Russell Ackoff Fellowship Proposal

Mechanisms for Information Sharing:
Recommender Systems and their Effects on Diversity

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1. Project Summary

1.1 Introduction

The number of product choices available to consumers has seen extraordinary growth in recent years. This increase in choice, it is believed, will allow consumers to obtain "the" ideal products for them. If the trend continues, in many industries it may create a shift from hit-oriented markets to niche-oriented ones. One problem that arises, however, is how consumers will find such niche products among seemingly endless alternatives.

Recommender systems are considered one solution to this problem. These systems use data on past purchases, ratings, and user profiles to identify which products are best suited to a given, or target, user. The systems take as input a small amount of data on the target user; then, they "borrow information" from people like the target to make predictions. Thus each user provides a small amount of information, but it is pooled to the benefit of all. The most familiar example may be Amazon.com's recommender, with its tagline, "Customers who bought X also bought Y." The proposition is appealing: tell the system about a handful of items that you like and dislike; it then uses information from people like you to to predict what you'll think of hundreds of other products, before you've seen them. In essence, these systems facilitate information sharing: each user contributes a small amount of information; the system assembles this into a whole; and it shares the right information with the right people.

1.2 Research Questions

Recommender systems observe our choices; we see their suggestions; and recommenders in turn observe these outcomes. This is repeated for thousands upon thousands of people, aggregating information across the nation or even world. How does the multiplicity of these events - users making decisions while observing the past choices of others - alter patterns of consumption?
In author Chris Anderson's view, "The main effect of filters, [which include online recommenders], is to help people move from the world they know ('hits') to the world they don't ('niches')." While recommender systems have been assumed to solve this problem, we examine why this might not be so. Instead of pushing consumers toward niches, we examine why popular recommenders might do the opposite. Will recommenders make us viewers of niche, independent media? Or, as we investigate, might they actually reinforce the existing blockbuster nature of media?

Two views exist about such effects, but they are at odds with one another. Anecdotes from users suggest recommenders help consumers discover new products and thus increase diversity. A number of others, however, believe recommenders are biased toward already popular products: popular products are recommended more, recommended products are purchased more, popular products are recommender more, and so on. Such cycles suggest recommenders decrease diversity by forcing convergence on a narrower set of items. This paper is a first attempt to reconcile these seemingly incompatible views. Holding supply-side offerings fixed, we ask whether recommenders and observing others' decision outcomes make our media consumption more diverse or more concentrated.

We hope to address three main themes. The first theme, diversity, is the primary area of interest. Addressing the second and third themes follow naturally. (1) Diversity: What is the net impact of recommender systems on diversity: are consumers pushed to the "tail" or do sales concentrate even more among hits? (2) Product success: how does user feedback, as amplified through recommenders, affect the fate (market share) of individual products? Can one predict which products will be helped by this information sharing, or are the effects stochastic, with chance playing a large role? (3) Social effects: How does the system affect communities? Does it serve as a common ground, connecting users of diverse tastes, or does it serve as a separator, pushing users into more fragmented groups?

1.3 Connections to Risk and Security

We note that while recommenders are typically used in media industries, we believe there exists, and hope to highlight in the Ackoff Fellows presentation, a connection to security and risk prevention. If the objects of study are not, say, books but intelligence reports about a possible attack, recommenders can help identify who should be reading what reports. These are the people who need particular information but are unaware of its existence and thus can't know to request it. This could be particularly useful in contexts where inter-organization information sharing is critical. The 9/11 Commission, for example, cited this often. Since automated recommenders can operate across organizational boundaries, ones that may be more difficult for humans to cross, they could serve a useful purpose in security applications.
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