



VII Conference of the Italian Chapter of AIS
Parthenope University, Naples, October 8-9 2010

The Wisdom of Networks: Matching Recommender Systems with Network Theories

Roberto Dandi
Luiss Guido Carli University
Rome, Italy

rdandi@luiss.it

Recommender systems: why bother?

Marketing:

- (i) They convert “browsing” users into buyers;
- (ii) increase cross-selling
- (iii) build customer loyalty
- (iv) better the understanding of customer needs
and of market segments

Recommender systems: what about their use **within** the organization?

Knowledge & information management:

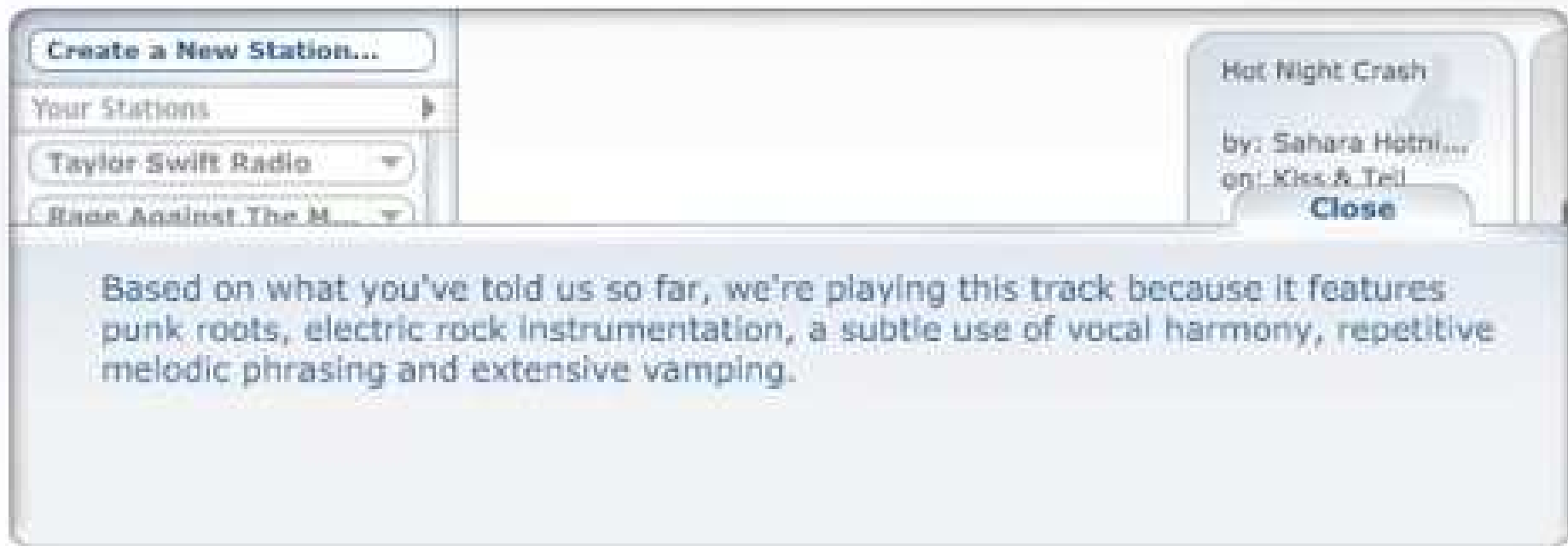
- They support knowledge exchange
- They support and speed up decision-making by reducing information overload
- They support expert recognition within the organization.

Category-based systems

- The customer selects a category of interest and gets recommendations based on that category
 - « Subjects > Books > History > Europe
 - People living in your area... people your age...

