**ISSN (Online) : 2348 - 2001**

International Refereed Journal of Reviews and Research

Volume 3 Issue 2 March 2015

International Manuscript ID : 23482001V3I2032015-19

(Approved and Registered with Govt. of India)

# EFFECTIVE REVIEW AND SURVEY ON ENGINEERING DESIGN MODIFICATION APPROACHES

*Satbeer Singh*

*Department of Mechanical Engineering*

*Shree Siddhivinayak Group of Institutions*

*Shahpur-Bilaspur, Distt. Yamuna Nagar*

*Arvind Singh*

*Department of Mechanical Engineering*

*Shree Siddhivinayak Group of Institutions*

*Shahpur-Bilaspur, Distt. Yamuna Nagar*

**ABSTRACT**

The planning design prepare or plotting setup strategy is a positive diagram of steps that originators use in making rational things and systems. The steps tend to get verbalized, subdivided, and/or addresses in a blend of gathered ways yet then notwithstanding, they all things considered reflect beyond any doubt inside norms concerning the secured insights and their specific development and interrelationship. In the development viewpoints the proposed philosophy is amazingly iterative - i.e. parts of the procedure generally speaking ought to be repeated generally before era of a thing can begin - however the part(s) that get iterated and the

**ISSN (Online) : 2348 - 2001**

International Refereed Journal of Reviews and Research

Volume 3 Issue 2 March 2015

International Manuscript ID : 23482001V3I2032015-19

(Approved and Registered with Govt. of India)

measure of such cycles in any given attempt can be particularly variable. Building up configuration necessities is a champion amongst the most essential parts in the blueprint methodology, and this task is commonly performed meanwhile as the likelihood examination. The layout necessities control the course of action of the attempt all through the building framework process. Some strategy necessities blend gear and programming parameters, sound judgment, testability and openness. The initiation and furthermore orchestrating and contraption chart is essentially arranging how to mass-make the attempt and which mechanical social events should be used as a storing's touch of the part. Assignments to complete in this step join selecting the material, determination of the creation shapes, determination of the development of operations, and decision of mechanical social events, for event, moves, tooling and establishment. This errand in like way combines testing a working model to ensure the made part meets limit gages. In the proposed investigation work, a metaheuristic technique reenacted reinforcing ought to be used. SA is one of the unmistakable metaheuristic approachs that are used for methodology change

Keywords – Engineering Design Modification, Optimization, Global Optima in Engineering

## INTRODUCTION

The building outline procedure is a progression of steps that specialists take after to think of an answer for an issue. Commonly the arrangement includes outlining an item (like a machine or PC code) that meets certain criteria and/or achieves a certain errand.

The progressions of the designing configuration procedure are to:

- Define the Problem
- Background Research
- Specify Requirements

**ISSN (Online) : 2348 - 2001**

International Refereed Journal of Reviews and Research

Volume 3 Issue 2 March 2015

International Manuscript ID : 23482001V3I2032015-19

(Approved and Registered with Govt. of India)

- Brainstorm Solutions
- Choose the Best Solution
- Development Work
- Build a Prototype
- Test and Redesign

Specialized illustrations is a vital piece of the designing configuration prepare through which architects and drafters/originators produce new thoughts and tackle issues. Customarily, designing configuration comprised of firmly related steps archived as paper design and content that streamed in a direct/consecutive way through an association. Notwithstanding expanded worldwide rivalry, numerous commercial enterprises in the United States have embraced a group arranged simultaneous methodology utilizing 3-D CAD model data as an essential means for correspondence. This section depicts a current way to deal with the building outline transform so you will have a superior comprehension of and gratefulness for the part of designing design in the configuration process.

Outline is the procedure of imagining or concocting thoughts rationally and imparting these thoughts to others in a shape that is effectively caught on. Regularly the specialized device is design.

Configuration is utilized for two main roles: individual expression, and item or procedure advancement.

Plan for individual expression, generally connected with workmanship, is isolated into cement (sensible) and conceptual outline and is regularly a wellspring of magnificence and hobby.

**ISSN (Online) : 2348 - 2001**

International Refereed Journal of Reviews and Research

Volume 3 Issue 2 March 2015

International Manuscript ID : 23482001V3I2032015-19

(Approved and Registered with Govt. of India)

At the point when a configuration fills some valuable need, for example, the state of another vehicles wheel, it is named an outline for item or procedure advancement.

Tasteful configuration is concerned with the look and feel of an item.

