The Solution-Focused Design Process Organization Approach Applied From Ship Design to Offshore Platforms Design

The objective of this work is to describe and discuss a design process organization approach named "solution-focused design." This method has been created and used successfully for advanced marine vehicles (AMV), ship and offshore platform design over the last ten years with reasonable advantages. It was first created in a context where the decision of what concept to adopt supersedes the use of the classical design spiral, suggesting a combination of the spiral with morphological charts, since the design processes of the concuring concepts are completely different from each other. The advantages are in terms of allowing for the introduction of creative ideas into the conceptual design process, eventually leading to an innovative product or design solution, establishing a sound design sequence and rationalizing the search for design tools and knowledge, parameter and task organization and classification (free variables, restrictions, performance specifications), and the design process itself. In this work the solution-focused design process is described and compared to some usual ones, which normally rely on "problem-focused" strategies for problem solving. It is shown how the process evolves from a preestablished scenario and a design briefing or specification to a design methodology. This is done in brainstorming sessions, using sketches and interactive design flowcharts (similar to design spirals), adapted for this approach. The objective is to provide the designer with means to define quickly and efficiently the optimal configuration of the design, while incorporating novelties into it. In order to show some features of the approach, three different examples of designs previously developed are presented: one for a SPAR Buoy Platform, another for a floating production, storage, and offloading unit (FPSO), and another for the feasibility and concept of a "fully submersible fast boat." This last one shows features from which the method evolved from AMV's to offshore platforms' design: detailed morphological comparisons of different concepts, in this case, of means of support. [DOI: 10.1115/1.2355516]

1 Introduction

This work focuses on an approach to organize the conceptual or concept design, although it is meant for designers with experience in design, construction, and a few critical aspects of operation, in order to allow for the creation of a reliable concept.

This approach evolved from a previous computer design system that was created based on the use of the design spiral, adapted for an optimization automated design process [1], to run design theory modules at early stages of design, interrelating them. For running different concepts, the user would pick the relevant design theory from a library and compile it in the design sequence. From this practice, an interactive design flowchart (and its building procedure) for controlling the design synthesis was created.

The practice of organizing the design process with the interactive flowchart, enlightened by the traditional design theory and a few new concepts, resulted in the solution-focused design approach. The strongest motivation for the creating of the method was the need to search for a solution when different design concepts or alternatives were under consideration in the design problem. This implies searching for solutions or innovative ideas for the definition of the product, and not defining a product first and then improving it.

The procedures of this approach are structured in an attempt to try to help solve the conflicts that exist between logical analysis and creative thought in the design process, in a harmonic composition of both, at the earliest possible stage.

The process evolves from a preestablished scenario and a design briefing or specification to a design methodology. It allows the designer to range from a global and functional view of the product to its analytical component. It is useful to identify and extract design factors and inter-relate them. Although the philosophy of the method could be extended to a variation of scenarios, at a higher level of risk analysis, the elements presented here are limited to a fixed preestablished scenario. A brief explanation of traditional design is presented in Sec. 3. The approach or method is presented in Sec. 4.

2 The Design Spiral and the Hull Form

The classical design spiral rationalization is the best-known means of synthesis representation of the ship design process. Design factors or stages can be organized and sequenced, providing a cyclic process, where previously unknown data get to be defined, as subsequent factors become solved. In ship design, tradeoffs can be expressed geometrically and this is a strong artistic motivation in the creative sense. With the design spiral this can be done in conjunction with rational reasoning.

One of the reasons the design spiral is so adequate for ship design is due to inherent characteristics of the hull form. It contains, in its design conception, the values—and their compromise—of carrying capacity (volume), equilibrium and stability, hydrodynamic resistance and maneuverability, seaworthih