ASSESSMENT OF EVIDENCE FOR THE EFFECTIVENESS OF DIFFERENT IDEATION PRACTICES

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Abstract – While most engineering schools substantially agree on the general form of the design process that should be used to address engineering design problems, surprisingly little is known about the actual practical effectiveness of many recommended techniques. In this paper and presentation, we review some of the recent evidence concerning the effectiveness of several well-known practices related to ideation - i.e., generating alternative potential solutions to a design problem.

Keywords: metrics, ideation, creativity, effectiveness, brainstorming, TRIZ, morphological analysis

1. INTRODUCTION

Training in design practice has become a standard component in engineering curricula in many countries and is required in Canadian schools that seek accreditation through the Canadian Engineering Accreditation Board. There is substantial agreement across most institutions and textbook authors about the key phases of the design process. However, in many of these phases, the tools and techniques that are taught are highly heuristic and empirical; many have been blessed by experience and practice rather than adopted based on demonstrated evidence of effectiveness relative to alternative approaches.

In this presentation, we survey the still relatively sparse scientific evidence concerning the effectiveness of different ideation practices.

2. METHODS

We began this review by searching the Engineering Village (Compendex) database for the terms "ideation effectiveness"; after culling irrelevant results, we identified approximately 50 papers that addressed some aspect of assessing the value of ideation tools or techniques on ideation performance in real or constructed (artificial or constrained) settings.

Numerous issues were covered by this set of papers, including such elements as descriptions of specific idea-generation techniques (e.g., variations on brainstorming, sketching tools, PAnDA, personas, TRIZ, ideation card decks, etc), metrics useful for evaluating the results of

idea generation processes, comparisons between different ideation processes, and the impact of framing or of the significance of the problem used in the study.

Design-by-analogy was probably the most popular topic, appearing in 8 of the 50 papers. Only a small number of papers explicitly focused on assessing metrics used to assess the effectiveness of ideation (only three had the word 'metric' in their titles); Shah [1] argued that two basic issues should be evaluated by ideation metrics: how well does the proposed method (1) expand and (2) explore the design space? They proposed four fundamental types of measures: *novelty*, *variety*, *quality* and *quantity*. Later papers suggest refinements to these metrics [2], while others apply them to assess the effectiveness of particular tools [3].

Relatively few studies evaluate the impact of different ideation techniques in realistic settings. However, there is some interesting suggestive evidence that quality and quantity of generated ideas are linked, which supports the view that techniques that increase the number of ideas considered will positively affect the design outcome [4].

3. RESULTS AND DISCUSSION

Overall, we found that there is some positive evidence supporting some key concepts embodied in the standard set of tools taught in typical undergraduate engineering design courses, but that instructors should be aware of the specific evidence supporting particular practices.

References

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