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# Prior Knowledge, Information load, Cognitive load and Performance in alternative choice task

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# Abstract

The present research deals with decision making in a situation of information load and cognitive load when the fundamental assumption is that variables such as information load and prior objective knowledge predict efficient performance in choice assignment.

In the present era people are exposed to many stimuli which are delivered and are changing at a rapid rate, thus in reality the individual is required to a great extent to continually process the knowledge that is presented to him in different and varied domains of his life. Nonetheless, a person's ability to process and analyze all the stimuli and information to which he is exposed, is limited. This gap between increased information and stimuli that are required for processing and the human limitation in the ability to process them, may lead the person to feel burdened.

The theory of cognitive load deals with the learning of complex cognitive tasks and in their course people may feel saturated from the number of elements of information that are required for processing in a simultaneous manner (Van Got, Pass & Sweller, 2010). A significant cognitive structure in the framework of this theory is the working memory. Actually, it is a kind of a workspace which contains the information in which an active use was done during the processing information in a state of wakefulness, while executing a wide range of tasks (Kaniel, 2010). Indeed, the work memory is characterized as a flexible system, but it is limited in its capacity and in the length of the time in which the information can be preserved in this work area. Thus, cognitive load is associated with the total mental activity which is imposed in a given moment on the working memory (Van Got, Pass & Sweller, 2010).

Cognitive load may even be formed from information load – a situation in which the amount of information that a person can integrate in the process of decision making during a

certain length of time, surpasses the amount of information that a person has to process for the purpose of completing a task. Actually when the amount of information the person needs to process exceeds his ability to process it, an information load occurs (Eppler & Mengis, 2004). Thus, cognitive load increases with the need for increased processing of information (Quiroga, Crosby & Iding, 2004) since the resources of the work memory areas are loaded, therefore a feeling of cognitive load may be created.

The focal point of the cognitive load theory deals mainly with the purpose of reaching meaningful learning in complex cognitive areas, while attempting to create optimal conditions for such learning (Sweller, 1988). As a result, it seems possible to decrease cognitive load by means of the individual's given attention to the amount of information, the manner in which it is presented, environmental conditions, mental, physical and as such.

In relation to that, one of the elements which may contribute to the decrease of cognitive load and information load is the level of prior knowledge which is in the individual's possession in a certain area. Prior knowledge constitutes the person's most basic function to organize events which are based on experience into categories with which it is possible to use for the purpose of predicting future events. Prior knowledge is directly related to the formation of schemes and, therefore, to the decrease of cognitive load. A scheme is a knowledge structure specific to a domain and information which is found in the long term memory is organized and stored in it. A scheme may contain a large amount of information but it is processed as one unit in the working memory and, therefore, cognitive schemes decrease the burden on the working memory. Thus, a high level of prior knowledge implies that schemes were formed and the knowledge can be extracted from them with relative ease. As a result, a person who is forced to cope with material which he learned in the past and is already stored in the long term memory, is actually

freed from the limitations of processing of the working memory which will only apply to new material which have no schemes and connections (Artino, 2008).

The research variables are: cognitive load, information load and prior knowledge which were discussed above, are tied to the decision making processes in different fields. In the present research emphasis will be placed on decision making in the area of consumerism in view of the possibility of measuring in an effective manner the different variables in this field. This, in the course of generalizing the results of the research on the field of education.

In the field of consumerism, the task of product choice, the manner of processing consumers' information is associated to the number of alternatives and the attributes of the product (Van Raaij, 1977). In the research literature it was found that consumers with prior knowledge have the unique ability to assess the attributes of a product. This, in comparison to those with low prior knowledge who lack criterions for assessing product attributes. In addition, there is a body of research from different fields that implies that the limitations of the working memory prevent even those with prior knowledge to increase the number of alternatives that are available to process in the working memory and, therefore, it can be expected that there will be no differences between those with prior knowledge and those who lack prior knowledge in the processing of the number of alternatives.

The purpose of the present research was to examine in which manner the levels of prior knowledge are related to cognitive load and information load as well as examine the differences between those with prior knowledge to those who lack prior knowledge while performing a task of choice based on different operational levels of information load (number of attributes and number of alternatives).

In view of the data from the research literature, hypothesis of the present research were that differences will be found between the various levels of information load (as per the different number of the attributes of products and the alternatives) in relation to the feeling of cognitive load. Thus, subjects that will be exposed to a great number of product attributes and alternatives will experience a higher level of cognitive load compared to the subjects that will be exposed to a smaller number of product attributes and alternatives. In addition, it was hypothesized that differences will be found between various levels of cognitive load in relation to the functioning while performing a choice task. Thus increasing information load by means of the increased alternatives as well as by means of increased product attributes will result in a decrease in the choice task performance. In addition, it was hypothesized that differences will be found between those with higher prior knowledge and those with low prior knowledge in interaction with information load according to the number of product attributes in relation to the choice task performance so that an improved performance will be found among those with high prior knowledge compared to those with low prior knowledge. Likewise, it was hypothesized that no differences will be found among those with high prior knowledge and those with low prior knowledge in interactions with information load according to the number of alternatives in relation to choice task performance since increased alternatives depends on the limits of the working memory.

For the purpose of the research 135 subjects were sampled (82 females and 53 males) in the ages of 18-75. The present research deals with presenting stimuli that are related to choosing alternatives in the process of purchasing professional cameras.

Information load was activated by presenting varying number of alternatives (options of purchasing cameras) and attributes (characteristics of each camera). The level of prior

knowledge was measured by a prior objective knowledge test and was designed in an exclusive manner for this research and by a questionnaire for measuring subjective knowledge (Mitchell & Dacin, 1996). In addition, in an effort to measure the level of cognitive load a subjective rating questionnaire was utilized (Pollock. Chandler & Sweller, 2002).

It is clear from the results of the present research that the number of alternatives is the dominant factor that predicts cognitive load as well as the effectiveness of the choice task performance. Thus, the higher the number of alternatives, the poorer is the performance. Furthermore, a high number of alternatives creates cognitive load. On the contrary, the number of product attributes does not predict the performance in choosing an alternative and even not the level of cognitive load. That is, information load that is based on the attributes of the product is not related to the additional research variables: cognitive load, levels of prior knowledge and effectiveness of performance. This research also found that the level of objective prior knowledge is significant in regards to task performance.

The implications that derive from this research are directly related to the education field, especially in view of the fact that many students are exposed to information load and so, based on the research results, may feel loaded cognitively. In view of this, it may lead to develop prevention programs on the subject of decision making, to which students will be exposed at a young age in the education system, in an effort to equip them with tools for coping with excess information. Furthermore, by means of increasing the awareness of teachers to the importance of students' levels of prior knowledge in the process of learning and urging to combine this knowledge within the framework of the their field of mind that they are teaching, it will be possible to enhance thought processes and the performance of students in the didactic facet.