An axiomatic design software tool for decision making during the product conceptual design phase

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Abstract: The objective of the product conceptual design phase is to provide one or more product concepts in order to meet customer requirements, that are translated as wishes from identified problems or project requirements. These concepts, named alternative concepts, are most of the time the power of the design process due to the high quantity of them and on the other side, the weakness, due to the hard work to address the whole alternatives, because the criteria to evaluate them are not always evident. By means of a critical analysis of the decision making process regarding concept selection, it was verified that the different methods in literature claim for clarity and simplicity of the design and, most of them present design specifications as criteria that, logically will be different from project to project. Thus, one may conclude that there are criteria and orientations to be followed during the decision making process. However, they are almost always domain dependent, having no set of design specifications that could be used for all design fields. Through an axiomatic design analysis, was verified that the design axioms were considered as quality measures of the design being applicable for all design fields, (SUH, 1990) but the way they were presented, either to their definition or lack of measuring metric, became somehow difficult its application in some cases. These axioms, were then redefined into criteria or goals to be optimized and by adding new metrics was possible to perform suitable evaluations in order to check their meeting, providing a broader axiomatic design application. Therefore, in this work was proposed a decision process for selecting alternative concepts regarding the new established metric that, implemented in a computational tool provides better results for problems that come up during the product conceptual design phase.

Keywords: axiomatic design, conceptual phase, decision making, product development.