Look for items in the same category

Content-based systems



**Look for items similar
to those chosen in the
past**

www.pandora.com

Song recommender

Collaborative filtering systems

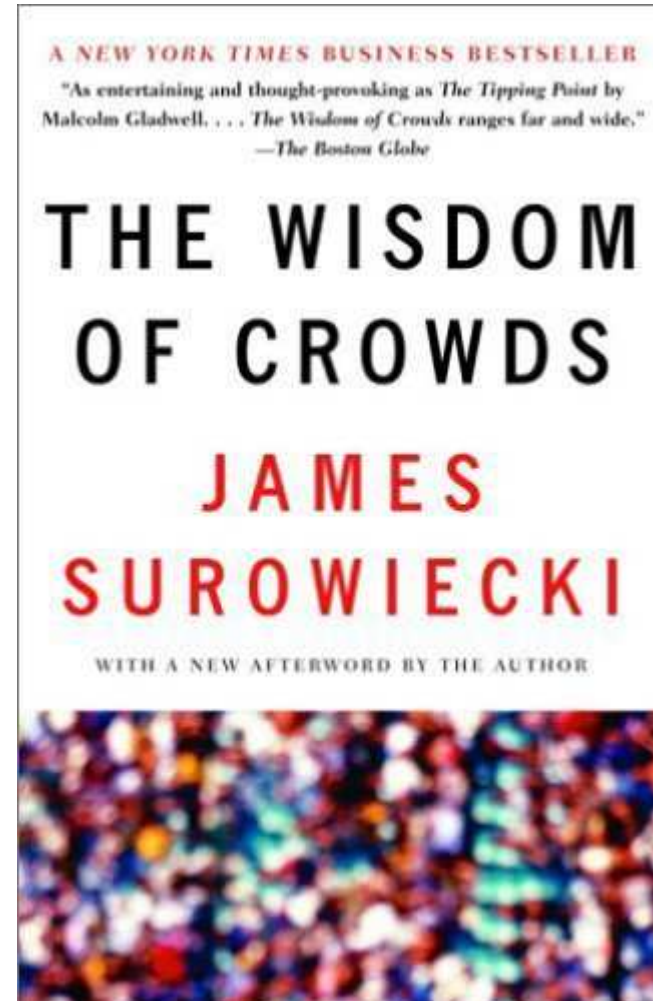
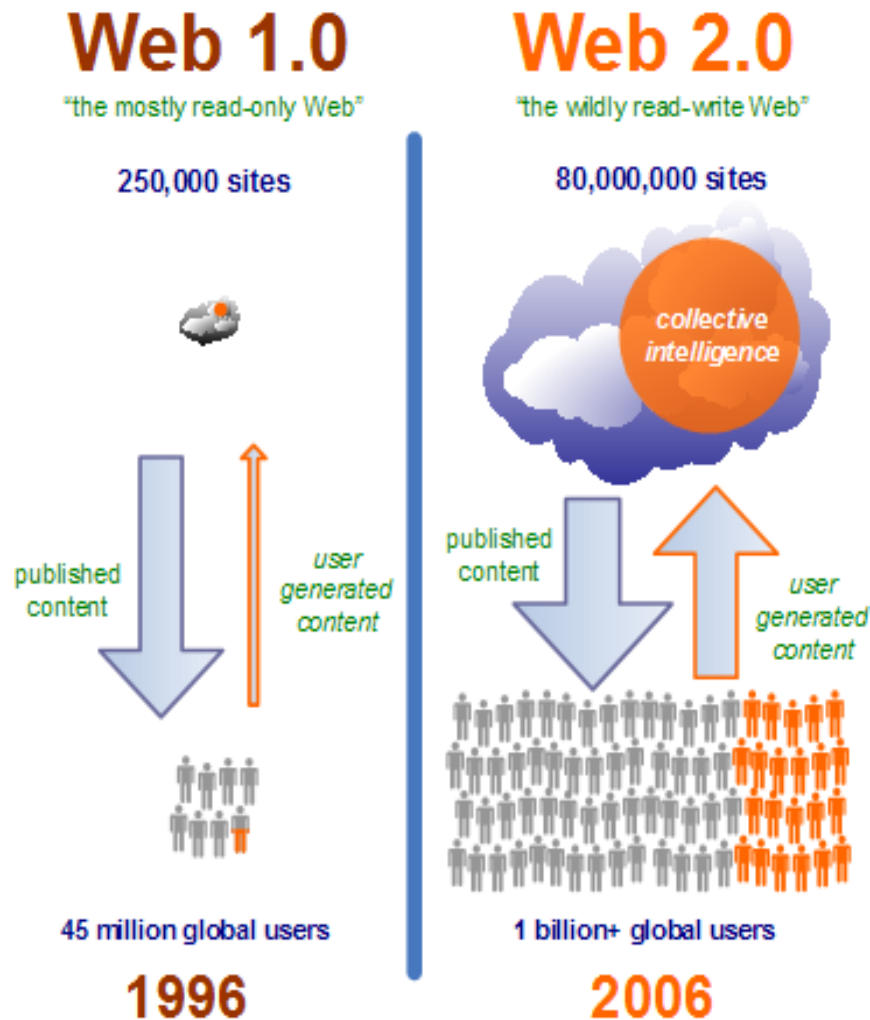
Look for users with similar tastes

	Book 1	Book 2	Book 3	Book 4	Book 5	Book 6
Customer A	X			X		
Customer B		X	X		X	
Customer C		X	X			
Customer D		X				X
Customer E	X				X	

	Book 1	Book 2	Book 3	Book 4	Book 5	Book 6
Customer A	X			X		
Customer B		X	X		X	
Customer C		X	X			
Customer D		X				X
Customer E	X				X	

(De Bruyn, 2001)

Collaborative filtering is the “wisdom of crowds”



Item-to-item collaborative filtering

Amazon... still wisdom of crowds!

