Chapter 7
Role of Multi-Agent System in Reducing Failure Probabilities in Production System

Vikram Singh
https://orcid.org/0000-0002-8234-7125
National Institute of Technology, Hamirpur, India

Somesh Kr. Sharma
National Institute of Technology, Hamirpur, India

ABSTRACT

The goal of this study is to reduce the possibility of failure and increase a manufacturing organization's performance. After a thorough analysis of the literature, 28 MAT variables. These variables were classified into six factor groups, which formed the conceptual domain. The factors and variables were prioritized using the Analytical Hierarchy Process (AHP). The structural model developed yield compelling results, indicating that the 'Manufacturing Process' is the most essential factor followed by others. For variables, AHP evolved "Process Planning Agent" most prioritized under factor 'Manufacturing Process', "Diagnosis" for factor 'Fault Identification', "Shop Floor Monitoring" for factor 'Control System', and so on. This indicates variables are not limited to work within their group. So, organizations must have to focus more on the factors and variables those obtained the top-ranking during implications of MAT. This study may help industrial businesses to minimize the possibility of failures, which may lead to lower costs, increased production, and improved overall efficiency.

DOI: 10.4018/979-8-3693-6230-3.ch007

1. INTRODUCTION

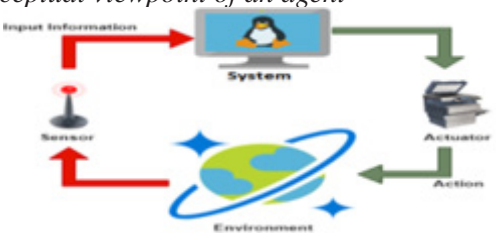
1.1. Introduction to Multi-Agent System

In this modern era, the technological revolution has completely changed the world of the manufacturing system. This revolutionization has changed the traditional manufacturing system with a computer-based system. The software programs are configured with hardware components to automate the manufacturing operations which builds the term "smart manufacturing." This paradigm helps manufacturers to develop an autonomous environment in their manufacturing system. Automation has made it possible for manufacturing firms to monitor their production from the stage of product design up to the point when the products fail. It helps in operations selection, system monitoring, fault identification, and diagnosis in manufacturing organizations. The word "automation" refers to tasks performed by agent-based systems. Agent-based systems are used by manufacturing firms that expect continuous production without any interruptions.

1.1.1 Agent Based systems

The era of automation is derived with the help of software programming languages and hardware systems, which give rise to a new term called agent technology. The agent can solve problems in any situation and achieve the defined objective. Agent technology plays a crucial role in aviation, manufacturing, designing, planning, maintenance, supply chain, etc (Singh & Sharma, 2023a). An agent is a self-contained creature that performs activities in an environment to achieve a target. The basic conceptual viewpoint of an agent in a simple operating system is shown in Figure 1.

Figure 1. Basic conceptual viewpoint of an agent



Fostering Pro-Environmental Behaviors With AI-Driven Educational Psychology in Education 5.0

Minh Tung Tran (2025). *Impacts of AI on Students and Teachers in Education 5.0 (pp. 255-270).*

www.irma-international.org/chapter/fostering-pro-environmental-behaviors-with-ai-driven-educational-psychology-in-education-50/368635