GlobeNet 2011

St. Maarten, January 23-28, 2011

Social Media Analytics

Prof. Dr. Freimut Bodendorf

Institute of Information Systems

University of Erlangen-Nuremberg, Germany

WI

Agenda

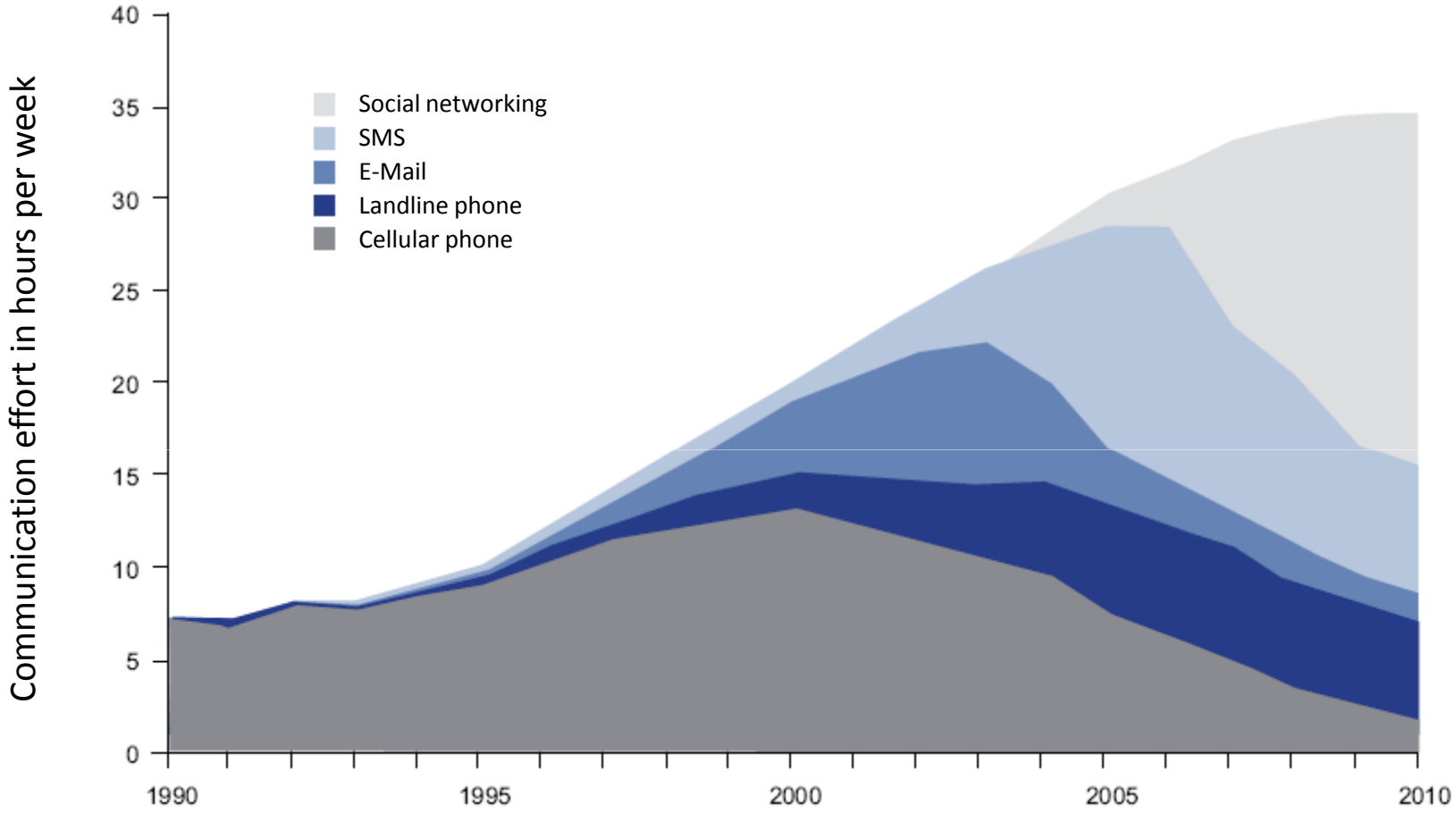
- **Social Media**
  - Virtual Communities
  - Social Commerce
  - Enterprise 2.0
- **Social Media Analysis**
  - Opinion Mining
  - Network Mining
  - Swarm Intelligence
  - Early Warning
- **Social Media Marketing**
  - Viral Marketing
  - Opinion Control

Agenda

- **Social Media**
  - Virtual Communities
  - Social Commerce
  - Enterprise 2.0
- **Social Media Analysis**
  - Opinion Mining
  - Network Mining
  - Swarm Intelligence
  - Early Warning
- **Social Media Marketing**
  - Viral Marketing
  - Opinion Control

Social
Media
examples
Twitter
content
Video
March
Evaluation
strategy
feed
different
get
participants
listening
workshop
Explore
think
may
site
like
online
Keep
want
need
tools
audiences
Photo
Bookmarking
newsletter
goals
Share
Web
help
much
blog
blogs
sharing
description
wiki
Use
see
tool
CG
people
many
sites
CGIAR
start
software
photos
strategic
Communications
Resources
new
work
page
make
event
feeds
Wikis
Toolkit
Using
things
might
Information
questions
Post
know
try
track
users
First
working
others
possible
moodle
websites
also
one
RSS
time
target
Flickr
facebook
Nancy
simone
KS
Support
reporting
discussion
open
space
find
Petr
CGIAR
ILRI
centers
conference
audience
research
account
easy
short
useful
create
another
messaging
example
call
publishing
list
means
ideas
knowledge
slide
add
trying
needs
bookmarks
ICT-KM
read
way
free
communication
staff
understand
networking
management
written
consider
group

Changes in communication behavior



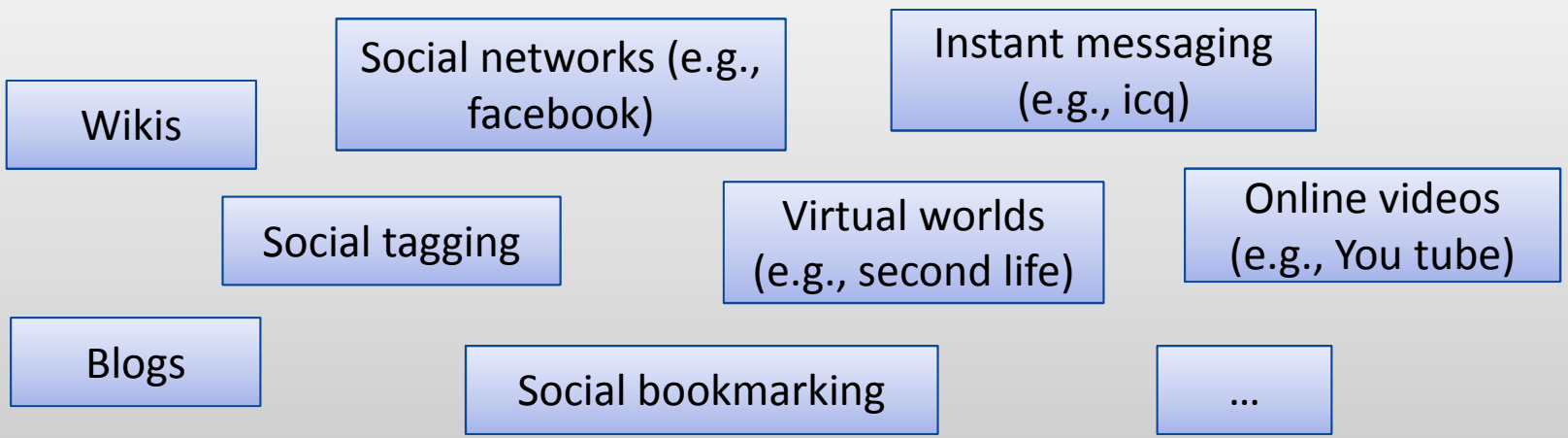
Changes in communication behavior of 15-25 year old people

Source: OVUM (2009): The Social Telco, p.4

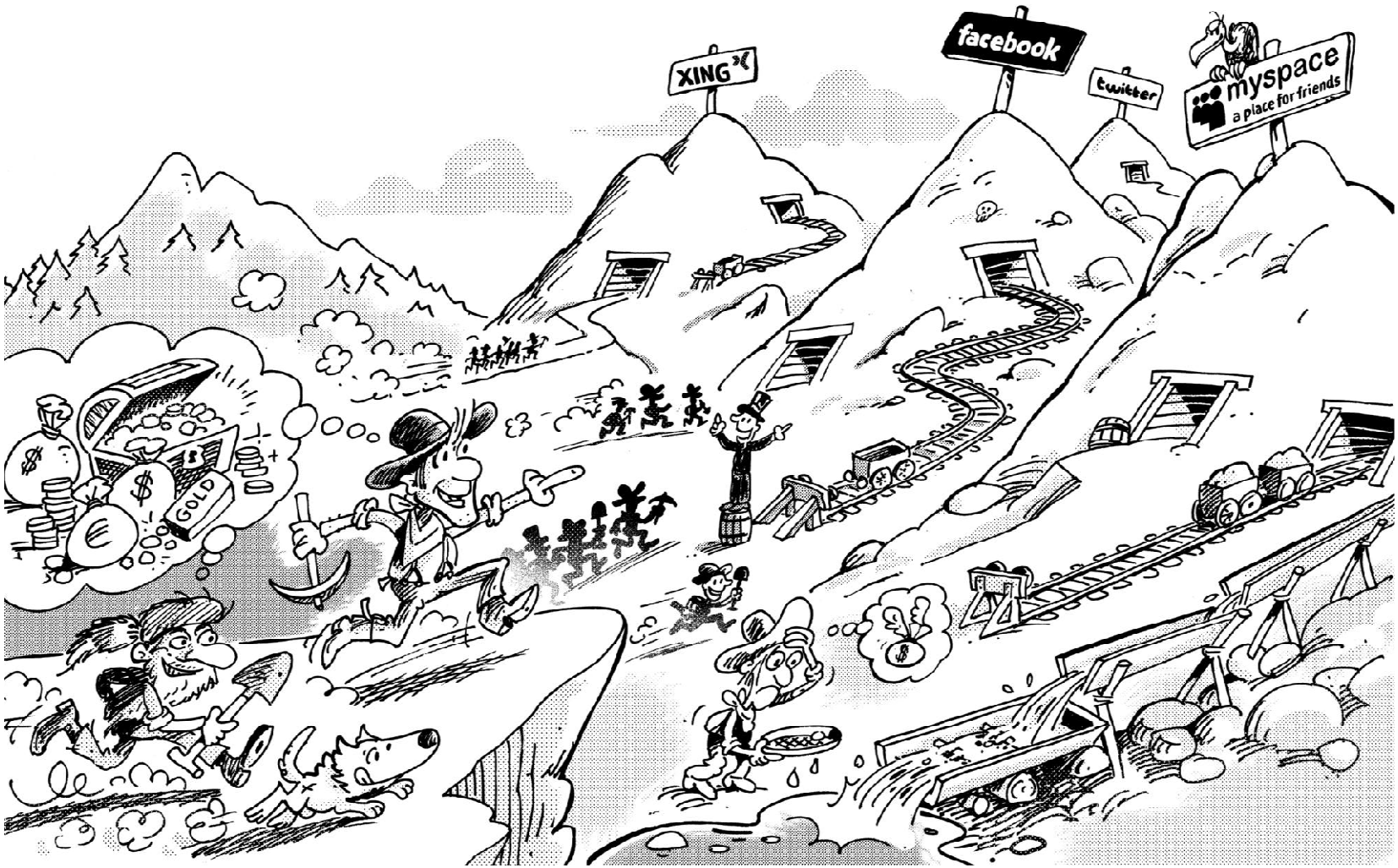
Social media

The term **Social media** comprises systems which enable people to work together, to communicate, or to interact in any other way. Social media supports the development and the self-management of virtual communities.

