

The Dynamics of Viral Marketing

[Extended Abstract]

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Here we summarize the findings presented in a paper to appear in the proceedings of the 2006 ACM Conference on Electronic Commerce.¹

We analyze a person-to-person recommendation network consisting of 4 million people who made 16 million recommendations on half a million products offered by an online retailer. The recommendation program was incentivized: if the recommendation is acted on, the sender receives a credit toward the next purchase, and the receiver receives a discount on the item purchased. As customers continue forwarding recommendations, they contribute to the formation of cascades. We find that most recommendation chains do not grow very large, often terminating with the initial purchase of a product. However, occasionally a product will propagate through a very active recommendation network. We present a simple stochastic model that accounts for the observed distribution of cascade sizes.

Even though the recommendations often did not form large cascades, our analysis revealed several interesting insights into how viral marketing dynamics differ from the propagation of biological viruses. It is frequently assumed in epidemic models that individuals have equal probability of being infected every time they interact. Contrary to this we observe that the probability of infection decreases with repeated interaction. Marketers should take heed that providing excessive incentives for customers to recommend products could backfire by weakening the credibility of the very same links they are trying to take advantage of.

Traditional epidemic and innovation diffusion models also often assume that individuals either have a constant probability of ‘converting’ every time they interact with an infected individual or that they convert once the fraction of their contacts who are infected exceeds a threshold. In both cases, an increasing number of infected contacts results in an increased likelihood of infection. Instead, we find that the probability of purchasing a product increases with the number of recommendations received, but quickly saturates to a constant and relatively low probability. This means individuals are often impervious to the recommendations of their friends, and resist buying items that they do not want.

In network-based epidemic models, extremely highly connected individuals play a very important role. For example, in needle sharing and sexual contact networks these nodes

become the “super-spreaders” by infecting a large number of people. But these models assume that a high degree node has as much of a probability of infecting each of its neighbors as a low degree node does. In contrast, we find that there are limits to how influential high degree nodes are in the recommendation network. As a person sends out more and more recommendations past a certain number for a product, the success per recommendation declines. This would seem to indicate that individuals have influence over a few of their friends, but not everybody they know.

We saw that the characteristics of product reviews and effectiveness of recommendations vary by category and price, with more successful recommendations being made on technical or religious books, which presumably are placed in the social context of a school, workplace or place of worship. Finally, we presented a model which shows that smaller and more tightly knit groups tend to be more conducive to viral marketing. So despite the relative ineffectiveness of the viral marketing program in general, we found a number of new insights which we hope will have general applicability to marketing strategies and to future models of viral information spread.

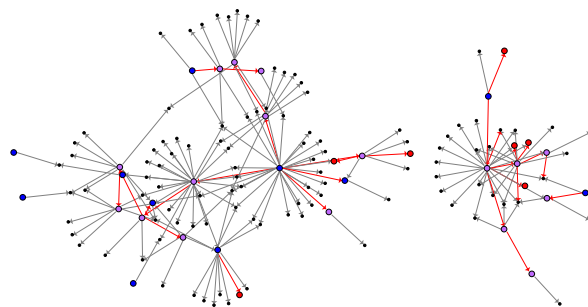


Figure 1: Part of a recommendation network for a medical book. Red and gray lines indicate successful and unsuccessful recommendations respectively. Blue, purple and red nodes are customers who purchased the book. Blue and purple nodes made recommendations, purple and red nodes received them.

¹<http://www-personal.umich.edu/~ladamic/papers/viral/viral-market-short.pdf>