Practical configuration is concerned with the capacity of an item or procedure. Capacity implies that an item has a structure related specifically to the reason for that item.

Item Design is the procedure used to make new items, for example, another car display, another apparatus, and another kind of wheelchair. Item outline is an unpredictable action that incorporates market, creation, deals, administration, capacity, and benefit examinations used to create an item that meets the needs and needs of the shopper, is monetarily created, is alright for the buyer and the earth, and is gainful to the organization.

**REFINEMENT**

**Refinement** is a repetitive (iterative or cyclical) process used to test the preliminary design, make changes if necessary, and determine if the design meets the goals of the project.

The refinement stage normally begins with technicians using the rough sketches and computer models to create dimensionally accurate drawings and models. The refinement stage is heavily dependent on graphics to document, visualize, analyze, and communicate the design idea. **Refinement drawings** are technical drawings and models used to analyze preliminary design ideas.

**ISSN (Online) : 2348 - 2001**

International Refereed Journal of Reviews and Research

Volume 3 Issue 2 March 2015

International Manuscript ID : 23482001V3I2032015-19

(Approved and Registered with Govt. of India)

**Modeling** is the process of representing abstract ideas, words, and forms, through the orderly use of simplified text and images.

A **descriptive model** presents abstract ideas, products, or processes in a recognizable form.

A **predictive model** is one that can be used to understand and predict the behavior/performance of ideas, products or processes.

A **mathematical model** uses mathematical equations to represent system components.

A **scale model** is a physical model created to represent system components.

**Rapid prototyping** is a broad term used to describe several related processes that create real models directly from a 3-D CAD database.

**Virtual reality (VR)** systems offer a way to visualize a model more realistically than on a traditional computer display. By using the principals of human perception, a completely immersive environment in which the user experiences the model is created.

**Computer simulation** is the precise modeling of complex situations that involve a time element. **Computer animation** is the imprecise modeling of complex situations that involve a time element. The major difference between simulation and animation

**ISSN (Online) : 2348 - 2001**

International Refereed Journal of Reviews and Research

Volume 3 Issue 2 March 2015

International Manuscript ID : 23482001V3I2032015-19

(Approved and Registered with Govt. of India)

is the degree of precision. An animation only approximately replicates a real situation; a simulation accurately replicates a real situation.

**Design analysis** is the evaluation of a proposed design, based on the criteria established in the ideation phase. It is the second major area within the refinement process, and the whole design team is involved. Typical analyses performed on designs include:

**Property analysis,** which evaluates a design based on its physical properties.

**Functional analysis,** which determines if the design does what it is intended to do.

**Human factors analysis**, which evaluates a design to determine if the product serves the physical, emotional, quality, mental, and safety needs of the consumer.

**Aesthetic analysis,** which evaluates a design based on its aesthetic qualities.

**Market analysis,** which determines if the design meets the needs of the consumer, based on the results of surveys or focus groups.

**Financial analysis**, which determines if the price of the proposed design will be in the projected price range set during the ideation phase.

**Finite element modeling** (FEM) is an analytical tool used in solid mechanics to determine

**ISSN (Online) : 2348 - 2001**

International Refereed Journal of Reviews and Research

Volume 3 Issue 2 March 2015

International Manuscript ID : 23482001V3I2032015-19

(Approved and Registered with Govt. of India)

the static and dynamic responses of components under various conditions, such as different temperatures.

**Discretization** is the process that divides a solid model into smaller, discrete parts such as triangles and rectangles. Each corner of these elements is called a node.

After the finite element is created, the **boundary conditions**, such as temperature or load, are defined. The model is then analyzed by a computer.

**Mechanism analysis** is concerned with the calculation of motions and loads in mechanical systems comprised of rigid bodies connected by joints.

**Assembly analysis** is used to define the individual rigid bodies of the mechanism and to assemble them correctly, considering both geometry and velocities.

**Kinematic analysis** determines the motion of assemblies without regard to the loads.

**Dynamic analysis** determines the loads that drive or create the motion of a mechanism.

**Functional analysis** is a judgment process in which factors, such as cost, appearance, profitability, marketability, safety, and others, are used to determine the worth of a design.

**ISSN (Online) : 2348 - 2001**

International Refereed Journal of Reviews and Research

Volume 3 Issue 2 March 2015

International Manuscript ID : 23482001V3I2032015-19

(Approved and Registered with Govt. of India)

**Human factors analysis** determines how a design interacts with the dimensions, range of motion, senses, and mental capabilities of the population that will use the product.