Examples: Social media



Social media mining



International Communities

National Communities

Other Social Communities

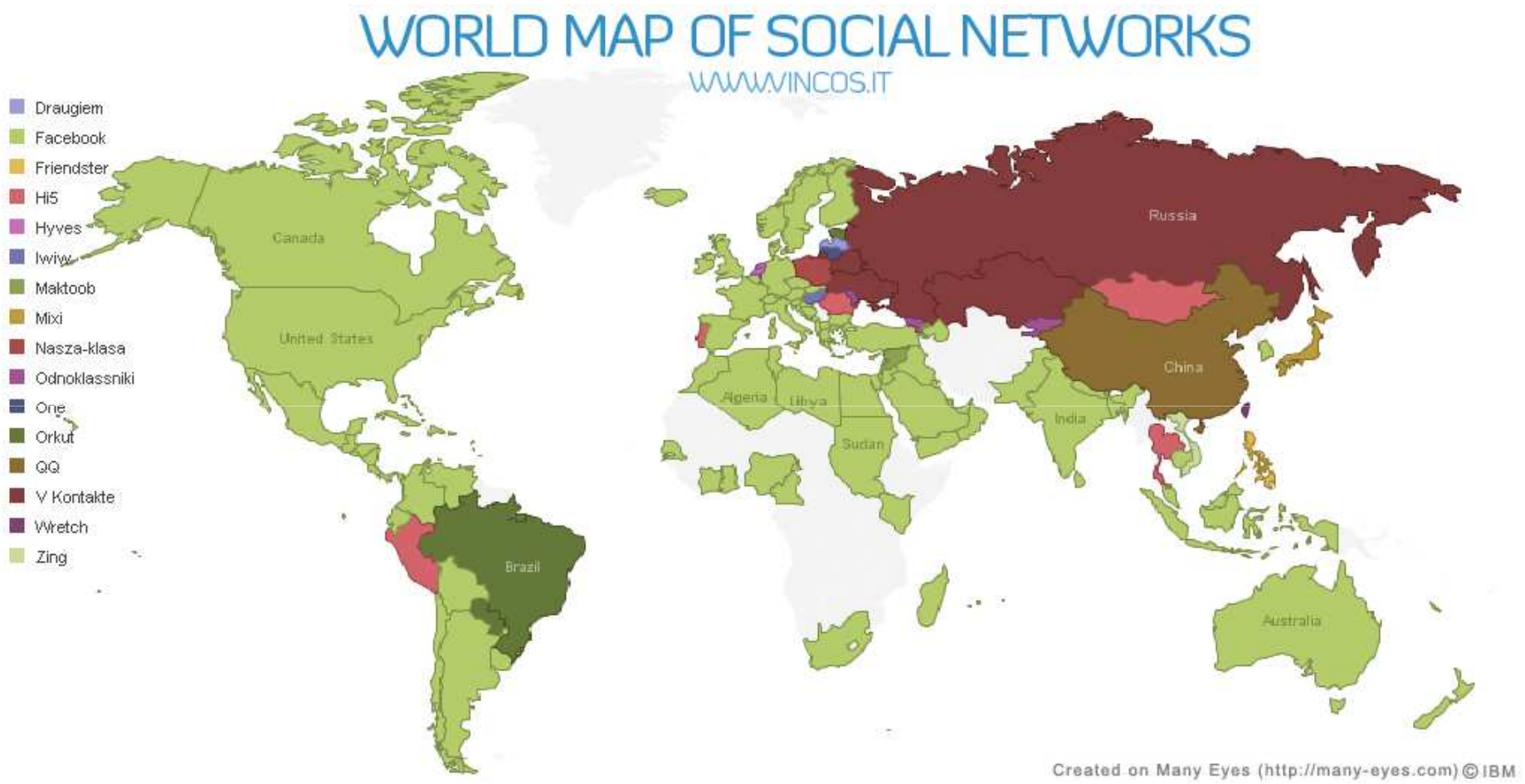
CHEFKOCH.DE

Types of social networks

Name	Facebook	Friendster	Bebo	Linked.in	MySpace	…VZ	Twitter	Xing	TheNext
Type	Live Oriented Community	Live Oriented Community	Media Oriented Community	Business Oriented Community	Media Oriented Community	Live Oriented Community	Live Oriented Community	Business Oriented Community	Retail Oriented Community
Date of foundation	2004	2002	2005	2003	2003	2005	2006	2003	2006
Target group	All the world	All the world	All the world (music and video enthusiasts)	Experts and managers	All the world	Students, all the world	All the world	Employed persons (people over 18)	All the world
Access	Web, apps (nearly for all mobile operating systems)	Web, apps	Web	Web, apps (iPhone, blackberry, palm)	Web, apps (iPhone, blackberry)	Web (iPhone, blackberry)	Web, mobile (all platforms)	Web, apps (iPhone, blackberry)	Web
Members (2010)	500 Mio.	115 Mio. (mainly in Asia)	10.7 Mio. in GB (focus on Europe)	75 Mio. in over 200 countries	Ca. 270 Mio.	17 Mio.	> 75 Mio.		> 600.000
Turnover (2010)	700-800 mio USD			17 mio EUR	495 mio USD	18 mio EUR	0, venture capital financed	45 mio EUR	

Source: Detecon 2010

Social networks



Facebook as an important Social Network

- More than 500 mio active users
- 50% of the active users log on to Facebook on any given day
- Average user has 130 friends
- People spend over 700 billion minutes per month on Facebook
- There are over 900 mio objects that people interact with (pages, groups, and events)
- Average user is connected to 80 pages, groups, and events
- Average user creates 90 pieces of content shared each month
- More than 250 mio Facebook users engage with Facebook on external websites every month
- More than two million websites have integrated with Facebook, including over 80 of comScore's U.S. Top 100 websites and over half of comScore's Global Top 100 websites

Agenda

- **Social Media**
  - Virtual Communities
  - Social Commerce
  - Enterprise 2.0
- **Social Media Analysis**
  - Opinion Mining
  - Network Mining
  - Swarm Intelligence
  - Early Warning
- **Social Media Marketing**
  - Viral Marketing
  - Opinion Control

Virtual communities

Virtual communities

Virtual communities can be defined as social aggregations that emerge from the Internet when enough people carry on those public discussions long enough to form webs of personal relationships. A virtual community is a group of people who may or may not meet one another face to face, and who exchange ideas through the mediation of computer networks.

Sources: Rheingold 1993; Chidambaram & Zigurs 2001

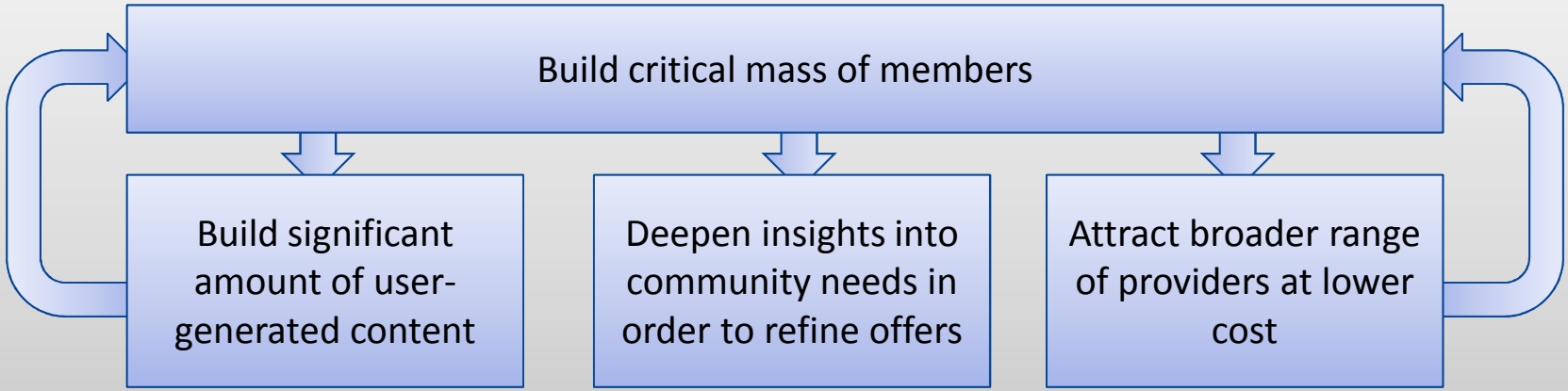
Virtual communities and network effects

What are network effects?

Network effects are present when a product or service becomes more useful to customers in proportion to the number of people using it.

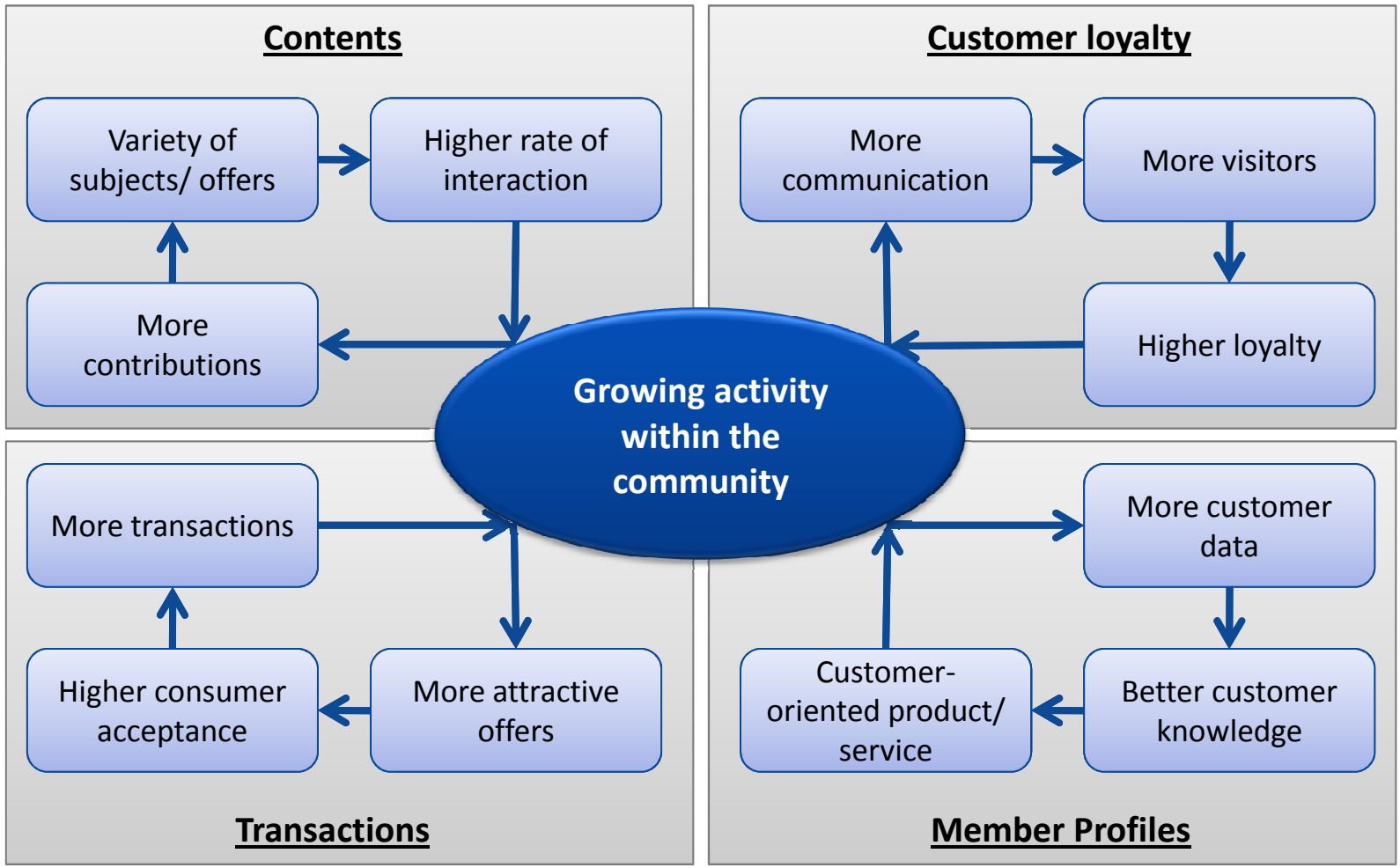
- **Direct network effects**: The strength of these effects depends directly on the number of users of a given device or technology
  Example: a single telephone by itself is worthless
- **Indirect network effects**: The value increases as the size of the installed user base grows
  - Example: complementary goods like dvd players and dvd videos

Network effects in virtual communities



Own illustration; adopted from Jelassi & Enders 2005

Roles in Virtual Communities



Source: own illustration adopted from Powarzynski

Agenda

- **Social Media**
  - Virtual Communities
  - Social Commerce
  - Enterprise 2.0
- **Social Media Analysis**
  - Opinion Mining
  - Network Mining
  - Swarm Intelligence
  - Early Warning
- **Social Media Marketing**
  - Viral Marketing
  - Opinion Control

Social Commerce

Social Commerce

- Social commerce is a subset of electronic commerce that employs collaborative social media tools to assist in online purchasing and selling.
- Characteristics:
  - involvement of customers
  - personal relationship between the company and its customers
  - communication among customers

Social Commerce: methods

Methods

- Appraisal of retailers and products by customers (*Social Navigation*)
- Comments of other customers (*Recommendation*)
- Virtual communities for companies or products, e.g., at Facebook (*Following*)
- Customers design products and sell them on their private homepage (*Shop Widgets)*

