Chapter 10
Influence Maximization and Online Social Capital for Entrepreneurs:
Leveraging Social Networks to Achieve Business Goals.

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ABSTRACT

Social networks are vital for businesses today, enabling them to reach a wider audience, engage with customers, and conduct market research. Influence maximization and online social capital are key to entrepreneurs' success, helping them strategically build and leverage networks to achieve specific goals. They can identify and engage with influencers, create high-quality content, and use tools to expand their reach. Social capital provides access to resources, builds reputation and credibility, and offers support and motivation. Successful businesses like Nike, Coca-Cola, Airbnb, and Tesla demonstrate the power of social networks in building customer relationships and promoting products. Overall, influence maximization is crucial for entrepreneurs to increase visibility, credibility, and influence in the digital age, helping them achieve their goals effectively.

INTRODUCTION

In recent years, researchers from various disciplines have contributed to a multitude of research problems centered on social networks (SNs). These include influence maximization, information diffusion (Chen et al., 2013), recommender systems (Amigó et al., 2023), rumor prediction (Xiang et al., 2023), opinion leader detection (Fournier-Viger et al., 2022), and many more SNs have become an integral part of our daily lives, providing an excellent platform for sharing ideas, opinions, and performing various online activities. They virtually connect people worldwide and serve as ideal platforms for promoting ideas, products, and businesses. A social network is a constantly evolving network where users produce and consume vast amounts of content. It can be represented as a graph g=(V,E), where V represents a set of people or entities present, and E denotes edges. An edge connects two nodes if both nodes have a social connection such as friendship, follow-followee, co-authorship, and so on.

Social media platforms such as Twitter, Facebook, Instagram, and Siena-Weibo have a significant impact on shaping public perceptions and raising awareness. Due to their massive global user base, these platforms are widely recognized for their low-cost marketing and business promotion benefits. In network science, influence maximization (IM) is a well-researched problem that aims to identify a small number of seed users, known as influential nodes, who can maximize the spread of information through diffusion cascades to the optimal number of nodes in the system (Banerjee et al., 2020). This is an optimization problem, and Kempe et al. (2003) demonstrated that obtaining an optimal solution is NP-hard under conventional information diffusion models. Mathematically, the IM problem can be stated as follows: "Given a social network G=(V,E), an information propagation model M, and a small positive integer k, the objective is to select a set s of k users as the seed set to maximize the information spread, subject to the condition that for any other seed set s* of k users satisfying $\sigma_{G,M}(s^*) < \sigma_{G,M}(s)$ where $S \subseteq V(G), S^* \subseteq V(G)$, and $\sigma_{G,M}(s)$ is the expected number of users influenced or infected by the users in set S."

Influence maximization (IM) is widely used for viral marketing (He et al., 2019; Nguyen et al., 2016) due to its commercial potential, where a company seeks to promote or adopt a product by targeting a few initially selected influential users and utilizing a "word-of-mouth" strategy through social connections. This triggers a large cascade of further adoptions (Leskovec, Adamic, & Huberman, 2007). Viral marketing is a powerful tool for promoting businesses as it is based on social relationships and mutual trust between users. Recommendations from known or trusted individuals are an effective method of advertisement and form the basis of viral marketing. Advertisers follow a similar approach to influence buyers by targeting influential nodes known as seed nodes. Therefore, e-commerce companies aim to target influential users to conduct successful advertisements and achieve maximum product publicity through viral marketing. IM and Online social capital are two related concepts that play a critical role in the success of entrepreneurs (Chen et al., 2010). Social capital refers to the network of relationships that individuals and organizations have, which provides them with access to valuable resources such as information, support, and opportunities. Meanwhile, influence maximization refers to the process of strategically building and leveraging one's social network to achieve specific goals or objectives, such as increasing visibility, driving sales, or securing funding. And also Finding influential nodes in social networks has many other applications, such as handling rumors, containing outbreaks of disease, maximizing opinions, political campaigning, and social recommendation.

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