Chapter 30
An Empirical Study on the Network Model and the Online Knowledge Production Structure

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ABSTRACT

Mass production has attracted much attention as a new approach to knowledge production. The R software system is a typical product of mass production. For its unique architecture, the R software system accurately recorded the natural process of knowledge propagation and inheritance. Thus, this article established a dynamic complex network model based on the derivative relationship between R software packages, which reflects the evolution process of online knowledge production structure in R software system, and studied the process of knowledge propagation and inheritance via the dynamic complex network analysis method. These results show that the network size increases with time, reflecting the tendency of R software to accelerate the accumulation of knowledge. The network density and network cohesion decrease with the increase of scale, indicating that the knowledge structure of R software presents a trend of expansion. The unique extension structure of R software provides a rich research foundation for the propagation of knowledge; thus, the results can provide us a new perspective for knowledge discovery and technological innovation.

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1. INTRODUCTION

The concept of mass production (peer production) is described as "the pattern of knowledge product production that is distributed together by the distributed users and jointly owned by the users." A typical feature of this new mode of production is that of non-central control: the producer voluntarily chooses the production content and result sharing, the producer is the user, and the output knowledge product is public (Benkler, 2006). All of these aspects are based on the Internet. The mass production project mode is mainly divided into 2 categories: Free Open Source Software Mode and Online Encyclopedia Mode. Open source software and online encyclopedias belong to the knowledge product area of online production, but the participants in the open source software need to have the ability to program. Because of this need for programming ability, the requirements for the participants are better than those for participants in online encyclopedias. The corresponding participation group is relatively stable, and the cooperation relationship between the knowledge producers in the community is more stable and persistent. In 2009, Black Duck reported that the cost of open source software development was estimated at 387 billion US dollars. Increasing numbers of software companies are involved in the development of open source software; one such example is that of Oracle's purchase of Sun's open source project for $7.4 billion in 2010. Google investment has created the open source community Google Code and the open source database MySQL. In the open source community, subsequent developers can create innovations based on the creations of earlier developers. This type of piggy-backing is a derivative of the anonymous cooperation model. It has not only greatly improved the efficiency of the creations of the developers but also promotes the development of knowledge products; that is, the speed of the development of open source software. The open source development mode provides a new way for the transformation of the industrial mode. Openness and transparency in the open source community can help to quickly gather public wisdom and effectively promote the formation and development of a new knowledge ecosystem.

Since it is a new approach to knowledge production, the mass production mode has attracted significant attention. Benkler and Nissenbaum (2006) examined how production cooperation can lead to knowledge innovation and communication in strange communities from an ethical perspective. The collaborative production mode in the open source community is usually described as a "virtual team" (Cohendet et al., 2001; Wellman, 1997). The research on the open source community can be summed up in 3 aspects: the participants' motivation for research, type of community the participants belong to, and network analysis of the community relations.

The research on the participants' motivations can be roughly classified into 3 categories: external motivation, intrinsic motivation, and internalized external motivation. External motivation includes career development (Hann et al., 2002; Hars & Ou, 2001; Orman, 2008; Hann et al., 2004), intrinsic motivation includes an interest in sharing (Ghosh, 1998) or learning opportunities (Shah, 2006; Ye & Kishida, 2003), and internalized motivation includes the development of the developer's own use requirements (Lakhani & Von Hippel, 2003; Lerner & Tirole, 2002). Henkel (2006) studied companies' participation in Linux open source community discovery and found that companies' desire to get external technology support was the main motivation for participation in open source. The motivation for individual participation is not only related to internal motivation (such as personal needs or prestige) but also related to the project community (such as leadership efficiency, interpersonal relationships, and community ecology) (Xu et al., 2009). Developers in different regions have different dominant motives (Subramanyam & Xia, 2008). Some studies also identified the motivation of dynamic participation (Shah, 2006; Wu et al., 2007).