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ABSTRACT

The competition in global market continues to inspire companies to consider all aspects of design including human psychology to develop reliable, safe, maintainable and novel products/systems. Psychological factors viz. emotions and motivations, cognition, personality, behavioural patterns, thinking and attitudinal responses relative to the design process have a great impact on the overall maintainability of the product/system under design consideration. The integration of psychology with the overall process of design can give forth innovative and creative products/systems. While all the physical resources necessary for task completion may be available, the effectiveness of design task (and other maintainability related tasks like maintenance, product support, etc.) completion is significantly impacted by psychological attributes of the personnel. The reviews of research papers reveal that 70 to 90% partial or complete system failures are taking place due to human errors. The reviews also reveal that more often these human errors have their root in stressed and tensed mental state of the personnel. Design personnel, being human, are no exception in this regard; they may also succumb to stress and anxieties of their personal and professional lives and are prone to commit errors. Design, being the most influential phase of life-cycle of a product/system, need to be done by design personnel who are psychologically in tune with the given design task.

The new orientations in research are required for the product/system development so that the output may inspire the users, meliorate their lives and call forth positive emotions in

their mind. It is observed that ‘Internal-World’ (values, emotions, attitudes, etc.) governs the ‘External-World’ (each and every action and behaviour of human beings along with various decisions made at design stage of the systems or products). This research work humbly attempts to bridge the gap between the technical and non-technical world. The reported research study identifies psychological (motivational) attributes for the design personnel. On the basis of these attributes and maintainability requirements of the system, maintainability checklists have been developed. These checklists ensure incorporation of maximum in-built maintainability features in the product/system under design consideration and also help in minimizing the chances of faulty design of the product/system due to design-induced human errors. It is felt intuitively that consideration of psychological aspects of design personnel can lead to the design of maintainable mechanical products/systems with considerably low life cycle cost.

The efforts are made for the design and development of products/systems from maintainability point of view, in general, and human psychology, in particular. For this, various human value attributes affecting the performance of design personnel are identified and discussed. A procedure based on digraph model and matrix method is applied for the quantification of these psychological attributes and in evaluating Human Values Index of the personnel involved in the design process. The developed procedure is useful for the design and development of maintainable mechanical products/systems. The procedure is also useful for analyzing effectiveness of the personnel or teams (or organizations) for a given task and making comparisons among these.

Key words: Design for Maintainability; Psychology; Human Values; Digraph; Matrix Method; Human Values Index