The screenshot shows the Amazon product page for the book "Theories of Communication Networks" by Peter R. Monge and Noshir S. Contractor. The page includes a navigation menu, a search bar, and a list of recently viewed items. The main content area displays the book's title, author information, and a list of related items. A yellow callout bubble is overlaid on the page, containing the text "Customers who bought this book also bought...".

BOOK INFORMATION
Explore this item
buying info
customer reviews
editorial reviews
search inside
Share your thoughts
write a review
write a So You'd Like to... guide
e-mail a friend about this item

RECENTLY VIEWED
Myself When I Am Real: The Life and Music of Charles Mingus by Gene Santoro
The Inmates Are Running the Asylum: Why High Tech Products Drive Us Crazy and How To Restore the Sanity (2nd Edition) by Alan Cooper
About Face 2.0: The Essentials of Interaction Design by Alan Cooper
The Inmates Are Running the Asylum: Why High Tech Products Drive Us Crazy and How To Restore the Sanity by Alan Cooper

Theories of Communication Networks
by Peter R. Monge, Noshir S. Contractor "Communication networks are the patterns of contact that are created by the flow of messages among communicators through time and space..." (more)
SIPs: focal network, other theoretical mechanisms, epistemic links, shared exogenous, triadic level (more)
CAPs: Social Support Theories, The Multitheoretical, Modal Parameters, Multilevel Frameworks, Edit Variable (more)

SEARCH INSIDE!
Search inside this book
Share your own customer images

List Price: \$24.50
Price: \$24.50 and eligible for FREE Super Saver Shipping on orders over \$25. See details
Availability: Usually ships within 2 to 4 weeks. Ships from and sold by Amazon.com.
7 used & new available from \$24.26
Edition: Paperback

Other Editions:
List Price: Our Price: Other Offers:
Hardcover \$39.50 3 used & new from \$34.95

Better Together
Buy this book with **Social Network Analysis** by Stanley Wasserman.
Buy Together Today: \$66.50
Buy both now!

Customers who bought this book also bought

- Social Network Analysis: Methods and Applications (Structural Analysis in the Social Sciences) by Stanley Wasserman
- Social Network Analysis: A Handbook by John P. Scott
- Models and Methods in Social Network Analysis (Structural Analysis in the Social Sciences) by Peter J. Carrington
- The Hidden Power of Social Networks: Understanding How Work Really Gets Done in Organizations by Rob Cross
- Social Networks and Organizations by Martin Kilduff

READY TO BUY?
Add to Shopping Cart
or
Sign in to turn on 1-Click ordering.
A9.com users save 1.57% on Amazon. Learn how.

MORE BUYING CHOICES
7 used & new from \$24.26
Have one to sell? Sell yours here

Customers who bought this book also bought...

Item-to-item collaborative filtering



“How does the site decide which books I might like to read?”

On every book page we ask users to suggest up to three other titles which are in some way similar to that book, and in the same way on an author page, we ask users to suggest other authors who share literary characteristics. These suggestions from real book lovers, along with the other factors, are fed into the recommendations engine and the product is a book you will hopefully enjoy.”

<http://www.bookarmy.com/>

Book recommender

Network filtering: people you may know...

Linked in Home Profile Contacts Groups Jobs Inbox (5) More...

Add Connections Colleagues Classmates **People You May Know**

Filter By

Current Company 

- All Companies
- Merck (5)
- Adecco (3)
- LUISS (3)
- Enel (3)

 **Robert Merrin** 2nd
Ph.D. Candidate at Maastricht University
In Common: ▾ 1 shared connection


Luigi
Freda

Network filtering: “your friends like/did this” (the wisdom of networks!)

