# Methods for Information Sharing:
# Do Recommender Systems Create Fragmentation

Proposal for the Ackoff Doctoral Fellowship 2009

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## I. Introduction.

Media has historically been a "blockbuster" industry, with sales concentrating among a small number of hits. In recent years, such concentration has begun to decrease: a large percentage of sales in online markets now come from niche goods. This phenomenon has been dubbed the "long tail," referring to sales distributions with significant mass beyond the top products (Anderson 2006). For example, whereas a large physical bookstore may stock 100,000 titles, Amazon stocks 3 million. Conventional wisdom suggests the other 2.9 million titles contribute little to sales, but at Amazon they are 30-40% of book revenue (Brynjolfsson et al. 2006).

Researchers have proposed frameworks for explaining what factors contribute to the long tail (Brynjolfsson et al. 2006). On the *supply side*, firms offer more products than before, enabling the possibility of a long tail. Firms can stock more products because digital goods have no inventory cost and physical goods' demand can be pooled across geography. On the *demand side*, consumers have new tools – recommender systems and search engines (e.g., as on Amazon, Netflix, and iTunes) – for sorting through the myriad choices.

While there has been much excitement about the long tail phenomenon, there have been few empirical studies of it and how these supply and demand factors contribute. In recent work (Fleder and Hosanagar 2009), it is even questioned how much these demand-side drivers contribute to the long tail at all.

## II. Research Questions

My ongoing research examines how demand side drivers, in particular recommender systems, contribute to the long tail.[1] This work is investigating the effects of recommenders on product-level and consumer-level diversity:

1. *At the product level, how do recommender systems affect market concentration? Do they increase the sales of niche goods or direct attention largely toward already popular items?* Anecdotal evidence suggests recommender systems lower market concentration (i.e. lengthen the tail). The literature, however, is theoretically ambiguous on this point. In recent work, Fleder and

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[1] Recommender systems are different than manually written customer reviews. Recommenders use data on past purchases and product ratings to predict which products are best suited to a given user. The most familiar example may be Amazon's recommender, with its tagline, "Customers who bought X also bought Y." Beyond Amazon, these systems are becoming ubiquitous online. They appear in many product categories, such as music, movies, books, TV, and online news, and at major firms, such as Amazon, Netflix, iTunes, Google News, and TiVo.

Hosanagar (2009) show that certain recommender systems which recommend items based on sales or ratings can *reduce* the tail by focusing undue attention on already popular products. All previous work on this question is theoretical, and using data from the music industry, I hope to test this empirically.

2. *At the consumer level, do recommender systems create fragmentation among people?*
The purpose of recommender systems is to tailor the consumption experience for each user's preferences. An online store or online newspaper's front page, for example, becomes personalized for every individual user and not for the general public.

Along with the benefits of this personalization, however, a debate has emerged as to whether such a powerful ability to filter has drawbacks. Critics argue that recommender systems will create fragmentation, causing users to have less and less in common with one another. For example, legal scholar Cass Sunstein argues that, "In a democracy people, do not live in echo chambers or information cocoons. They see and hear a wide range of topics and ideas, … even if they did not … choose to … in advance" (2007).

An alternate view, however, contends that recommenders do the opposite: recommenders may have homogenizing effects because they push users toward the same items and share information among users who would not communicate otherwise. This research will present empirical evidence reconciling the debate as to whether recommenders fragment versus homogenize users.

## III. Data for Empirical Study

We recently obtained a large, novel data set for this work. The firm iLike Inc. has provided sales and recommendations data for millions of users. iLike is one of the leading music recommendations providers and top applications on Facebook, with 30 million registered users.

## IV. Connection to Risk Management

Currently, most companies that use recommender systems are in the media industry. However, we believe there are extremely valuable uses in the risk management and intelligence communities. If the objects of study are not, for example, book recommendations but intelligence reports about a possible attack, recommenders can identify which agents should be reading which reports. These systems, by definition, try to identify who needs what information but may not know of its existence. This is critical in contexts that rely on inter-organization information sharing. The 9/11 Commission, for example, cited this problem often. Automated recommender systems may help solve this problem: it is easy for them to cross organizational lines when humans cannot. Our research about fragmentation effects has direct relevance for such an application, as it asks whether information will spread out in the population or be locked in clusters of people.

**V. Sample research budget**

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| Conference (1) | $1600 |
| Books | $300 |
| Total | $1900 |

My other source of funding is the Baker Center. I plan to use that grant to attend a conference. I would like to present my work at a second conference and to that end the Ackoff fellowship would be very useful.

**VI. Additional Comments**

Besides supporting my research, an additional reason I'm applying for the Ackoff fellowship is that I'd like to meet Professor Ackoff. I heard so much about Professor Ackoff from my advisor Professor Zandi when I was an undergraduate at Penn engineering. More recently, during my graduate studies, I read a book by Professor Ackoff titled *Ackoff's Best*. I am so glad I discovered the book and hope that I can apply his lessons in my work. Thank you for your consideration. I would be honored to be an Ackoff Fellow.

**References**

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