**Aesthetic analysis** is a process that evaluates a design based on aesthetic qualities. The look and feel of the product are analyzed by industrial designers, marketing personnel, environmental and human factors engineers, and the customer.

**Market analysis** determines the needs and wants of the customer so that the product produced is the product wanted by the consumer. **Financial analysis** determines the capital available for a project, and the projected expenses to design, manufacture, assemble, market, and service a product. **Graphical analysis** is a process used in engineering analysis to display empirical data in the form of graphics.

## LITERATURE REVIEW

Chan, J., & Schunn, C. (2015) - Research on innovation often highlights analogies from sources outside the current problem domain as a major source of novel concepts; however, the mechanisms underlying this relation- ship are not well understood. We analyzed the temporal interplay between far analogy use and creative concept generation in a professional design team's brainstorming conversations, investi- gating the hypothesis that far analogies lead directly to very novel concepts via large steps in con- ceptual spaces (jumps). Surprisingly, we found that concepts were more similar to their preceding concepts after far analogy use compared to baseline situations (i.e., without far analogy use). Yet far analogies increased the team's concept generation rate compared to baseline conditions. Over- all, these results challenge the view that far analogies primarily lead to novel concepts via jumps in conceptual spaces and suggest

**ISSN (Online) : 2348 - 2001**
International Refereed Journal of Reviews and Research
Volume 3 Issue 2 March 2015
International Manuscript ID : 23482001V3I2032015-19
(Approved and Registered with Govt. of India)

alternative pathways from far analogies to novel concepts (e.g., iterative, deep exploration within a functional space).

Ames, R. T. (2014). *A survey of Utah's public secondary education science teachers to determine their feelings of preparedness to teach engineering design* - The Next Generation Science Standards were released in 2013 and call for the inclusion of engineering design into the science classroom. This integration of science and engineering is very exciting for many people and groups in both fields involved, but a good bit of uncertainty remains about how prepared science teachers feel to teach engineering design. This study analyzes the history of science standards leading up to the Next Generation Science Standards, establishes key components of the engineering design, and lays the background for the study detailed in this report. A survey was given to several hundred public secondary science teachers in the state of Utah in which respondents were asked to report their feelings of preparedness on several aspects of engineering design. The findings of the study show that Utah teachers do not feel fully prepared to teach engineering design at the present time (2014).

Larsson, J., & Wang, Q. (2014). The prospect of using large eddy and detached eddy simulations in engineering design, and the research required to get there. *Philosophical Transactions of the Royal Society of London A: Mathematical, Physical and Engineering Sciences*, *372*(2022), 20130329 - In this paper, we try to look into the future to envision how large eddy and detached eddy simulations will be used in the engineering design process about 20–30 years from now. Some key challenges specific to the engineering design process are identified, and some of the critical outstanding problems and promising research directions are discussed.

Dearman, W. R. (2014). The characterization of rock for civil engineering practice in Britain. *Annales de la Société géologique de Belgique* - Characterization of rock can be approached from

**ISSN (Online) : 2348 - 2001**

International Refereed Journal of Reviews and Research

Volume 3 Issue 2 March 2015

International Manuscript ID : 23482001V3I2032015-19

(Approved and Registered with Govt. of India)

the point of view of geology, and for engineering purposes from the contrasting needs of rock mechanics and engineering geology - The geological approach is usually concerned with the study of samples of fresh rock and classification is based on mode of origin, mineral content and a variety of textural features. The bases of the classification of the three genetic groups — the igneous, the sedimentary and the metamorphic rocks — are discussed and simplified versions of classifications are presented for each group.

Bingham, G., Southee, D., & Page, T. (2013) - This paper examines the traditional engineering-based provision delivered to Product Design and Technology (BSc) undergraduates at the Loughborough Design School and questions it relevancy against the increasing expectations of industry. The paper reviews final year design project to understand the transference of engineering-based knowledge into design practice and highlights areas of opportunity for improved teaching and learning. The paper discusses the development and implementation of an integrated approach to the teaching of Mechanics and Electronics that formalises and reinforces the key learning process of transference within the design context. The paper concludes with observations from the delivery of this integrated teaching and offers insights from student and academic perspectives for the further improvement of engineering-based teaching and learning in a design context.

