



# Multifunctional Concrete Material: Construction Management Point of View

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## Abstract

In this short note, the authors are highlighting extreme lack of matured consideration of experimental decision science as well as constructability studies in multifunctional concrete materials research. Having experience in research on self-healing, waterproof concrete, anti-algae and anti-fungi concrete, thermal diode concrete, and heat conductive and waterproof concrete [1-17] with construction management background the authors are imposing the taxonomy of body of knowledge in multifunctional concrete material as an “outsider in the house”. Recently, there is an extensive attention by research community on multifunctional materials applicable for construction industry. This, as a self-downstream requirement, has been emerged in multifunctional concrete materials as demand driven solution. It is while, outcome of this multifunctional concrete materials was not studied under construction managers evaluation and assessment. To this end, “Decision science of experimental design” and “Constructability of findings” are two major research shortcomings in multifunctional concrete design and development.

**Keywords:** Multifunctional Concrete; Multifunctional Material; Construction Management; Constructability; and Decision Science

## 1 Multifunctional Concrete Definition and Shortcomings

Scopus indexed publication records and databases shows Multifunctional material has been titled since early 1980s. In general term, “Multifunctional material” shall be defined as an objective given to material “Having or fulfilling several functions” [18]. By definition, when it comes to concrete science, it should be based on development of new active derivative function or improvement of existing attribute to a meaningful function. Existence of every newly developed function in parallel to default functions will conclude to novel introduction of Multifunctional concrete. Concrete has historical limitations that in some cases addressing that can conclude to a new function. It is while, equally modern area and its fashion of economic, environmental and social friendly is persuading to introduction of concrete’s new function. However, there are

shortcomings to multifunctional concrete associated with “Decision science of experimental design” and “Constructability of findings”, which the following presents, in details.

## 2 Decision Science of Experimental Design

It is well understood that “Decision science” is not that matured as mathematical science, chemical science, or other fundamental core sciences. Indeed, the existing development of decision science body of knowledge is not well in practice by concrete researchers. The following are examples supporting this statement:

- Majority of researches in Multifunctional concrete material is shortsighted to lab condition outputs under extreme control variables. This is while, non-measured casual and control variables are another missing points.
- Dependent and independent variables are measured, but measurable variables are not comprehensive or not well investigated.
- Experimental process of evaluating different functions is being conducted per requirement of “Dominant decision making”, in discrete form, while it is not necessarily a valid approach. “Non-dominant decision making” process has been rarely focused by researchers.

All above comes under scope of decision process analysis of Multifunctional concrete research where it is part of constructability study in construction management, as well.

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### 3 Constructability of Findings

O'Connor [19] research on constructability is one of fundamental effort to this knowledge. Based on this work "...Constructability improvement impacts are most often modifications in resource utilization and usually involve a tradeoff between engineering and construction resources. Constructability improvements seldom benefit a project without requiring some additional effort to be expended in some manner." This in mind, economic analysis, supply change, contractor capacity, labors skill, end user acceptance and other downstream requirement has been rarely studied in multifunctional concrete material research. Analysis of upstream requirements of constructability can be another major future research concern; including, availability of resources, dynamic and complexity of expanding material input, process change order, etc.

### 4 Conclusion

This short note is to highlight shortcomings of global research in Multifunctional concrete materials. It indicated inadequacies associated with "Decision science of experimental design" and "Constructability of findings" in multifunctional concrete materials research. Commitment of editors, reviewers, authors and researchers is needed to reconsider standards and proper experimental decision science as well as constructability analysis in Multifunctional concrete research publication. As such development, it will shorten shelf life of research for ultimate benefit of all construction stakeholders, as well as, public communities.

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