

# Chapter 23

## Artificial Neural Network in Operation Management Regarding Communication Issue

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### ABSTRACT

*Communication issue in operation management is important concern in the age of 21st century. In operation, communication can be described based on major three wings- Travelling Salesman Problem (TSP), Vehicle Routing Problem (VRP) and Transportation Problem (TP). Artificial Neural Network (ANN) is an important tool to handle these systems. In this chapter, different ANN based models are discussed in a comprehensive way. This chapter deals with how various approaches of ANN help to design the optimal communication network. This comprehensive study is important to the decision makers for the analytical consideration. Although there is a lot of development in this particular domain from a long time ago; but only the revolutionary contributed models are taken into account. Another motivation of this chapter is understanding the importance of ANN in the operation management area.*

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## **INTRODUCTION**

Communication through a proper and optimal network by meeting demand in satisfactory level is an important part of decision-making in operation management. Proper and optimal network can be defined in a significant way. The term ‘optimal’ refers to optimization of cost, use of resources, like fuel, manpower etc. ‘Proper’ signifies congestion handling. More specifically, the term ‘proper’ follows the research question “How is congestion reduced in a specific network?” Considering these facts with different motivations and contexts, various decision-making models were developed in this area. Among all these models, ANN based models play a significant role for decision-making. In this chapter, a set of ANN based models are taken into account for analysing the efficacy of ANN as a tool. All the developed ANN based models are not taken as consideration. The specific models are selected based on three following criterion:

- Revolutionary change in goal over earlier models
- Revolutionary change in technical outcome
- Introducing a real scenario in modelling

Before going to the detail of the modelling analysis, a small outline of three major wings- Travelling Sales Problem (TSP), Vehicle Routing Problem (VRP) and Transportation Problem (TP) is given in the following:

### **Travelling Salesman Problem (TSP)**

Travelling Salesman Problem is a combinatorial optimization problem as well as it is NP hard in nature. It is equally important in the area of operation research and operation management. The basic objective of this problem is to identify an optimal path for a traveller among a set of cities/nodes. Optimality of network can be described in terms of cost, time, distance etc. But in generally, optimization of cost is taken into account. The crucial assumption of this problem is that each city should be covered once only. Mathematical structure of TSP model is,

$$\text{Minimize } Z = \sum_i \sum_j c_{ij} X_{ij} \quad (1)$$

Subject to

$$\sum_i X_{ij} = 1 \quad \forall j \quad (2)$$

$$\sum_j X_{ij} = 1 \quad \forall i \quad (3)$$

$$X_{ij} \in \{0,1\} \quad (4)$$

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