Application of social media: spread shirt

Agenda

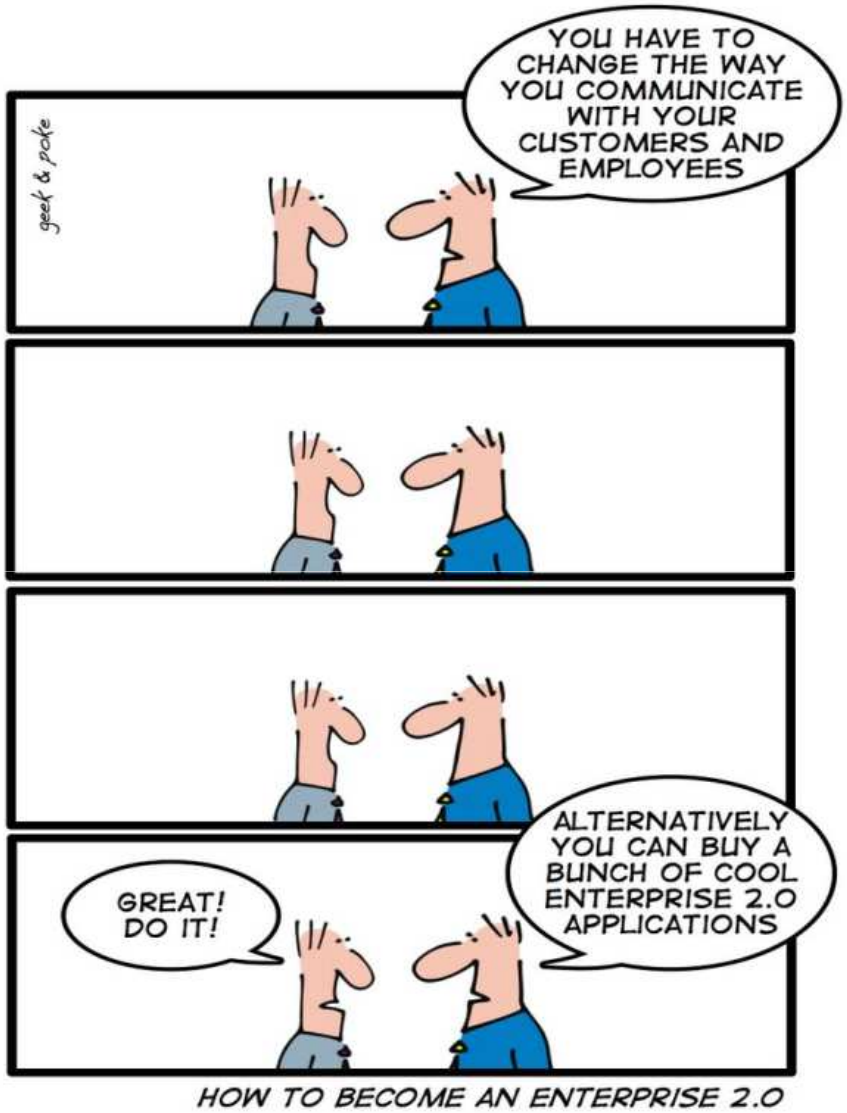
- **Social Media**
  - Virtual Communities
  - Social Commerce
  - Enterprise 2.0
- **Social Media Analysis**
  - Opinion Mining
  - Network Mining
  - Swarm Intelligence
  - Early Warning
- **Social Media Marketing**
  - Viral Marketing
  - Opinion Control

Definition of Enterprise 2.0

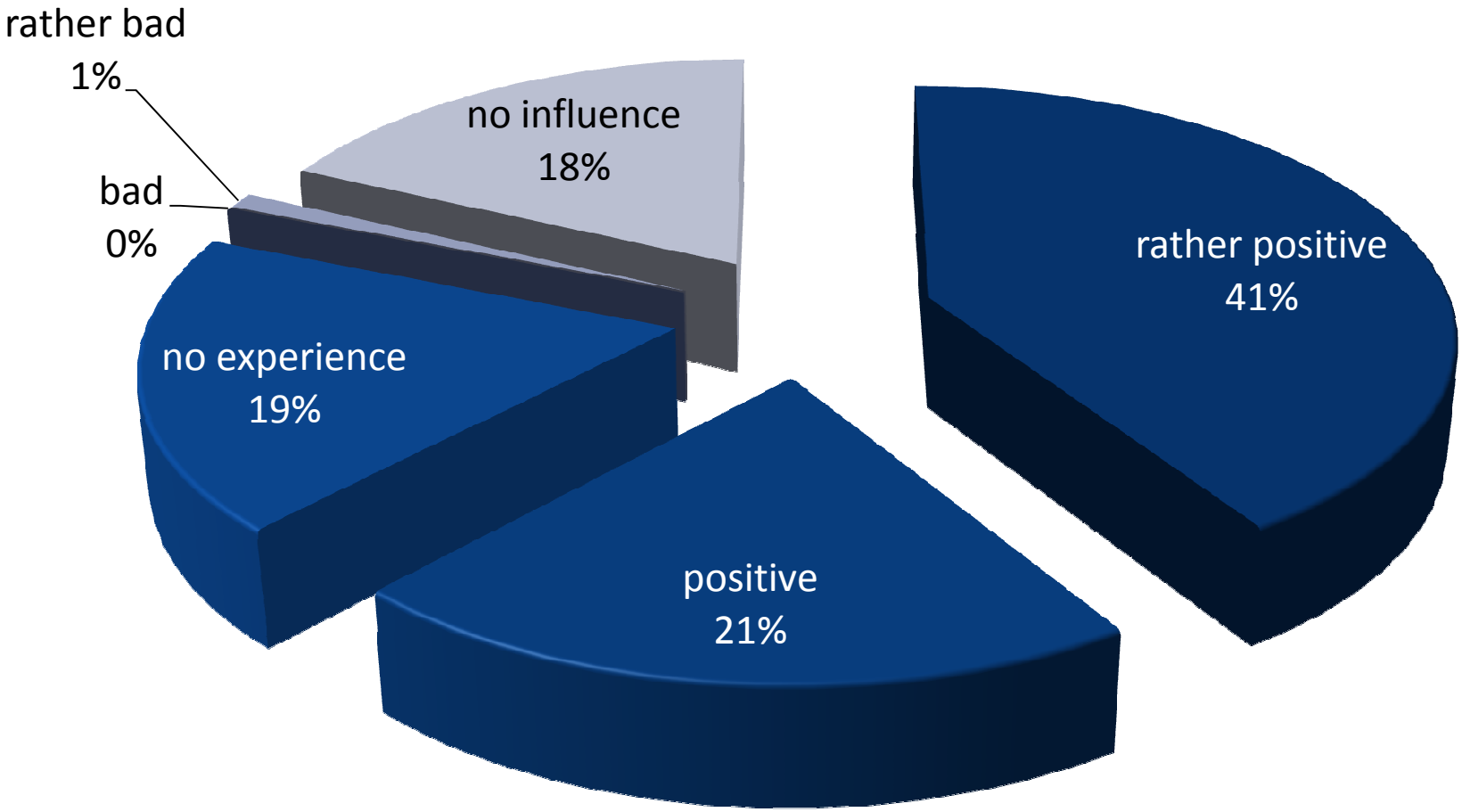
Definition

"Enterprise 2.0 is the use of emergent social software platforms within companies or between companies and their partners or customers. Social software enables people to rendezvous, connect or collaborate through computer-mediated communication and to form online communities."

Andrew McAfee


YOU HAVE TO CHANGE THE WAY YOU COMMUNICATE WITH YOUR CUSTOMERS AND EMPLOYEES
geek & poke
ALTERNATIVELY YOU CAN BUY A BUNCH OF COOL ENTERPRISE 2.0 APPLICATIONS
GREAT! DO IT!
HOW TO BECOME AN ENTERPRISE 2.0

Effects of Enterprise 2.0 on the corporate success



Source: http://www.hays.de/mediastore/Events/HaysForumWillmsBuhse_web20.pdf

Example: Enterprise 2.0 at IBM in figures

Profiles in Yellow Pages

IBM‘s internal „BluePages“ (Yellow Pages) include **582,765** profiles, that acquire **1 million** search requests a week. All application authentications run over that.

Communities

The IBM Community Map includes over **900** communities (of interest). More than **147,000** threads with over **410,000** entries are in IBM‘s forums.

Blogs

IBM‘s Blog Central supported **50,400** employees with over **13,100** blogs, including **112,000** entries and **115,000** comments and **25,800** obvious tags during the last 12 months.

Wikis

Two-thirds of IBM‘s employees use WikiCentral. Every day, **72,600** staffers access nearly **170,000** sites out of **12,000** wikis.

Bookmark Sharing

IBM‘s internal Bookmark Sharing System includes more than **394,000** stored links with **991,000** tags entered by **12,600** users.

Activities

IBM‘s internal Activities Service saves **46,100** processes, including **359,000** activities and **72,300** participants

Source: http://www.hays.de/mediastore/Events/HaysForumWillmsBuhse_web20.pdf

Agenda

- **Social Media**
  - Virtual Communities
  - Social Commerce
  - Enterprise 2.0
- **Social Media Analysis**
  - Opinion Mining
  - Network Mining
  - Swarm Intelligence
  - Early Warning
- **Social Media Marketing**
  - Viral Marketing
  - Opinion Control

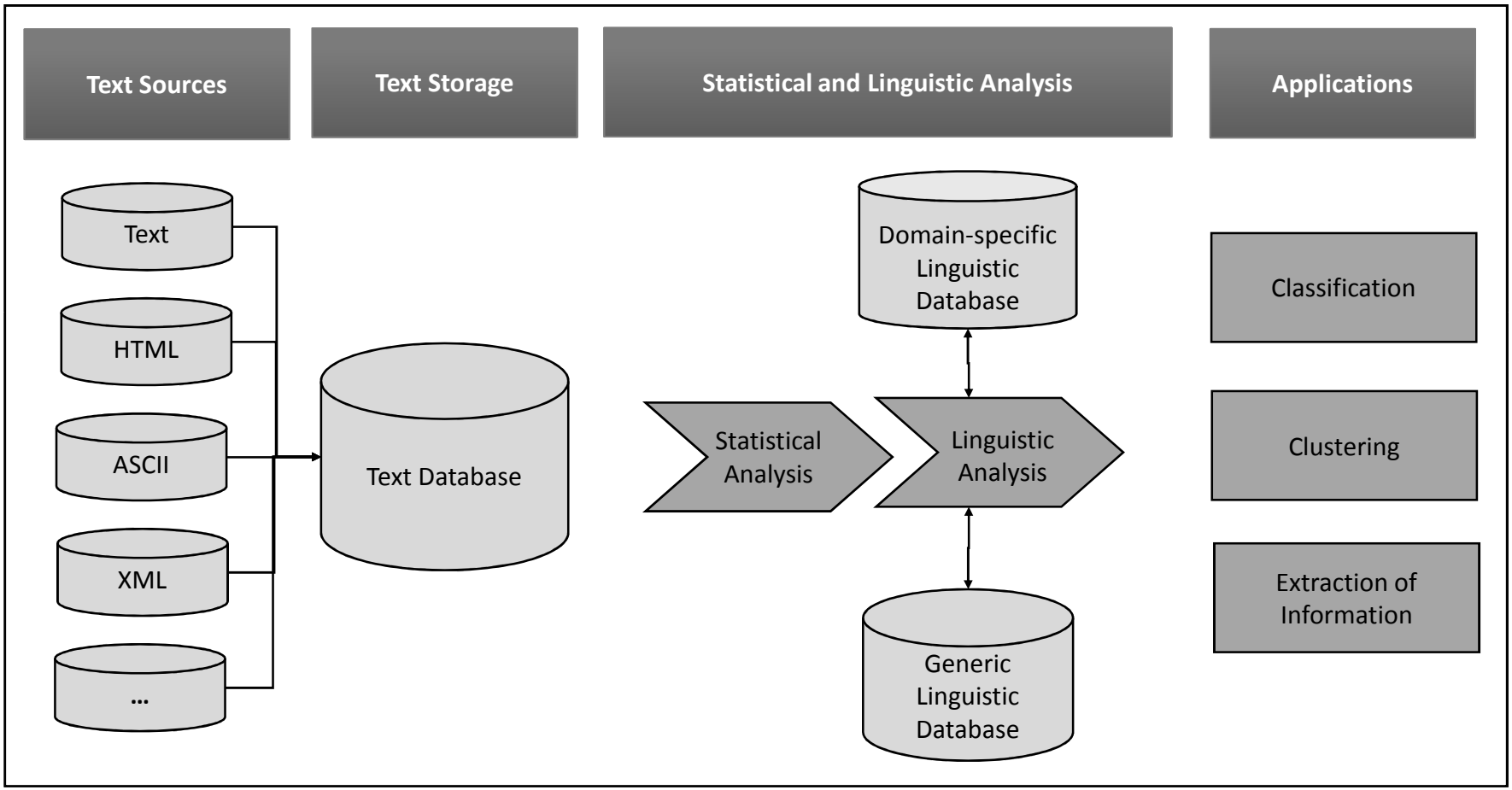
Agenda

- **Social Media**
  - Virtual Communities
  - Social Commerce
  - Enterprise 2.0
- **Social Media Analysis**
  - Opinion Mining
  - Network Mining
  - Swarm Intelligence
  - Early Warning
- **Social Media Marketing**
  - Viral Marketing
  - Opinion Control

Opinion Mining

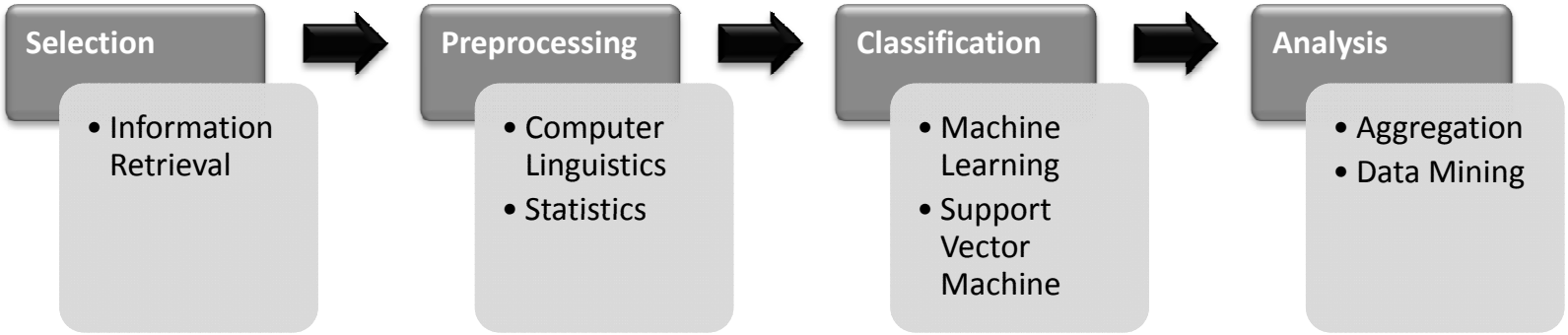
Opinion Mining aims at discovering valuable member/customer/consumer insights from social media by applying mining algorithms.

