

MANAGING ENVIRONMENTAL IMPACT OF PROJECTS: AN EVOLUTIONARY GAME THEORY - SYSTEM DYNAMICS BASED APPROACH

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ABSTRACT

This paper proposes a model for study of interactions among the key stakeholders associated with the monitoring and control of environmental performance of the projects - the project portfolio manager, the project manager and the environment manager. The model makes use of the evolutionary game theory and the system dynamics approach. The initial interactions among the stakeholders with fixed reward and penalty did not lead to the stable strategy choices. Two other systems namely the random inspection system and the dynamic penalty – reward system are identified from the literature and applied. Based on the simulation results, the roles of key stakeholders were prescribed for the project organization. The aim of this research is to explore practical solutions for optimal strategy of stakeholders during the course of project execution.

Keywords: Environmental Sustainability, Project Management, Evolutionary Game Theory (EGT), System Dynamics (SD), Project Portfolio.

1. INTRODUCTION

The world is realizing the threat of climate change on our very existence. Governments across the world are working towards environmental protection, due to the obligations of United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto protocol. Due to the continuously increasing focus on environment, companies are coming under strong global pressure to incorporate environmental considerations in their way of doing business. Companies widely use projects and project management principles for achieving business objectives. Companies worldwide make use of projects to address their changing requirements generated by technological advances, competition, regulation, social pressure or economic demands (Magalhães et al., 2018). Projects account for substantial and important part of the business activity. Therefore, it is essential that the environmental concerns of the top management percolate to the level of projects. Most of the projects are linked with the environment, as they consume energy and other resources from the environment to produce the required deliverables and cause environmental impacts in the process. It is evident that the environmental sustainability is linked with projects (Armenia et al., 2019).

Project is defined as “a temporary endeavor undertaken to create a unique product, service or result” (PMI, 2017, p4) and project management is “application of knowledge, skills, tools, and techniques to project activities to meet the project requirements” (PMI, 2017, p10). In the companies, project managers are concerned with the project performance variables such as quality, cost and schedule performance and the top management’s concern is achievement of the company objectives. The project portfolio management is the link between the project performance and the company objectives such as environmental sustainability. Hence, the project portfolio management also, in addition to the project management is important for addressing environmental sustainability through projects. A project portfolio is defined as “projects, programs, subsidiary portfolios, and operations managed as a group to achieve strategic objectives” (PMI, 2017, p15) and the project portfolio management is “centralized management of one or more portfolios to achieve strategic objectives” (PMI, 2017, p4).

In addition to the roles of project manager and project portfolio manager, there is another key role in the context of environmental impacts of project execution. It is role of the environmental manager. The environmental manager plays a critical role in advancing environmental sustainability (Greenwood et al.,