The growing awareness of environmental responsibility and the current global market competitions has pressurised the process industrial sector to adopt the green practices in their supply chain management (SCM). Green supply chain management (GSCM) is a developing concept recently utilized in many process industries with a view towards achieving environmental objectives and reducing cost in their operations. The sustainability of the green supply chain (GSC) is always depending on the green purchasing strategies of an organization. The primary function of the green purchasing activity is the supplier selection based on economic and environmental performances and it is very much important than none for the purchasing related responsibilities. Generally, the supplier selection process is a challenging issue in the purchasing activity and it deploys a tremendous amount of a firm’s finance resources. In return, firms expect significant benefit from contracting with suppliers offering high value. In recent years, due to the environmental pressures and awareness, many process industries prefer the green suppliers in their purchasing activity and it involves environmental, social and economic dimensions in a quantitative and qualitative way.
The goal of any GSC is to maximize the value creation and minimize the cost involves in the operation. The identification of right green supplier in GSC will perceive the quality, quantity, time, price and environmental competency for an organization. The challenges involves in the green supplier selection process are developing the economic and environmental based evaluation criteria frame work; carefully defining the meaning of each criterion; decide which criteria are relevantly more important than others in a quantified manner and finally evaluate the right green suppliers according to strength and weakness against each of the selected pertinent criteria by collecting relevant information. Hence, the green supplier evaluation and selection in green supply chain involves multi-criteria, multi-level, multi-objective and multi personal decision. The decisions at the interference between green suppliers and manufacturers are depends on the trade-offs between various economic and environmental factors and it imposes the necessity of multi criteria decision making (MCDM) framework for the green supplier evaluation and selection process. Some of the research questions are addressed in this work such as, which environmental and economic criteria’s are suitable for green supplier selection in process industries?, how the green supplier evaluation uncertainties can be solved during the selection process?, how the decision framework can help the supplier selection decision making team and purchase professionals in green suppler evaluation and selection problem and allocation of orders problems?,
what type of decision model associated with methodologies are suitable for

green supplier evaluation and selection for process industry?

The aim of this research is to develop the decision frame work to

evaluate and select the suitable green supplier in process industries. The green

supplier selection process in various process industries has been studied in this

work such plastic industry, food industry, paper industry and mine industry.

The methodology used in this research for solving the decision frame works in

the processing industries are fuzzy axiomatic design (FAD), fuzzy analytic

hierarchy process (FAHP), Preference Ranking Organization METHod for

Enrichment Evaluations (PROMETHEE), fuzzy Technique for Order of

Preference by Similarity to Ideal Solution (FTOPSIS), analytic hierarchy

process (AHP), Taguchi loss function and multi objective linear programming

(MOLP). Based on the nature of the selection process, availability of

information and the case companies’ requirements, the above methodologies

are applied in individual way or hybrid way in multi-criteria environment to

contribute for the efficient green supplier evaluation and selection. Moreover,

single sourcing concept and multiple sourcing concepts is studied in this

research for supplier evaluation, selection and order allocation. The criteria

framework is developed by the information collected through the distribution

d of questionnaire to the pertinent internal sources such as purchasing, SCM,

marketing and finance etc., and external sources such as academic experts,
literatures, reference books, websites and, other related industries. In this research, fuzzy set theory is used to address the uncertainty information of decision making team on qualitative and quantitative criteria, and green supplier performance in selection process. From the study, it was observed that the proposed multi criteria decision framework will provide the significant support to the decision making team in the evaluation and selection process of green suppliers under uncertain multi criteria environment.