Text Mining aims at discovery and extraction of relevant information and knowledge from unstructured text, e.g. semantics of content or relationships of authors.

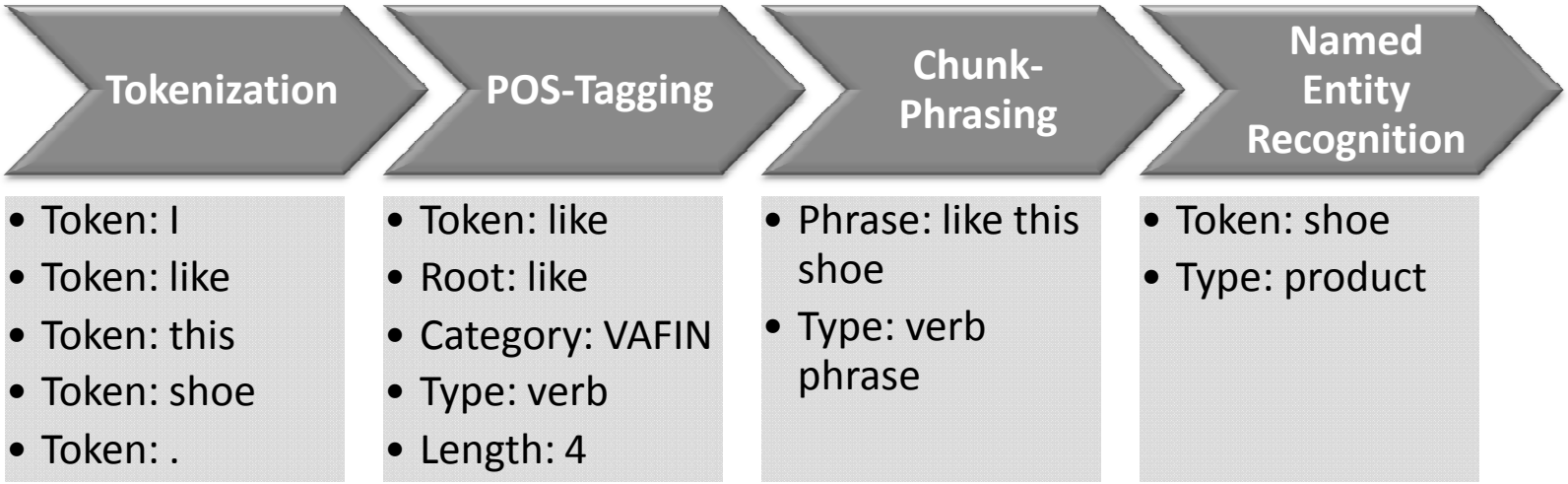


Heyer et al. 2006

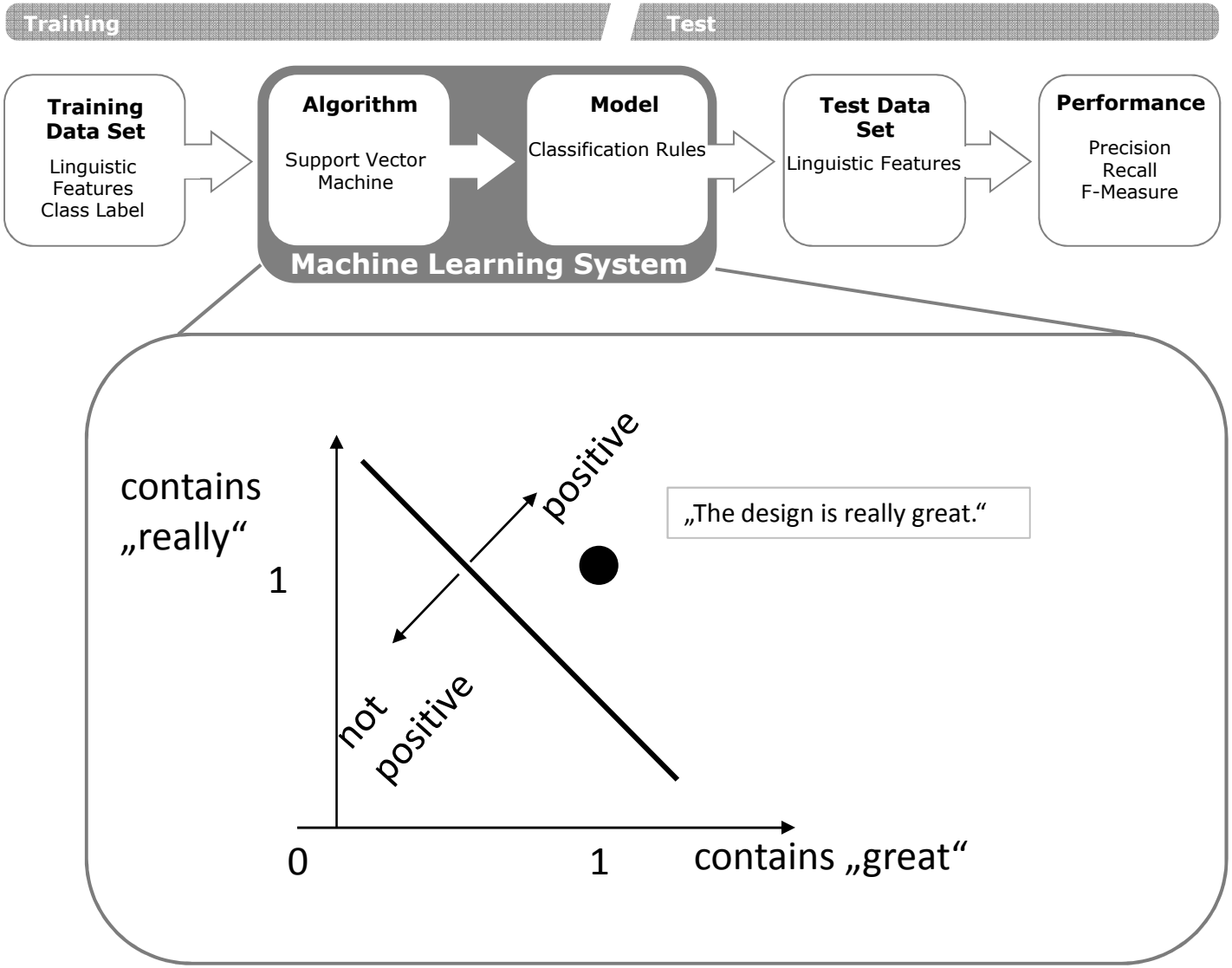
Mining Process



„I like this shoe.“



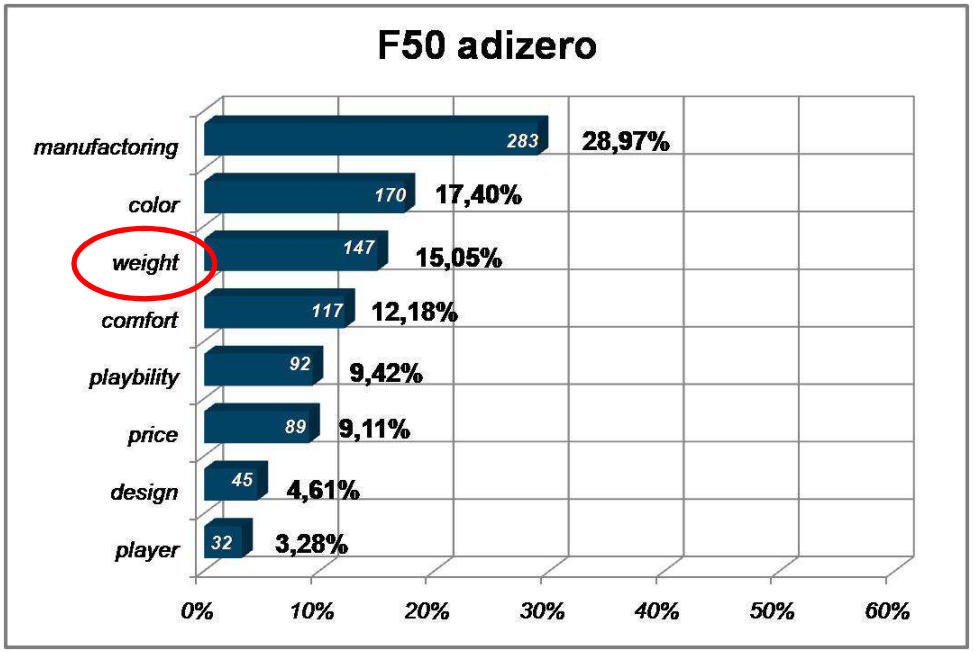
Classification



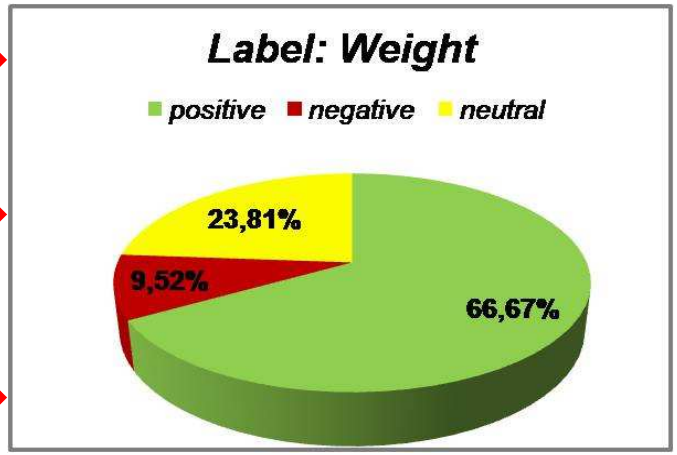
Product Management

association of different labels (e.g., product attributes) with sentiments

Frequency of single labels

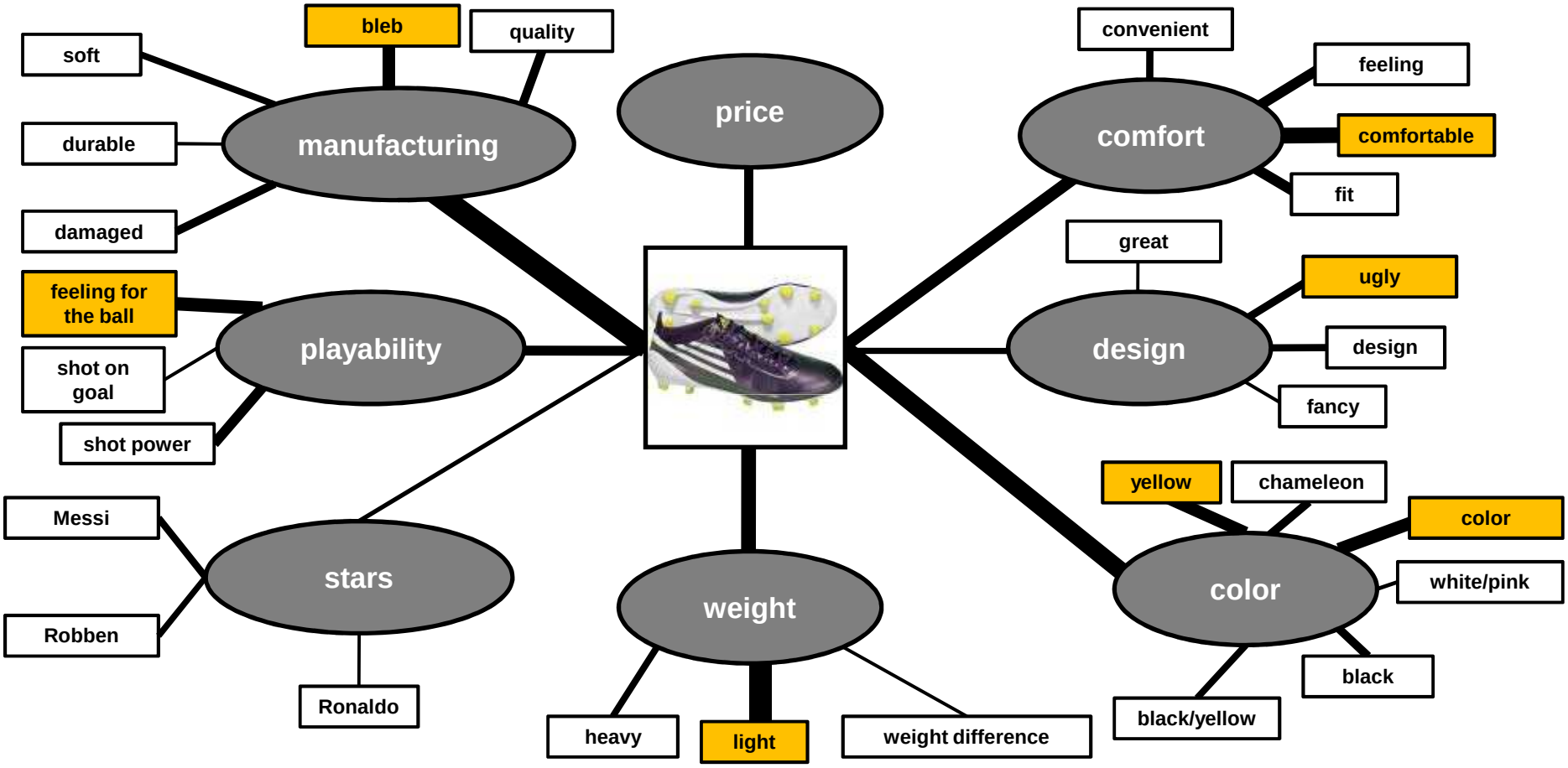


Associated sentiment



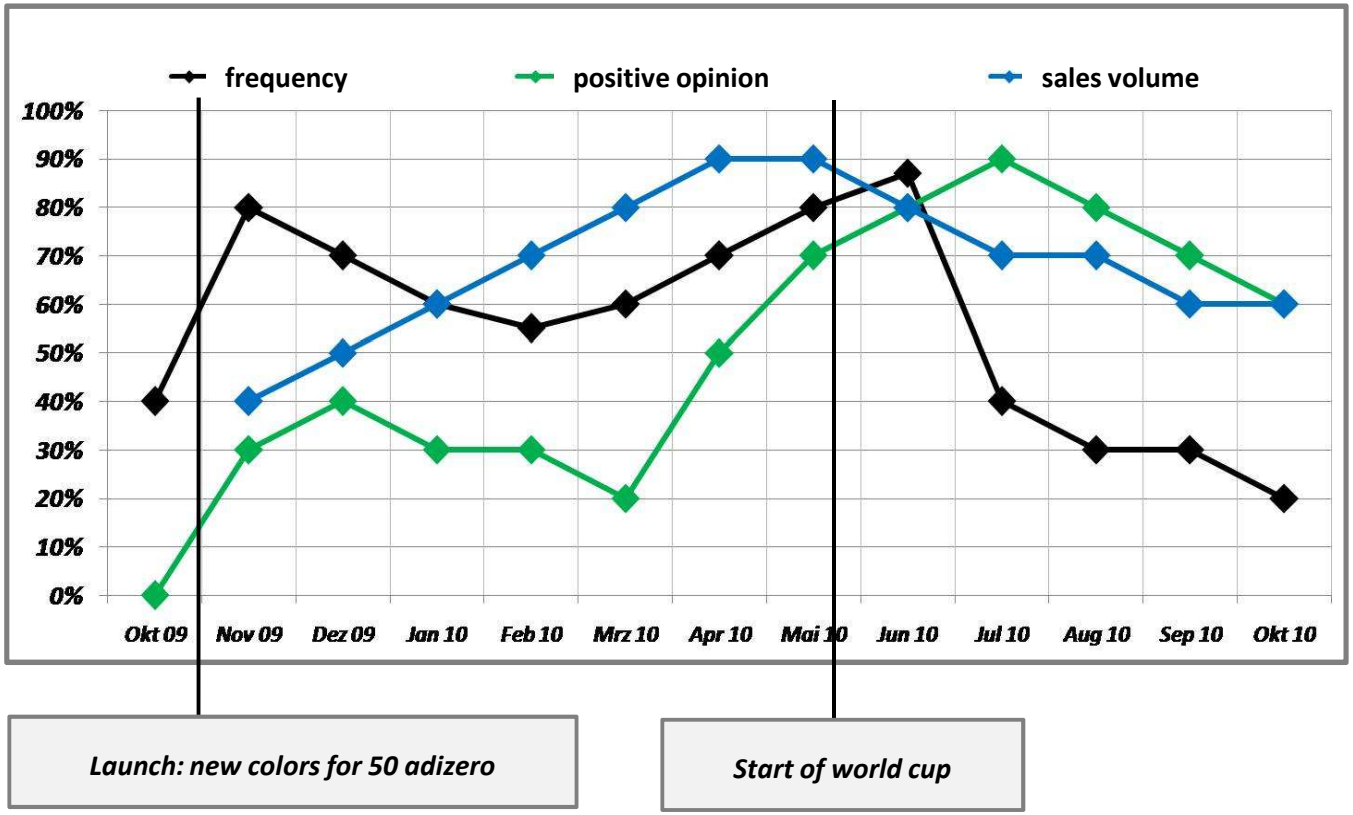
*Realized for **all labels** (product attributes and product components)*

Static Analysis



Product Management

How often and in which sentiment were the different products discussed over time?

