

ABSTRACT

New Product Development (NPD) is the most important activity, which is recognized as the growth engine for product centric organizations to sustain, prosper, and accumulate stakes in the market. Development of new products is completely original process; it starts from scratch and takes physical functional form that serves the specific purpose of users. The researcher is interested in understanding experimentation and decision-making activities of designers during new product design and development process.

Experimentation is believed as the spirit behind jumping into undiscovered glories. It is one of the gracious ways of trying and testing the principles and investigates the legality of hypothesis. The process of experimentation allows the experimenter to determine the usefulness of previously untried things. In this research context, the researcher has come to know that designers' way of experimentation is quite different from that of scientists and artists. Taking this as a point of motivation, the objective of the present research work is to understand, capture, and report designers'/design teams' experimentation phenomenon during new product design and development process from their psychology perspective.

One more crucial activity designers/design teams face at every product development stage is that they make Go and No-Go decisions. This is the mandatory part of new product design and development process takes place from idea-to-launch. This decisive act of designers decides product success or failure. Designers and developers face high risk every time when they make Go/Kill decisions at every development stage-gate. Thus, going with the right decisions and refusing the wrong ones should be the driving force that allows designers to move ahead. The researcher is interested in understanding designers'/design teams' Go-No-Go decision-making during various product development stages.

The researcher has found that the application of statistical experimental design techniques to the new product design problems is not quite famous among designers. Instead of that, designers use their own ways of doing experiments. To achieve the research objectives, the post facto analysis of the three new product design case studies is conducted. The researcher has engaged and keenly observed these design projects as an active/passive observer. The observed cases studies were not completely structured

but followed some implicit and explicit structure. Blandford's **PRETAR framework** is used to design, conduct, and report this semi structured qualitative product design case studies. The researcher is interested in doing qualitative descriptive analysis of the case studies without formulating any hypothesis. This view is supported by the grounded theory approach.

The **Combined IP-SR-GP Methodology** is the grounded theory/model developed in this thesis. The three approaches - Immanuel Kant's '**Principle of an Inquiry Propagation**' [IP], Newell and Simon's '**Search Representation of a Problem**' [SR] and the basic concepts and principles of perceptual organization i.e. **Gestalt School of Psychology** [GP] are sequentially applied to case studies to understand designers'/design teams' experimentation phenomenon and their Go-No-Go decision-making.

Inquiry propagation is famous term used by the philosopher Kant [1724-1804]; that suggests every answer begets more inquiries. The inquiry propagation approach is used to identify and explicitly report the designers' flow of inquiries associated with experimental and decision-making activities. These inquiries were acted like a series stimuli and the designers'/teams' response to these inquiries was to perform experiment and to make Go-No-Go decisions.

Search representation of a problem approach is used to present the designers' internal representation of product design problem. The designers encoded the product design stages as initial states, intermediate states and goal states. The spaces between these states were search spaces and action spaces. Within search spaces, the designers used various kinds of uninformed and heuristic searches. In action spaces, designers performed experimental and decision-making acts. The researcher has identified the designers' solution action sequences, search types, and types of experiments in these spaces. Also, the designers' mental models and heuristics during experimentation are recognized. The four groups of decision-making constituents - performance parameters and critical factors, causes contributed to process of rational inference, decision-making heuristics, and factors from mental models are identified. These constituents aggregately acted as inputs to decision gates and influenced the designers' Go-No-Go decision-making. Gestalt school of psychology approach is used to deeply look into the designers' perception towards understanding and recognizing patterns of experimentation and decision-making by using Gestalt psychology principles.