

Selection of a Solution When Using Axiomatic Design

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Abstract. Over the years, the importance of the creativity inclusively in the field of design activities was highlighted. In accordance with the opinions of certain researchers, the divergent thinking could contribute to the increase of creative processes efficiency. On the other hand, the axiomatic design method is considered as a method able to stimulate the technical creativity when the problem of designing a mechanical equipment is stated. To increase the efficiency of using the axiomatic design method, the possibility of selecting the most convenient solution among many available solutions could be discussed. The analysis revealed that there are many methods that could be applied in the process of optimum solution selection among many available solutions. In this paper, some aspects concerning the possibilities of using the method of analytic hierarchy process are analyzed, inclusively by considering a case study concerning a device for investigating the universal horizontal lathe rigidity. Afterwards, the first axiom from axiomatic design method was applied to define the selected solution for the approached device.

1 Introduction

In a short definition, *the creativity* could be defined as the ability to generate new ideas or concepts, eventually by applying methods able to help the process of new ideas generation. There is not a unique opinion concerning the person who used firstly the concept of *creativity*. Thus, in a work concerning the of *aesthetics* evolution, the Polish poet and theoretician of poetry Maciej Kazimierz Sarbiewski (1595–1640) is considered as the first person who applied the word “creation” in the field of poetry [1]. On the other hand, the English mathematician and philosopher Alfred North Whitehead is taken into consideration as the inventor of the word “creativity”; he used the concept when defining his metaphysical scheme [2].

In a book published in the Romanian language (I. Căpâlnianu, *Intelligence and creativity*, Editura Militară, Bucharest 1978), there is the opinion that the concept of *creativity* was introduced by Gordon Allport, in 1937 [3].

Over the years, various definitions for the concept of creativity were proposed by the researchers from distinct activity fields. The researchers considered also that there is a certain connection between the significances and applications of the concepts of *creativity* and *divergent thinking*. The last concept (divergent thinking) takes into consideration the generation of multiple alternatives for solving the addressed problem. The distinction between

the *convergent thinking* (aiming to identify a single accepted solution) and *divergent thinking* was made by the American psychologist J.P. Guilford; in fact, he used the concepts of *convergent* and *divergent production*, the concepts of convergent and divergent thinking being adopted subsequently.

Generally speaking, *the divergent thinking* is an intellectual process of fluent and operative generation of various solutions for a certain problem. Just from this definition, one could notice the connections between creativity and divergent thinking. In solving technical and engineering problems, it is important to find many solutions in the initial stages of problem-solving, so that subsequently, applying adequate selection methods, the most convenient alternative or alternatives are established.

Such an aspect is also highlighted by a principle of management; this principle shows that when for a strategic problem, a single solution seems to exist, there is a high probability that this solution is not the best one [4]. In accordance with such a principle, the same idea of the significance of the necessity to firstly find many solutions for the addressed strategic problem is stated. Only in a subsequent stage, the selection of the best solution could be approached.

In the last decades, many techniques and methods were proposed and applied to stimulate the technical creativity and some of them take into consideration the

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