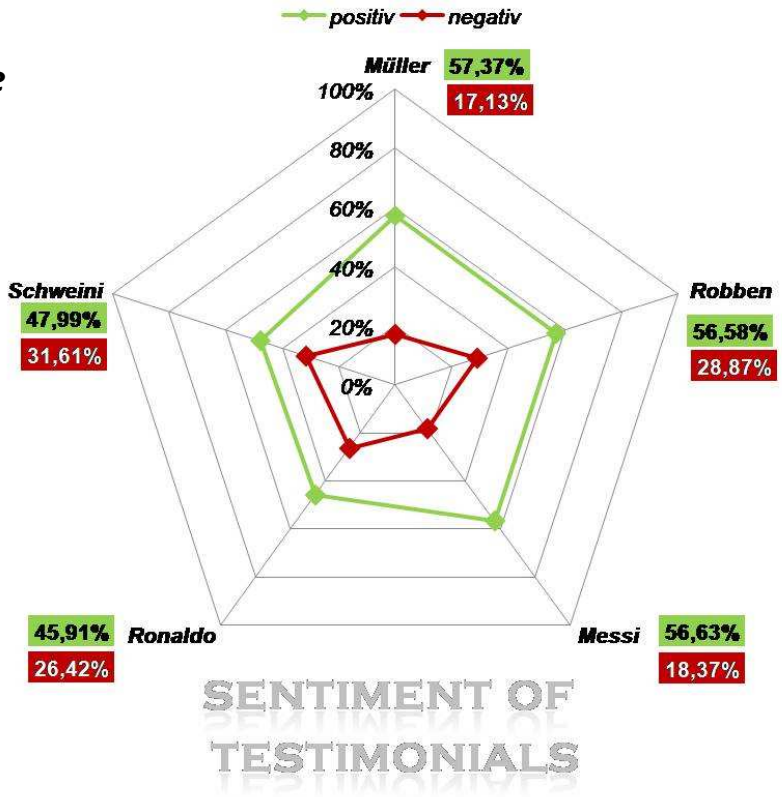


Player Management

Frequency and sentiment of postings discussing single athletes (e.g., skills)

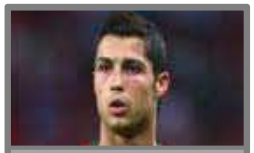
Schweini

167 positive
110 negative
71 neutral



Müller

144 positive
43 negative
64 neutral



Ronaldo

73 positive
42 negative
44 neutral

Robben

116 positive
59 negative
13 neutral

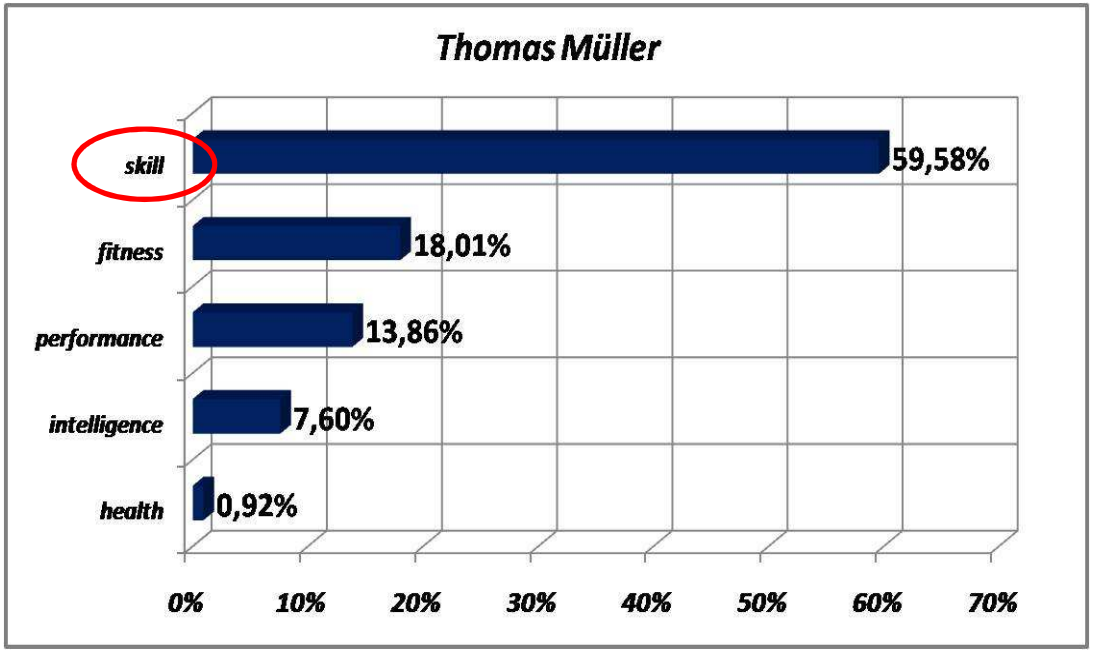
Messi

111 positive
36 negative
49 neutral

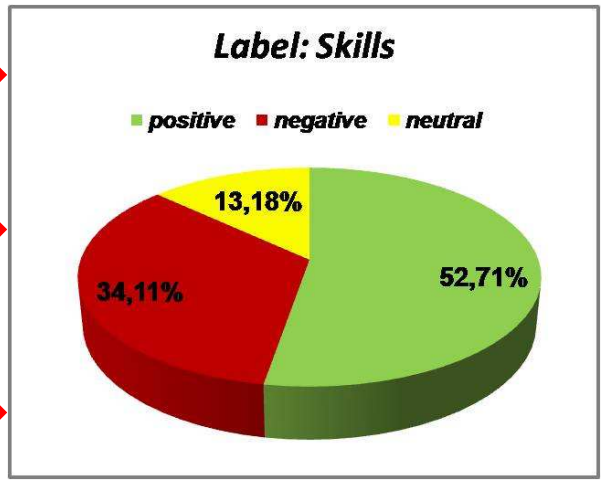
Player Management

Connection of different labels (e.g. skills) with associated sentiments

Frequency of single labels



Associated sentiment

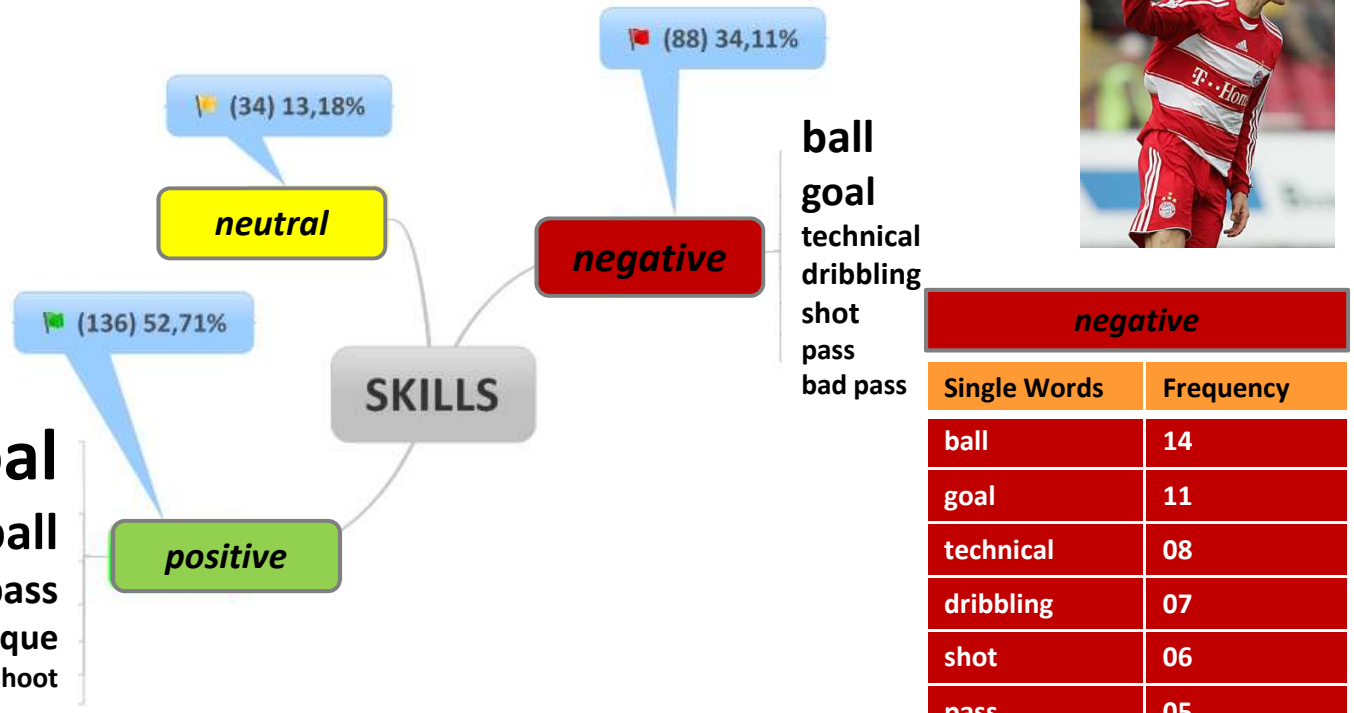


*Realized for **all labels** (football skills and player personality)*

Player Management

Analysis of single words within the label (e.g., skills) and associated sentiments