The image shows a screenshot of a Facebook profile for Roberto Dandi. The profile includes a search bar, a profile picture, and navigation tabs for Wall, Info, Photos, FunSpace, Boxes, and Cities Visited. A post by Roberto Dandi is visible, mentioning a tagging in Sabrina Bruschetti's album from July-September 2010. On the right, there are two sponsored ads: 'GFI Software' and 'Can You Tycoon? Millionaire City'. Blue arrows point from the ads to callouts below. The first callout shows a snippet of the GFI Software ad: 'and Remote Monitoring &... Carol M: likes this. Like'. The second callout shows a snippet of the 'Can You Tycoon?' ad: 'hottest new city game! Sergio C, Patrizia C and Emanuela L played this.'

facebook Search

Roberto Dandi

Wall Info Photos FunSpace Boxes Cities Visited >> +

What's on your mind?

Attach: [Icons] Share

View Photos of Me (154) Edit My Profile

Roberto Dandi was tagged in Sabrina Bruschetti's album. Luglio-Settembre 2010

GFI Software

GFI

GFI Software provides the single best source of Web & Mail Security, Archiving & Fax, Networking & Security and Remote Monitoring &...

Carol M: likes this. Like

Can You Tycoon? Millionaire City

Create a monopoly and watch your real estate and investments grow in the hottest new city game!

Sergio C, Patrizia C and Emanuela L played this.

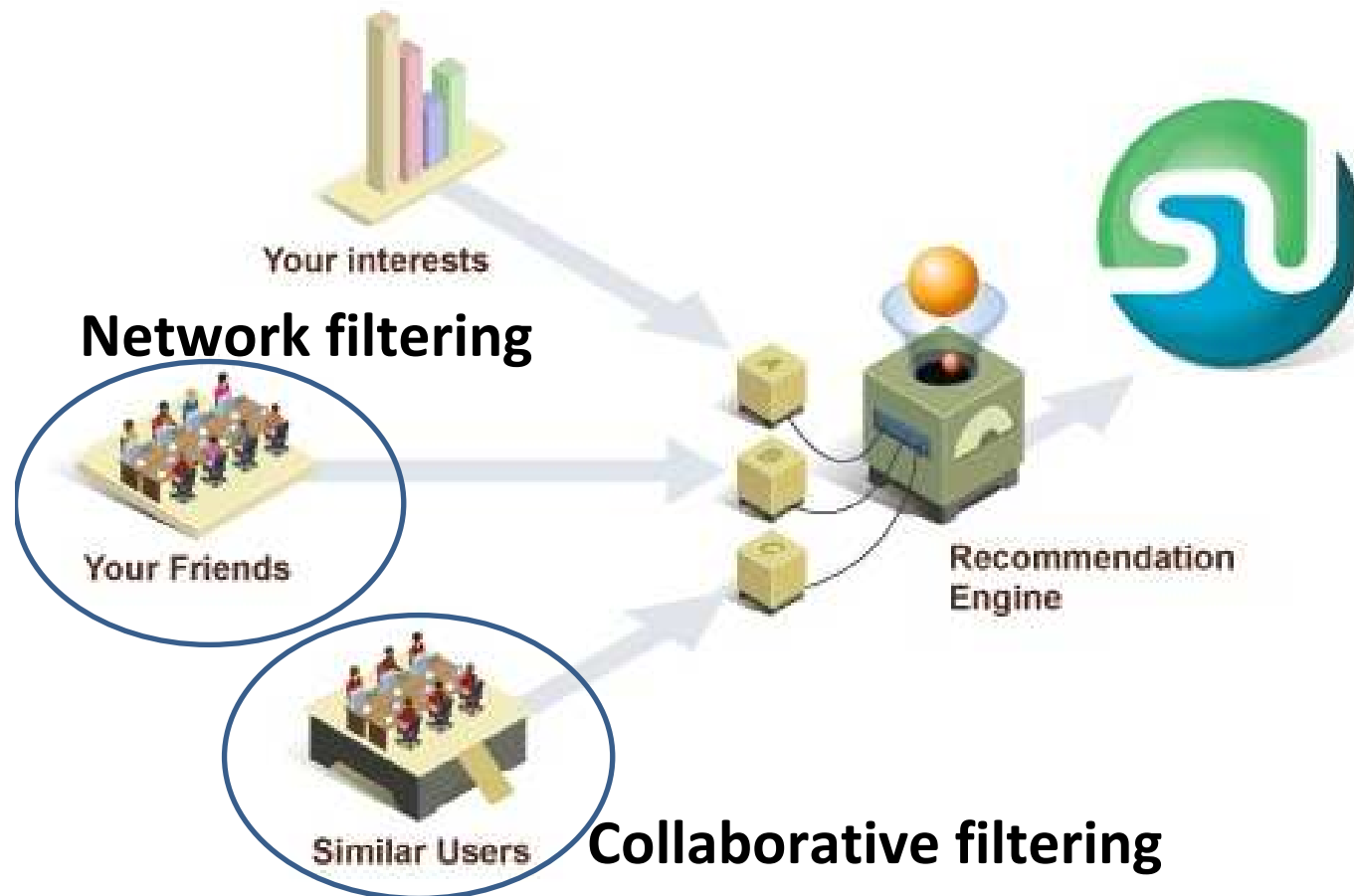
and Remote Monitoring &... Carol M: likes this. Like

hottest new city game! Sergio C, Patrizia C and Emanuela L played this.

