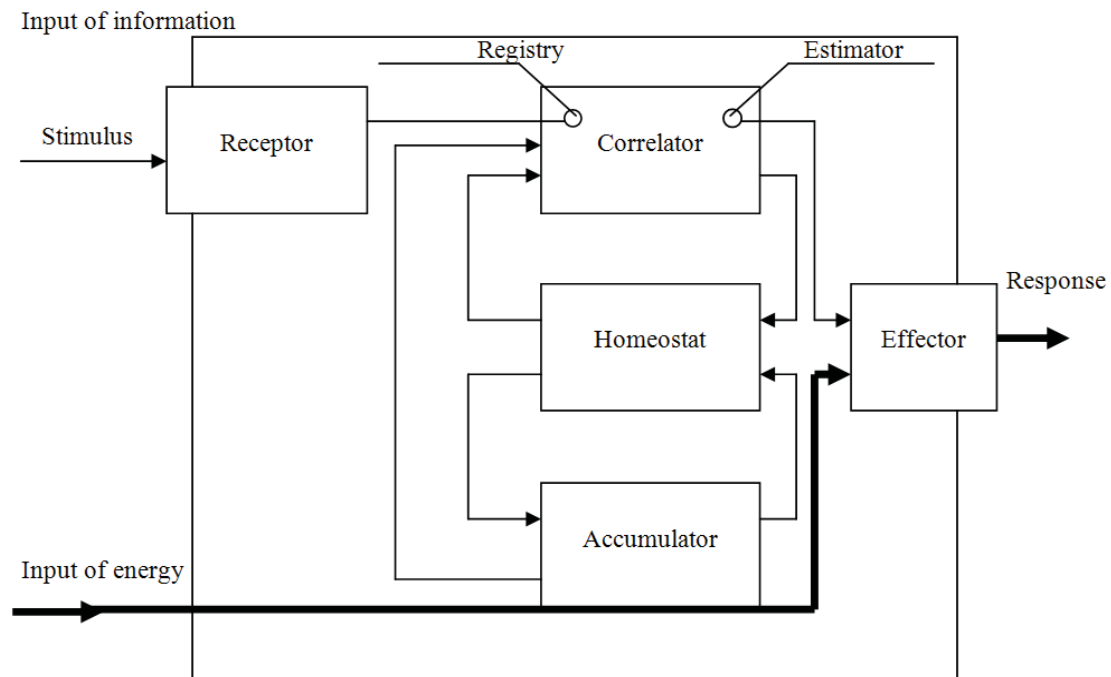


Figure 2. Model of information processing according to Mazur (Filipkowski).

On the basis of the memory, homeostat determines whether the information is interesting to the recipient. If the information is less important, the potential of the correlator decreases rapidly, so that from this segment, information will not be sent further for the effector. So, the response will be absent, because the potential in the correlator is not enhanced by additional impulses, whereby the information remains unmemorised. In the case of incidence of strong and short-time stimulus, the fast reactions arise, because the impulse itself has the sufficient potential to lead to the response. Similarly, if the homeostat evaluate the information as important, additional impulses will enable that in the correlator reaches the threshold necessary for decision making, so immediately after that it will occur the execution of responses. Performing of all of these processes require a certain power consumption. Accumulator has the task to provide the additional energy necessary to achieve the potential of correlation, i.e. potential that can lead to the reaction (Filipkowski).

Mazur's model in terms of structure is quite different from all other models of information processing. We note three completely new structural segments (correlator, homeostat and accumulator), whose functions also appear at the first time in any of information-processing models. One of the novelties of this model is also presented through the function

of estimation in the correlator, where the decision-making process performs, depending on the achieved energy value of the impulse in the relation to the decision making threshold. In this model, also for the first time we meet with the notion of the importance of information, for whose assessment the homeostat is responsible. The function of accumulator in terms of obtaining of energy for the execution of mental processes is a novelty compared to previous models. All in all, Mazur's approach with regard to the presentation of the structure and flow of information processing is different from approaches that are represented in the models of other researchers.

As a possible drawback to this model can be pointed out that is to a single structural segment (correlator) attributed almost the entire function of information processing. What the correlator symbolizes in Mazur's model, in other models of information processing is separated through functions of a greater number of structural segments, which essentially constitute the very core of these models. Thus, for example, Mazur's model does not provide the insight into the information flow between different memory segments, and also is omitted the block that relates to organization of responses.

Since the effectors receive information only from the correlator that in the model of Mazur represents the

"bottleneck", this model of information processing can be classified as a single- channel.

#### LITERATURE

- [1] Filipkowski S., 1974, Industrijska ergonomija, Institut jugoslovenske i inostrane dokumentacije zastite na radu, Nis.
- [2] Velickovskij B., 1982, Sovremennaja kognitivnaja psihologija, Moskovskij universitet, Moskva.
- [3] Zunjic A.. and Milanovic D.D., 2002, Obrada informacija kroz prizmu Wickensovog modela obrade informacija, Zbornik radova sa jugoslovenskog naucno - strucnog skupa Ergonomija 02, Ergonomsko drustvo SR Jugoslavije, Beograd.
- [4] Zunjic A., 2007, Strukturna analiza modela obrade informacija po Atkinsonu i Shiffrinu i Luczakovog modela obrade informacija, Zbornik radova sa srpskog naucno - strucnog skupa Ergonomija 2007, Ergonomsko drustvo Srbije, Beograd.
- [5] Zunjic A., 2009, Structural analysis of information processing models according to Haber and Hershenson, Proceedings of the 4<sup>th</sup> Internacional Conference on Industrial Engineering, Faculty of mechanical engineering, Belgrade.