A rock classification to meet the requirements of rock mechanics is concerned with both the rock as a material and the rock in the mass. In particular an essential ingredient is information on physical and mechanical properties, and parameters of use in engineering design. After a review of the development of ideas in classification and characterization, in which the need for cheap index tests to supplement expensive and elaborate engineering design tests as a means of characterizing large areas for design purposes, work carried out on all these aspects in the United Kingdom is discussed.

**ISSN (Online) : 2348 - 2001**

International Refereed Journal of Reviews and Research

Volume 3 Issue 2 March 2015

International Manuscript ID : 23482001V3I2032015-19

(Approved and Registered with Govt. of India)

Acknowledgement of the significance of geological processes in determining how rock masses achieved their present condition highlights the importance of understanding all aspects of the geology of a particular engineering site as a prerequisite of engineering-geological classification and characterization of rock. The engineering-geological approach has high powers of discrimination, and is invaluable in the relatively inexpensive assessment of rock-mass properties of large areas and volumes of *in situ* rock.

## PROBLEM IDENTIFICATION

The engineering design process is one of the rigorous tasks for upcoming manufacturing / production as well as quality phases. If the task is handled with utmost importance, the upcoming issues can be resolved very easily without any complexity and overhead.

## CONCLUSION

The present frameworks for building design conformities are not beneficial and should be taken care of using specific estimations of metaheuristic methods. Metaheuristics are used to deal with Combinatorial Optimization Problems, like Bin Packing, Network Routing, Network Design, Assignment Problem, Scheduling, or Industrial Manufacturing Problems, Continuous Parameter Optimization Problems, or Optimization of Non-Linear Structures like Neural Networks or Tree Structures as they routinely appear in Computational Intelligence.

The metaheuristics, for instance, Simulated Annealing is a champion amongst the most standard approaches to manage examine in the field of streamlining and it will pass on supernatural occurrence to the universe of estimations in future.For future scope of the work, following techniques can be used in hybrid approach to better and efficient results

**ISSN (Online) : 2348 - 2001**

International Refereed Journal of Reviews and Research

Volume 3 Issue 2 March 2015

International Manuscript ID : 23482001V3I2032015-19

(Approved and Registered with Govt. of India)

- Particle Swarm Optimization
- HoneyBee Algorithm
- Simulated Annealing
- Genetic Algorithmic Approaches

**REFERENCES**

[1] Chan, J., & Schunn, C. (2015). The impact of analogies on creative concept generation: lessons from an in vivo study in engineering design. *Cognitive science*, *39*(1), 126-155.

[2] Jahan, A., & Edwards, K. L. (2015). A state-of-the-art survey on the influence of normalization techniques in ranking: Improving the materials selection process in engineering design. *Materials & Design*, *65*, 335-342.

[3] Asimakopoulou, E. K., Kolaitis, D. I., & Founti, M. A. (2015, June). Evaluation of fire engineering design correlations for Externally venting Flames using a medium-scale compartment-façade fire experiment. In *9th Mediterranean Combustion Symposium, Rhodes, Greece* (pp. 7-11).

[4] Xia, Y. Q., & Zhang, J. (2015, January). Reverse Engineering Design of Vehicle Rear Axle Based on CATIA. In *Applied Mechanics and Materials* (Vol. 697, pp. 298-301).

[5] Meen, T. H., Prior, S. D., Hsu, K. S., & Lam, A. D. K. T. (2015). Mathematical and Computational Topics in Design Studies. *Mathematical Problems in Engineering*, *501*, 296029.

[6] Fenton, C., & Kernohan, J. (2015). Characterisation of Surface Fault Rupture for Civil Engineering Design. In *Engineering Geology for Society and Territory-Volume 5* (pp. 1003-1008). Springer International Publishing.

[7] Tripathi, A., Sharma, T. K., & Singh, V. (2015). Bespoke Shuffled Frog Leaping Algorithm and its Engineering Applications.

**ISSN (Online) : 2348 - 2001**

International Refereed Journal of Reviews and Research

Volume 3 Issue 2 March 2015

International Manuscript ID : 23482001V3I2032015-19

(Approved and Registered with Govt. of India)

[8] Scott, M. A., Hughes, T. J. R., Sederberg, T. W., & Sederberg, M. T. (2014). An integrated approach to engineering design and analysis using the Autodesk T-spline plugin for Rhino3d. ICES REPORT 14–33. *The Institute for Computational Engineering and Sciences, The University of Texas at Austin*.

