



Evolution of knowledge sharing behavior in social commerce: An agent-based computational approach



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ABSTRACT

The rapid development of e-commerce has expedited knowledge growth in the e-commerce social community. Knowledge sharing among online users has exhibited a nonlinear dynamic evolution. This paper examines the evolutionary process of knowledge sharing among users of the social commerce; builds an evolutionary game model to depict knowledge sharing phenomenon in the virtual community; and develops a mixed learning algorithm based on individual user's historical game strategy, neighborhood user's strategy, and information noise. We design a computational model based on multi-agent theory and social network, and implement computational experimental system using NetLogo 5.0. We find that the proposed computational–experimental model can help decision makers simulate evolutionary process under various scenarios. The evolutionary game rule and social network structure significantly influence the degree of cooperation and knowledge sharing among users. The greater noise the network information has the less stable the users' behavior will be. One can thus identify an optimal initial cooperation rate to facilitate the system to reach equilibrium state quickly. Our study on the dynamic evolution of knowledge sharing behavior in the social commerce contributes to the theoretical development of literature and provides valuable decision-making support to managers.

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1. Introduction

The emergence of Web 2.0 has changed the way users and enterprises interact and collaborate with each other. It creates social commerce by combining social media, social network and e-commerce. Social commerce is filled with social interactions and users in the online commerce community and other social network rate and share online product information and advice [1]. Individual opinions earnestly contributed to the online community have enhanced knowledge sharing and steered new consumer behavior.

iResearch (www.iresearch.com) reports that the online shopping behavior of social media users have significantly changed in recent time, as (i) the community of seeking friends online is growing rapidly; (ii) social media users pay more attention to “acquaintance”, and are more confident of friends' comments as they are often skeptical of advertising claims; and (iii) the integrated e-commerce and social media can re-sort the user's social relationships, and effectively motivate the

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product spread and form virtuous circle [2]. In particular, iResearch revealed that 54% of social media users respond that they would purchase a product if their friends “like” it, as opposed to 28% of the overall e-shoppers.

Social commerce exemplifies a collaborative environment where people share information and resources, so that the total effect is greater than the sum of individual effects. The users in social commerce can influence the buying behavior of others by word of mouth, recommendation and transfer of knowledge on the social network [3]. Examples of social commerce can be found in. Pinterest (www.pinterest.com), ebay community (community.ebay.com), and taobao forum (bbs.taobao.com). Users can quickly access and readily capture other peoples’ experiences and derive comprehensive and relevant information about the merchandise. In short, knowledge exchange has inundated the social commerce and effective knowledge management is crucial for enhancing e-commerce performance. However, there is a dearth of research directed toward optimizing knowledge sharing in social commerce [4]. Few studies have empirically examined what drives continued knowledge sharing [5,6], but none have explored the evolution issues from the perspective of mathematical modeling and simulation approach in social commerce.

Registered users in social commerce build their networks by publishing shopping and answering shopping posts. Users can easily see the remarks, reply, and comments of other users. For example, a registered user in the discussion forum can quickly locate the posts of connected users after log-on. Users may share real knowledge, reserve or even distort facts, and even post incomplete or inaccurate information. A user often becomes more active over time; their remarks and replies increase network knowledge and before long the network would form a nonlinear evolutionary state. Users can choose knowledge sharing strategies (actual experience or unreal shopping information) based on their own preference and others’ actions. They may choose a strategy now, adopt a different one later, and use a combination strategy at the end. The e-commerce administrator thus should decide on what management strategies suit the network structure and user behaviors best.

The knowledge sharing behavior among users in a social commerce exemplifies the evolution of knowledge interactions over time. In this research, we employ agent-based computational approach to explore the dynamic evolutionary process of knowledge sharing among users of the social commerce. The goals of this study is to (1) model user interactions in the social commerce using game theory and identify the equilibrium of the dynamic evolution; (2) build a computational model to study the behavioral evolution of knowledge sharing in social commerce based on evolutionary game, multi-agent, and social network theory; and (3) analyze how management strategies affect e-commerce discussion forums, and how to select knowledge sharing network structures; examine how network parameters and information transparency shape the evolutionary equilibrium. In short, we seek to provide mechanisms for social commerce administrators to establish knowledge sharing strategy and manage under different scenario.

Our paper is organized as follows. In Section 2, we review the extant literature. Section 3 proposes a theoretical model and develops a dynamic methodology to help reach evolutionary equilibrium. In Section 4, we conduct computational study to validate the proposed model and understand the evolution of knowledge sharing in e-commerce. Section 5 presents computational results through virtual experiment, while the implications, limitations, and suggestions for future work are given in Section 6. Section 7 concludes this research.

2. Literature reviews

2.1. Virtual community and social commerce

In social commerce, people communicate with each other through electronic media [7]. The virtual community comprises people, intention of sharing, policy, and computer system [8]. Bhattacharjee [9] defines a virtual community as one gathering rational community users, interacting with virtual spaces, and sharing among users. Therefore, obtaining knowledge through information collection and user interactions is a key feature of a virtual community. The e-commerce forum offers a special virtual community, which can integrate social features and enhance e-commerce performance.

2.2. Knowledge sharing in virtual community

Literature on knowledge sharing in a virtual community abounds. Most researchers have examined the drivers affecting the participation in the community, and found individual motives include internal, external, and social motives [10–12]. These factors affect the initial motivation of users joining the community for knowledge sharing [11,12]. Yet, the initial motives may not continue. Few studies focus on the influence of trust instead of motives on users’ continuous participation of the virtual community [5]. In fact, social learning takes place during the virtual community involvement, and users may alter their motivation. Sun et al. [6] find that task complexity and self-efficacy (two social learning factors) moderate the relationship between motivation and sustained participation. The transactional complexity and the exterior motive have a negative correlation, whereas complexity and the interior motive have a positive non-linear relationship.

Existing studies assume users’ continuing participation in virtual community is monocyclic and static [5,6]. However, the continuous knowledge accumulation, expansion and interaction is a dynamic evolutionary process. Its evolutionary strategy has a significant influence on organizational performance. An optimal strategy to knowledge evolution significantly aid the accumulation and improvement of knowledge [13]. Few literature on users’ continuous participation is based on the theory

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