Chapter V

Innovation Diffusion Among Heterogeneous Agents: Exploring Complexity with Agent-Based Modelling (ABM)

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Abstract

In this chapter we apply agent-based modelling (ABM) to capture the complexity of the diffusion process depicted in Medical Innovation, the classic study on diffu-
sion of a new drug tetracycline by Coleman, Katz, and Menzel (1966). Based on our previous model with homogenous social agents, Gammanym (Ratna et al., 2007), in this chapter we further our analysis with heterogeneous social agents who vary in terms of their degree of predisposition to knowledge. We also explore the impact of stage-dependent degrees of external influence from the change agent, pharmaceutical company in this case. Cumulative diffusion curves suggest that the pharmaceutical company plays a much weaker role in accelerating the speed of diffusion when a diffusion dynamics is explored with complex agents, defined as heterogeneous agents under stage-dependent degrees of external influence. Although our exploration with groups of doctors with different combination of social and professional integration signifies the importance of interpersonal ties, our analysis also reveals that degree of adoption threshold or individual predisposition to knowledge is crucial for adoption decisions. Overall, our approach brings in fresh insights to the burgeoning policy literature exploring complexity, by providing necessary framework for research translation to policy and practice.

Introduction

This chapter examines how interpersonal interactions influence the diffusion of a new product. The approach uses ABM to capture the complexity of the diffusion process and the importance of social networks. It builds upon previous work (Ratna et al., 2007) and examines the classic study on the diffusion of a new drug, tetracycline by Coleman et al. (1966). This paper, elaborating on extended version of Gammanym, that is, Gammanym1, investigates the diffusion process by incorporating: (1) heterogeneity of adoption thresholds among principal social agents, that is, doctors; and (2) stage-dependent degrees of influence from the pharmaceutical company, a communicating social agent creating external influence for the doctors by providing information through various marketing strategies. We then proceed to capture the complexities of adoption decisions for heterogeneous agents under stage-dependent degrees of external influence. Our principal objective in this exploration with Gammanym1 is to offer fresh insights into the dynamics of interpersonal relations and the resultant group outcomes in terms of aggregate adoption, and also to provide a comprehensive framework for research translation into policy and practice.

The chapter is structured as follows. We first review the literature and provide a motivation for the current study. The third section summarises our modelling approach while the fourth explores two major and, hitherto ignored, concepts: heterogeneity of adoption threshold among social agents and stage-dependent degrees of external influence. Results of the modelling and simulation with complex agents are provided in the fifth section while the last section offers concluding remarks.
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