[9] Ma, J., Martin, K. H., Dayton, P. A., & Jiang, X. (2014). A preliminary engineering design of intravascular dual-frequency transducers for contrast-enhanced acoustic angiography and molecular imaging. *Ultrasonics, Ferroelectrics and Frequency Control, IEEE Transactions on*, *61*(5), 870-880.

[10] Jonathan, P., Ewans, K., & Flynn, J. (2014). On the estimation of ocean engineering design contours. *Journal of Offshore Mechanics and Arctic Engineering*, *136*(4), 041101.

[11] Tee, T. W., Chowdhury, A., Maranas, C. D., & Shanks, J. V. (2014). Systems metabolic engineering design: Fatty acid production as an emerging case study. *Biotechnology and bioengineering*, *111*(5), 849-857.

[12] Ma, J., Martin, K. H., Dayton, P., & Jiang, X. (2014). A preliminary engineering design of intravascular dual-frequency transducers for contrast-enhanced acoustic angiography and molecular imaging. *Ultrasonics, Ferroelectrics, and Frequency Control, IEEE Transactions on*, *61*(5), 870-880.

[13] Ashby, M. F., & Jones, D. R. H. (2014). *Engineering materials 2: an introduction to microstructures, processing and design*. Elsevier.

[14] Pahl, G., & Beitz, W. (2013). *Engineering design: a systematic approach*. Springer Science & Business Media.

[15] Bingham, G., Southee, D., & Page, T. (2013). An integrated approach for the teaching of mechanics and electronics in a design context. In *DS 76: Proceedings of E&PDE 2013, the 15th International Conference on Engineering and Product Design Education, Dublin, Ireland, 05-06.09. 2013*.

**ISSN (Online) : 2348 - 2001**

International Refereed Journal of Reviews and Research

Volume 3 Issue 2 March 2015

International Manuscript ID : 23482001V3I2032015-19

(Approved and Registered with Govt. of India)

[16] Deb, K. (2012). *Optimization for engineering design: Algorithms and examples*. PHI Learning Pvt. Ltd..

[17] Hubka, V., & Eder, W. E. (2012). *Theory of technical systems: a total concept theory for engineering design*. Springer Science & Business Media.

[18] Hubka, V., & Eder, W. E. (2012). *Design science: introduction to the needs, scope and organization of engineering design knowledge*. Springer Science & Business Media.

[19] Buede, D. M. (2011). *The engineering design of systems: models and methods* (Vol. 55). John Wiley & Sons.

[20] Kashan, A. H. (2011). An efficient algorithm for constrained global optimization and application to mechanical engineering design: League championship algorithm (LCA). *Computer-Aided Design*, *43*(12), 1769-1792.

[21] dos Santos Coelho, L. (2010). Gaussian quantum-behaved particle swarm optimization approaches for constrained engineering design problems. *Expert Systems with Applications*, *37*(2), 1676-1683.

[22] Linsey, J. S., Tseng, I., Fu, K., Cagan, J., Wood, K. L., & Schunn, C. (2010). A study of design fixation, its mitigation and perception in engineering design faculty. *Journal of Mechanical Design*, *132*(4), 041003.

[23] Sinnott, R. K. (2009). *Chemical engineering design: SI Edition*. Elsevier.

[24] Improving Simulated Annealing-based FPGA placement with directed moves, K. Vorwerk, A. Kennings, J. W. Greene IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, Volume 28, Issue 2, pp. 179-192, February 2009

[25] Zahara, E., & Kao, Y. T. (2009). Hybrid Nelder–Mead simplex search and particle swarm optimization for constrained engineering design problems. *Expert Systems with Applications*, *36*(2), 3880-3886.

[26] Cross, N. (2008). *Engineering design methods: strategies for product design*. John Wiley & Sons.

**ISSN (Online) : 2348 - 2001**

International Refereed Journal of Reviews and Research

Volume 3 Issue 2 March 2015

International Manuscript ID : 23482001V3I2032015-19

(Approved and Registered with Govt. of India)

[27] Series: Operations Research/Computer Science Interfaces Series, Vol. 32 Ibaraki, Toshihide; Nonobe, Koji; Yagiura, Mutsunori (Eds.) 2005, XII, 414 p. 106 illus., ISBN: 978-0-387-25382-4

[28] Shigley, J. E., Budynas, R. G., & Mischke, C. R. (2004). Mechanical engineering design.

[29] Performance evaluation of metaheuristic search techniques in the optimum design of real size pin jointed structures, O. Hasançebi, S. Çarbaş, E. Doğan, F. Erdal and M.P. Saka 2009