Discover cool stuff personalized to you

Explore the best of the web

Hybrid



Hybrid system for cross-selling

choicestream

Real Relevance. Real Results.

Blog

Contact

Careers

Products

Retail Solutions

Customers

Company

News

Resources

The Fastest Way to Lift Retail Revenue

Personalized product recommendations, email and advertising that boost sales online and in-store

[Learn more ▶](#)

Personalized Email

SMARTretailer
your retail superstore
iPod Blowout!


Product Recommendations

Personalized Advertising


Matching **social** recommenders with **social** network theories

- **Category-based systems**
(recommendations based on other user attributes such as gender, location, industry etc.)
 - **Homophily theory**
(people select and act like people similar to them)
 - **Heterophily theory**
(opposite as above)
 - **Proximity theory**
(people select and act like people around them)

Matching **social** recommenders with **social** network theories

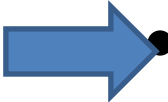
- **Collaborative filtering**  • **Homophily theory** (people select and act like people similar to them)

Monge, P. R., & Contractor, N. S. (2003) *Theories of Communication Networks*: Oxford University Press.


- **Item-to-item filtering**  • **Structural equivalence** (disconnected people linking to same others/items act similarly)

Hanneman, R. A. and Riddle, M. (2005). *Introduction to social network methods*. Riverside, CA: University of California, Riverside (published in digital form at <http://faculty.ucr.edu/~hanneman/>)

Matching **social** recommenders with **social** network theories

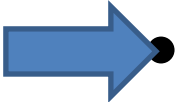
- Network filtering  • **Balance theory** (if A is friend to B, and B to C, then A becomes friend to C)
- “People you may know”

Monge, P. R., & Contractor, N. S. (2003) *Theories of Communication Networks*: Oxford University Press.

- Network filtering  • **Social contagion** (people choose items chosen by people in their social / trust network)
- “Your friends like / did this”

Monge, P. R., & Contractor, N. S. (2003) *Theories of Communication Networks*: Oxford University Press.

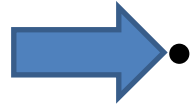
Matching **social** recommenders with **social** network theories

- Network filtering:  **Transactive Memory Theory** (people interested in a topic connect to those whom they recognize experts on that topic)
“**who do people recognize as the expert?**” (LinkedIn Best Answer, C-IKNOW)

Wegner, D. M. (1995). A Computer Network Model of Human Transactive Memory. *Social Cognition*, 13(3), 319-339.

Matching **social** recommenders with **social** theories

- No system recommending complementary people or items



- **Collective action theory:** (complementary people group together to achieve results otherwise unachievable)

Monge, P. R., & Contractor, N. S. (2003) *Theories of Communication Networks*: Oxford University Press.

- No system recommending to connect to non-connected people



- **Structural holes** (people connect to non-connected others in order to enhance their structural autonomy)

Burt, R. S. (1992) *Structural Holes: The Social Structure of Competition*, Cambridge, MA, Harvard University Press.

Conclusions

- **Social recommender systems** (category filtering, collaborative filtering, item-to-item filtering, and network filtering) being “social” are **implicitly based on social theories**
- Social theories explaining why a human connects with another human can be included among the **network theories** (Monge, P. R., & Contractor, N. S. , 2003)
- Network theories explain not only human-to-human networks but also human-to-item networks, **as recommender systems do!**
- Network theories **are not fully implemented** in recommender systems

Conclusions

- As Contractor (2005) claimed, social scientists (social psychology, org science scholars...) could **strategically** help **design** recommender systems based on social network theories
- Social networking sites in return can help **test social network theories** using unprecedented massive amounts of data about **real** online **social behavior**

Contractor, N. (2005). *The role of social network analysis in enabling cyberinfrastructure and the role of cyberinfrastructure in enabling social network analysis*. White paper prepared for the National Science Foundation workshop on Cyberinfrastructure for the Social Sciences, Airlie House, Warrington, Virginia, USA.