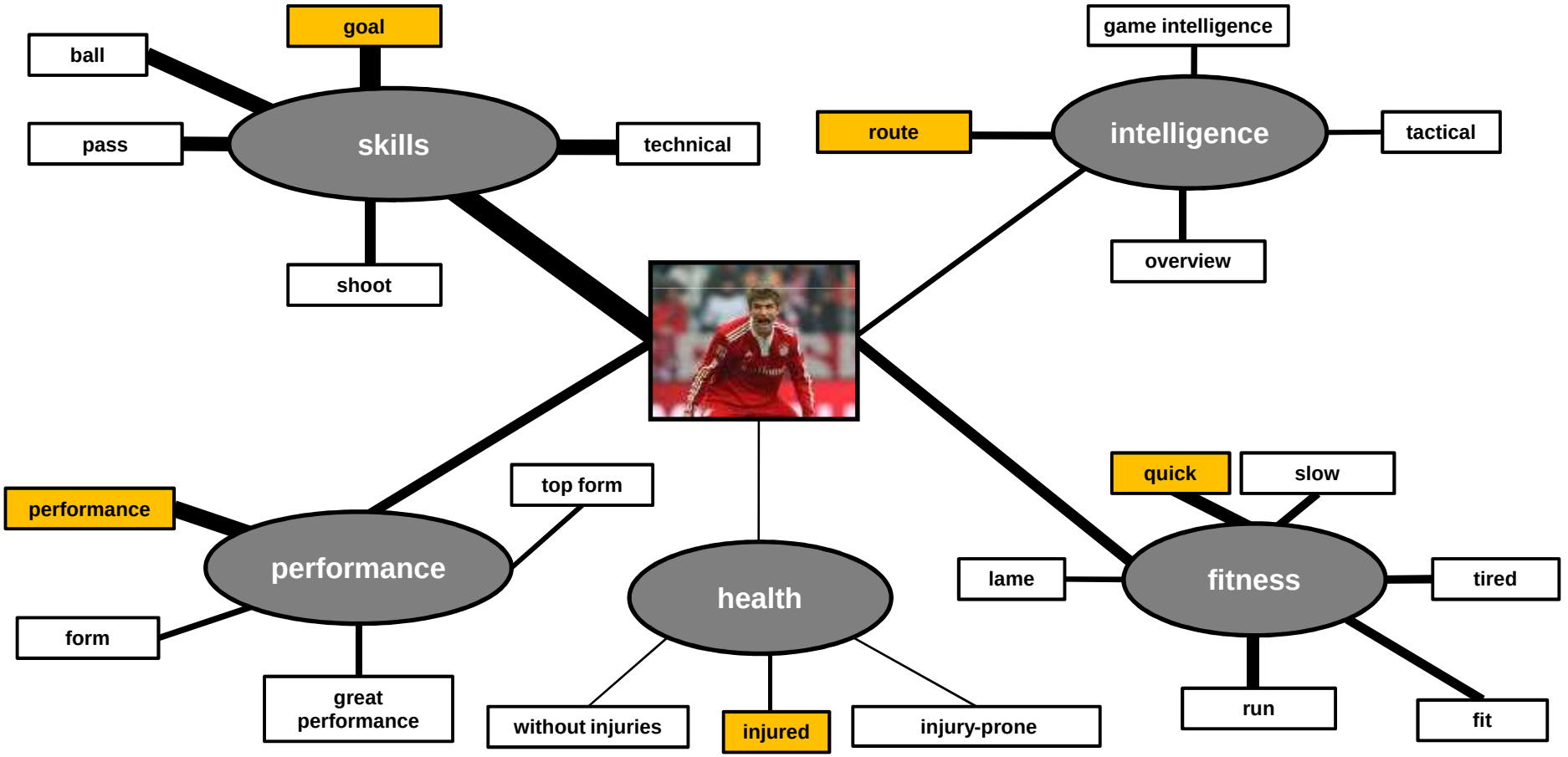
Positive	
Single Words	**Frequency**
goal	33
ball	17
pass	12
technique	11
shoot	04



negative	
Single Words	**Frequency**
ball	14
goal	11
technical	08
dribbling	07
shot	06
pass	05
bad pass	03

Player Management

Creation of association networks (e.g., skills of Thomas Müller)



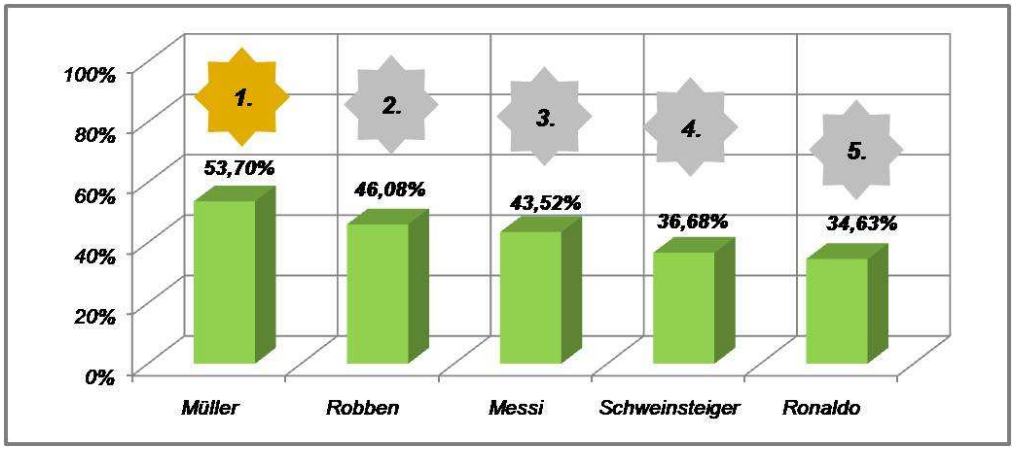
Player Management

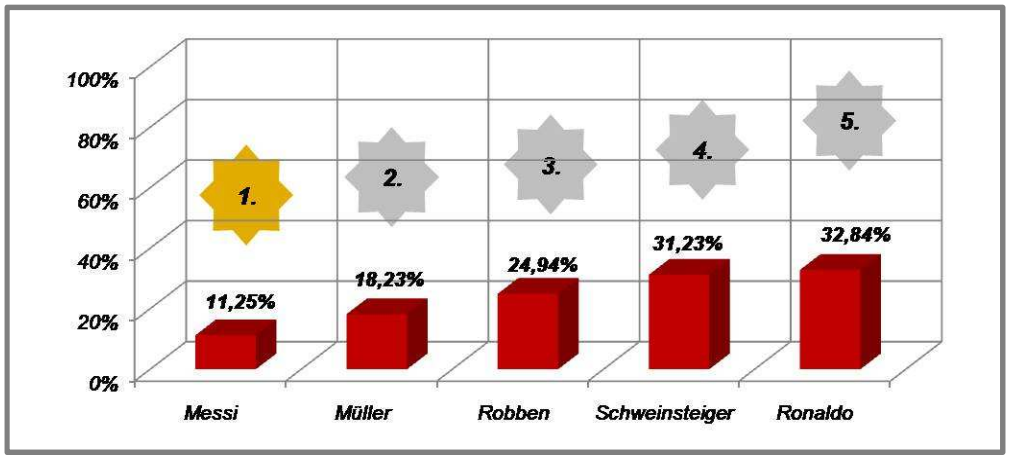
Which players are seen particularly positive/negative in the investigated period?

Final Ranking

Ratio of positive to negative sentiment

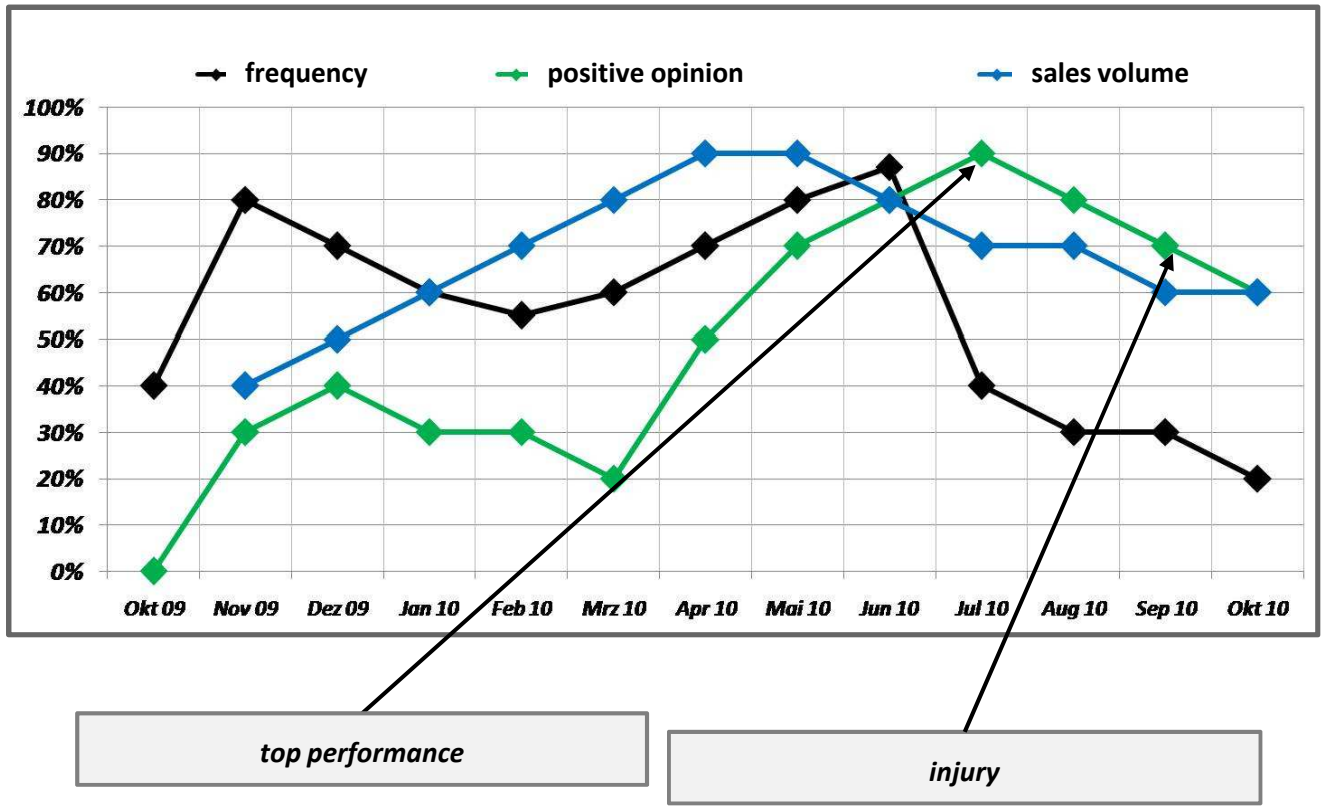
players	positive	negative	ratio
Müller	53,70%	18,23%	+ 35,47%
Messi	43,52%	11,25%	+ 32,27%
Robben	46,08%	24,94%	+ 21,14%
Schweini	36,68%	31,23%	+ 5,45%
Ronaldo	34,63%	32,84%	+ 1,79%



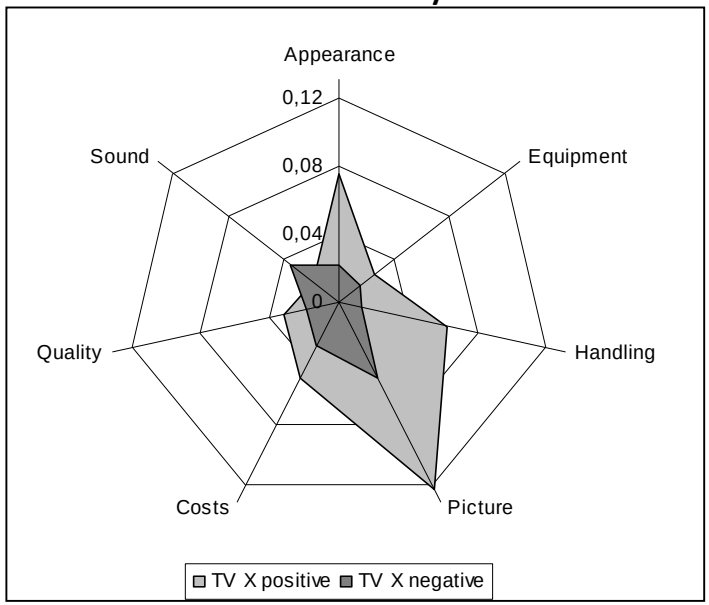


Player Management

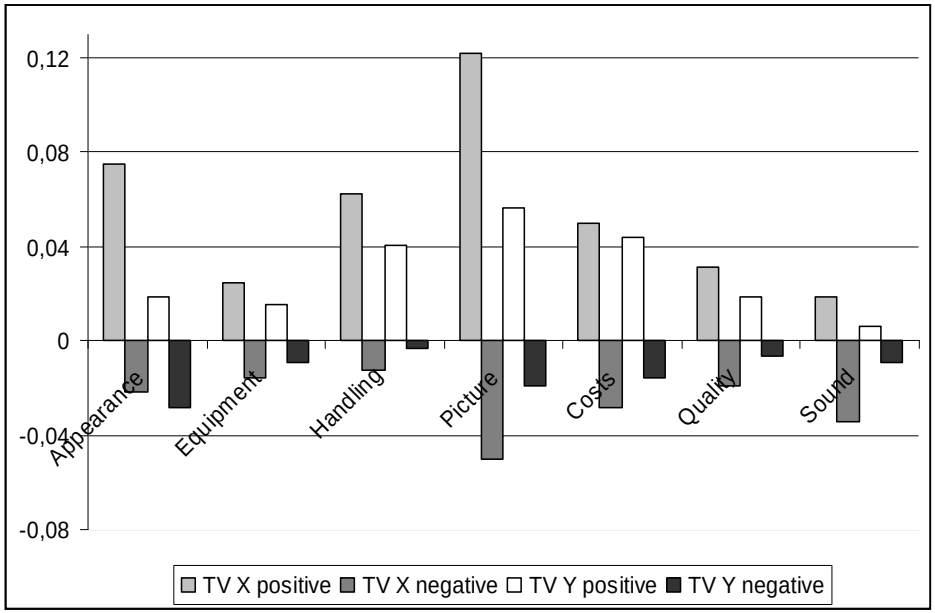
How did the sentiments change over time and which events were crucial for this?



Summary



Competitor Analysis

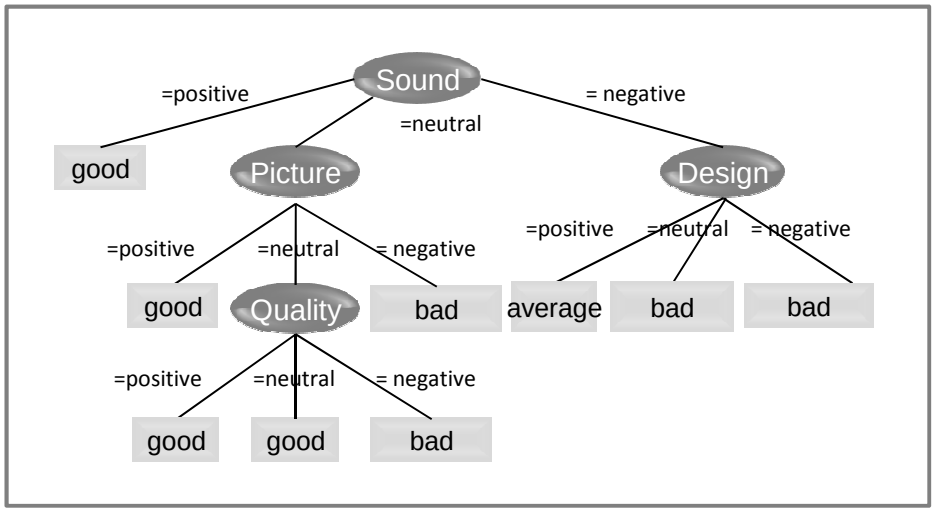


Dependencies

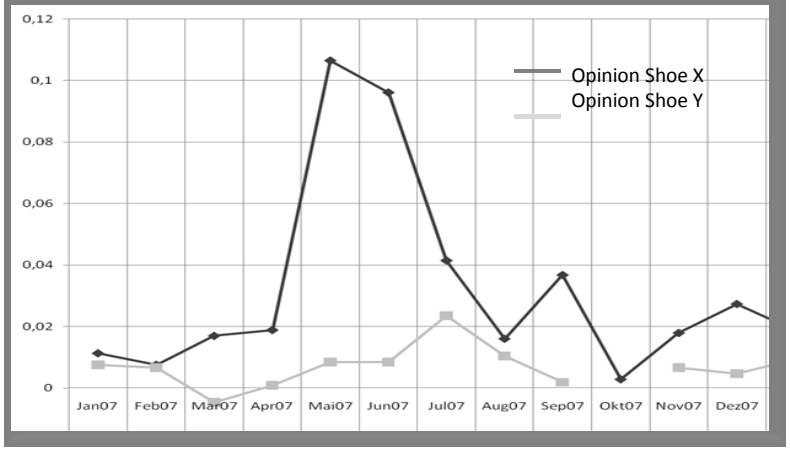
If costs = negative
then picture = negative

If design = positive
then handling = positive

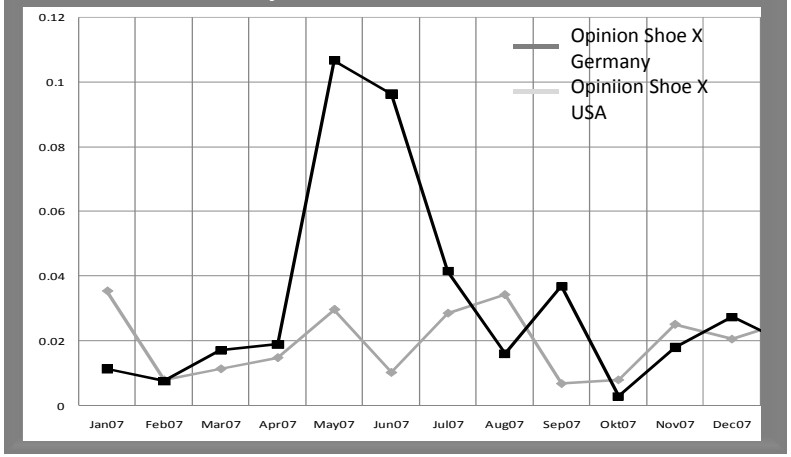
Main Determinants



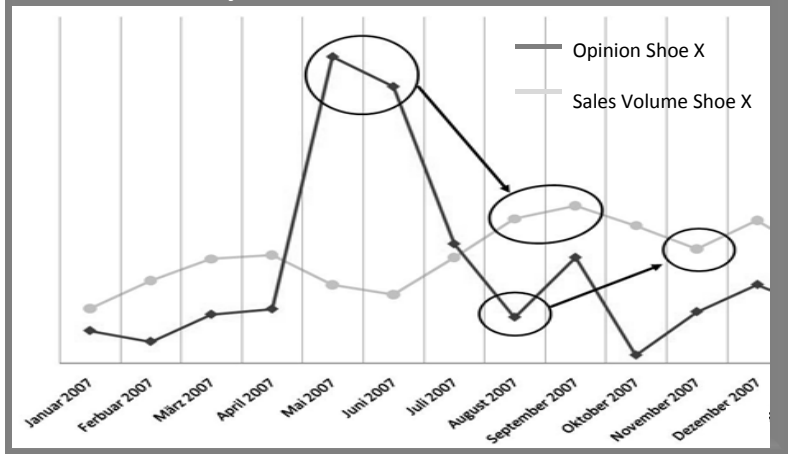
Competitor Analysis



Market Analysis



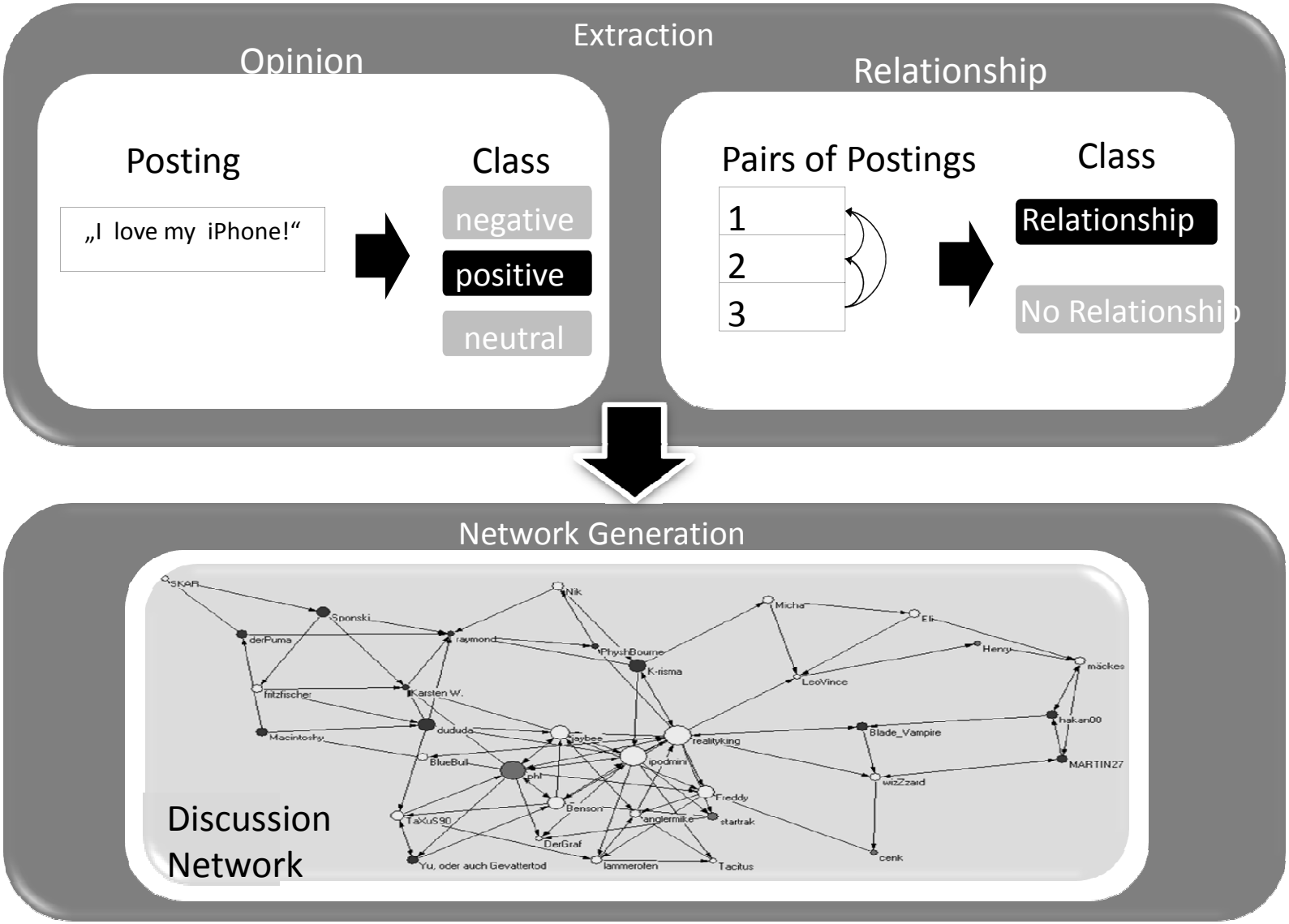
Sales Analysis



Agenda

- **Social Media**
  - Virtual Communities
  - Social Commerce
  - Enterprise 2.0
- **Social Media Analysis**
  - Opinion Mining
  - Network Mining
  - Swarm Intelligence
  - Early Warning
- **Social Media Marketing**
  - Viral Marketing
  - Opinion Control

Social Network Generation



Definition

Social network analysis observes interactions between active members of a group.

Key figures

- Calculate key figures for individual members
  - **Centrality**
  - Prominence
  - Prestige
- Calculate key figures for the total network
  - **Centralization**
  - Cluster structure

Centrality
refers to the position of an individual member.

Centralization
characterizes the total network.

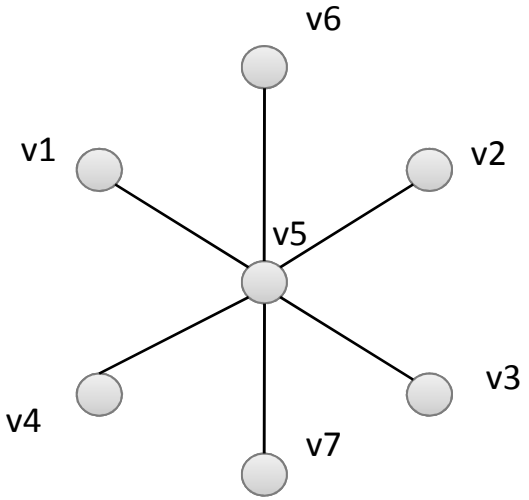
Different approaches:

- degree centrality measures number of direct contacts
- closeness centrality measures number of indirect contacts

Star Structure

→ v5 has maximum centrality

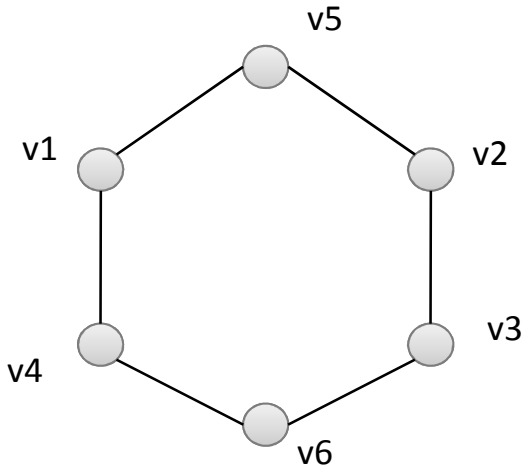
→ A star network has the maximum centralization compared to networks of the same size



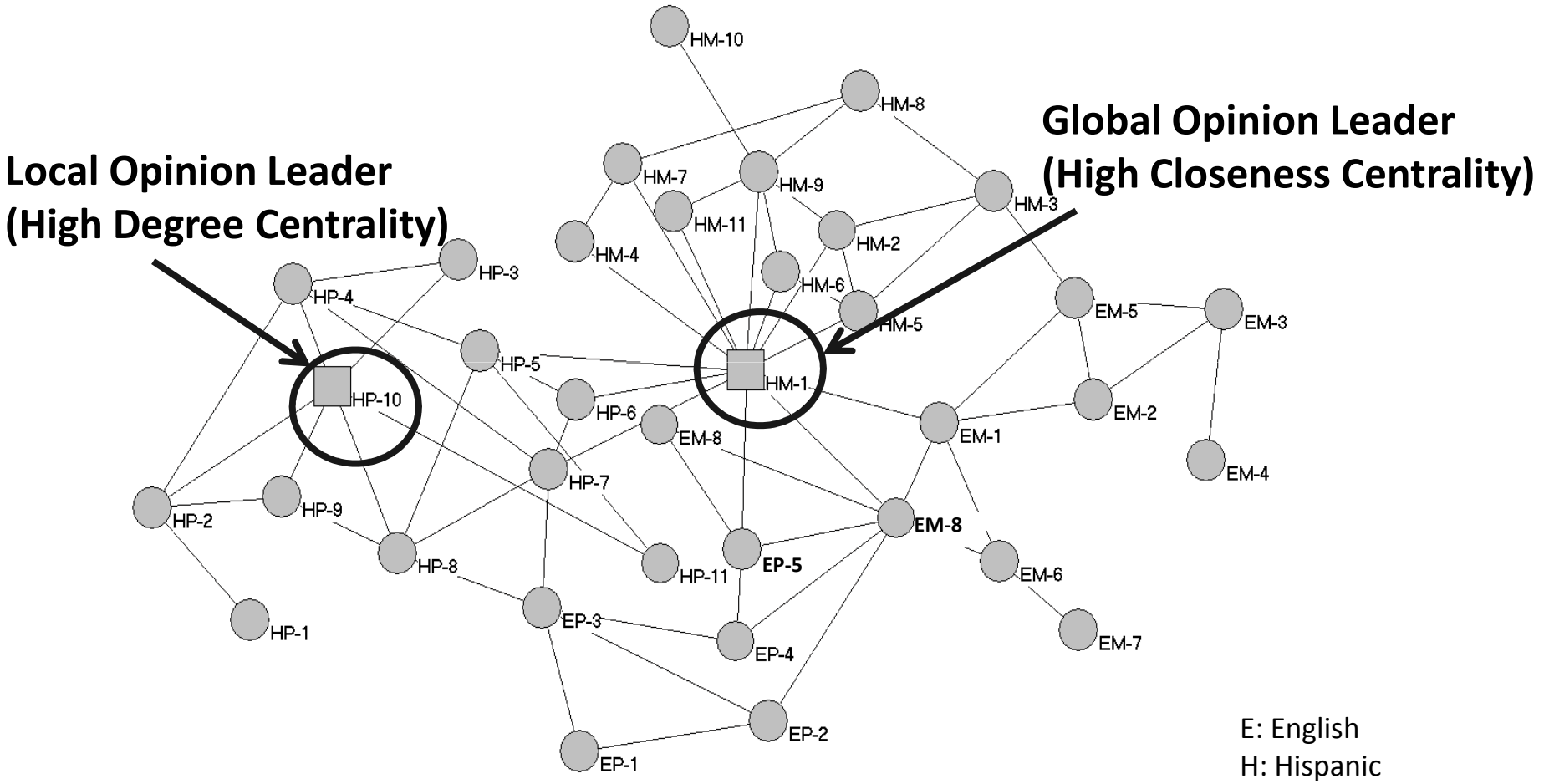
Circle Structure

→ Each node has the same centrality

→ Minimum centralization

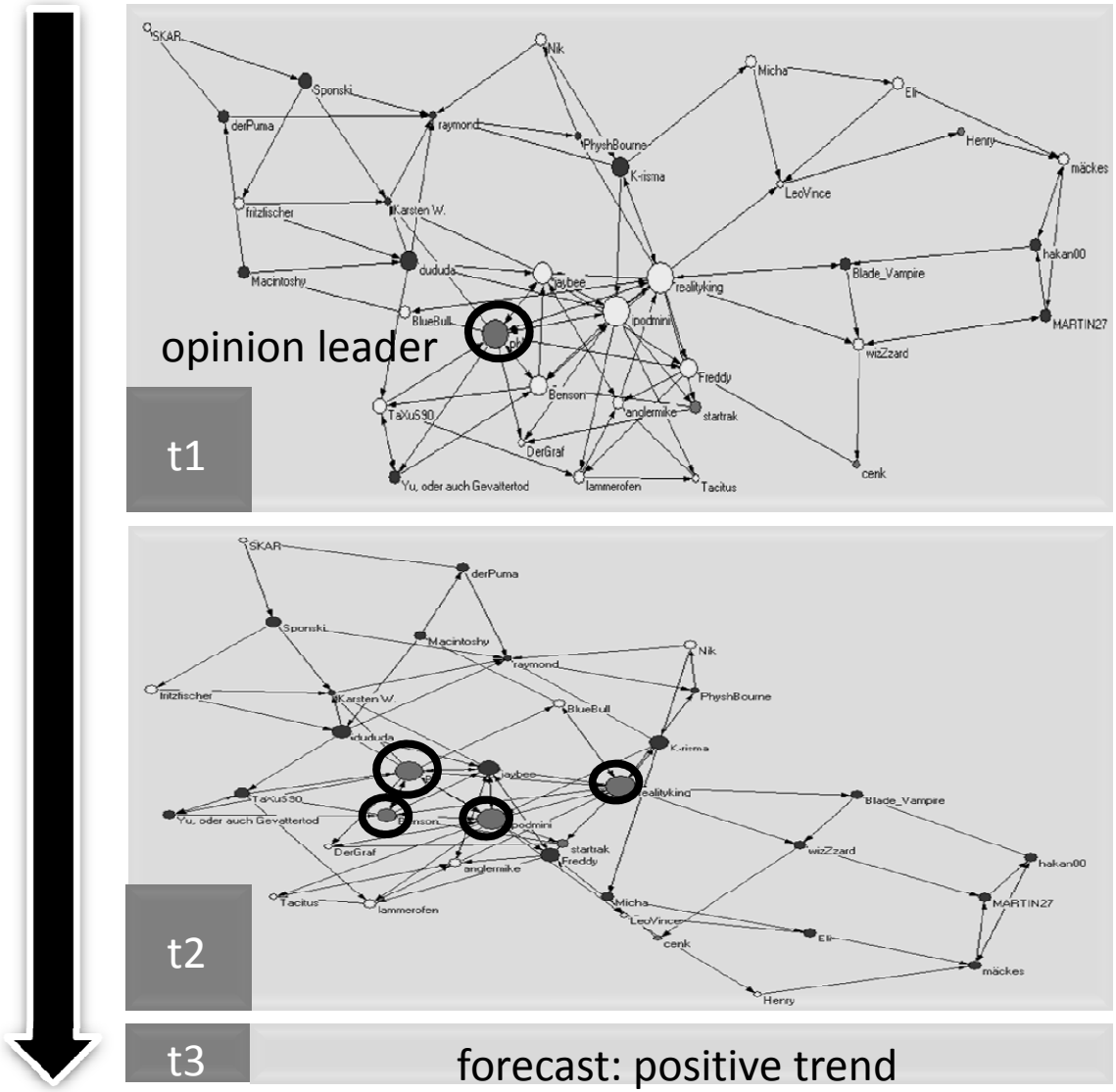


Opinion Leaders



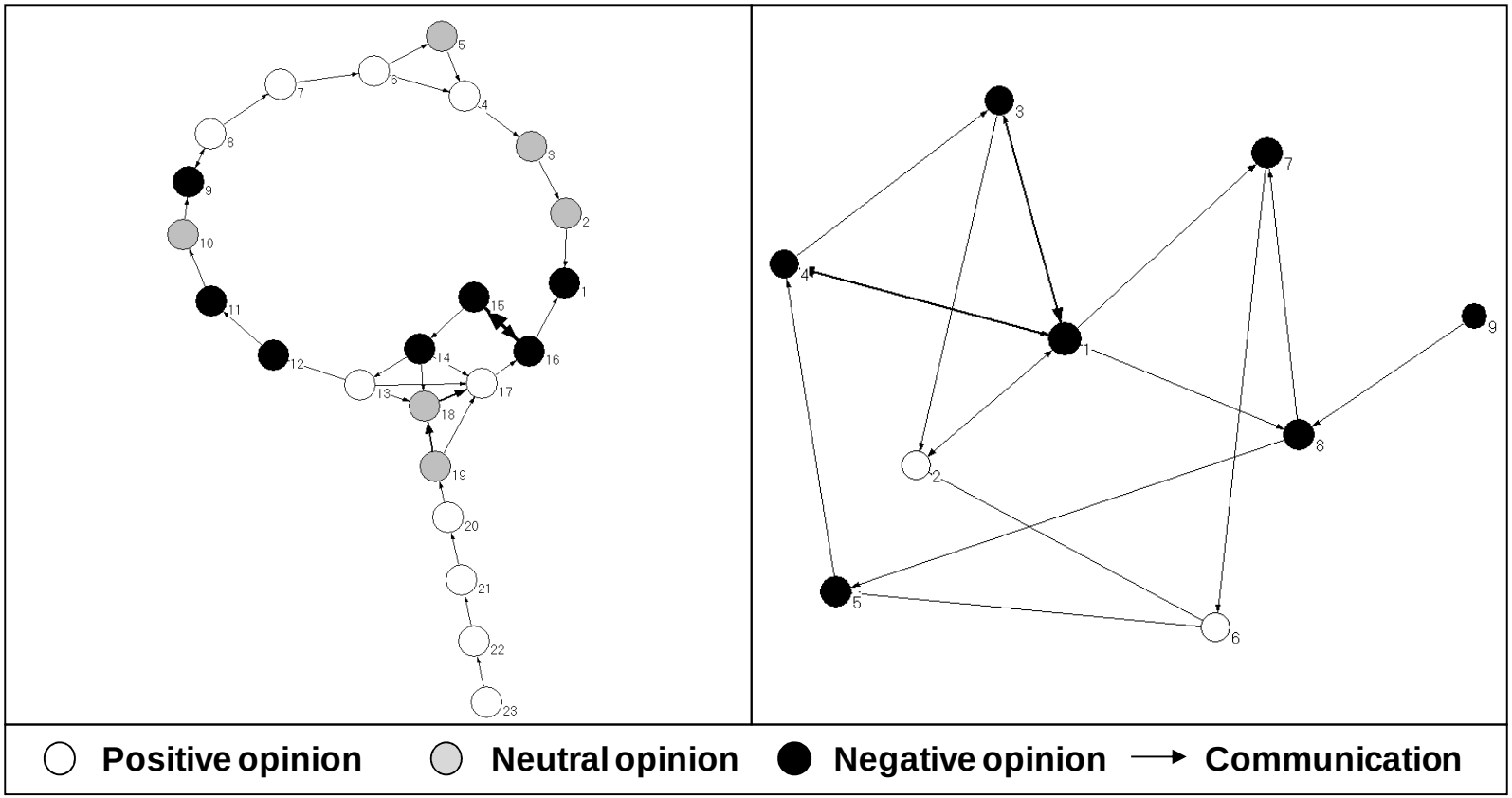
E: English
H: Hispanic
P: Pittsburgh
M: Miami

Social Network Analysis: Example Mobile Phones



Network Structure

Low centralization, low density -> balanced discussion	⟷	High centralization, high density -> trends emerge easily



Link-based Clustering

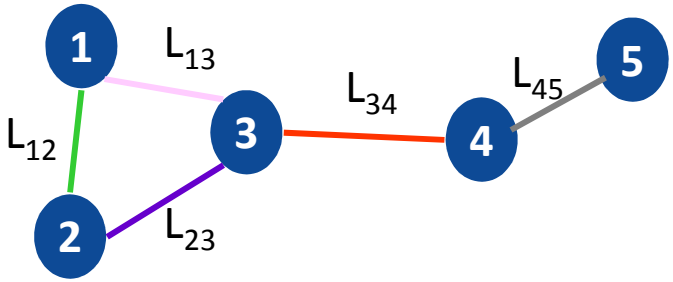
Basic Idea

- Cluster persons by successively eliminating links
- Eliminate links which connect different clusters (inter-cluster links)

Link-based Clustering – Edge Betweenness Algorithm

Edge Betweenness (EB)

- Measurement for determining links to be deleted
- Definition: A link's Edge Betweenness is the number of the shortest paths between pairs of objects that run through this link

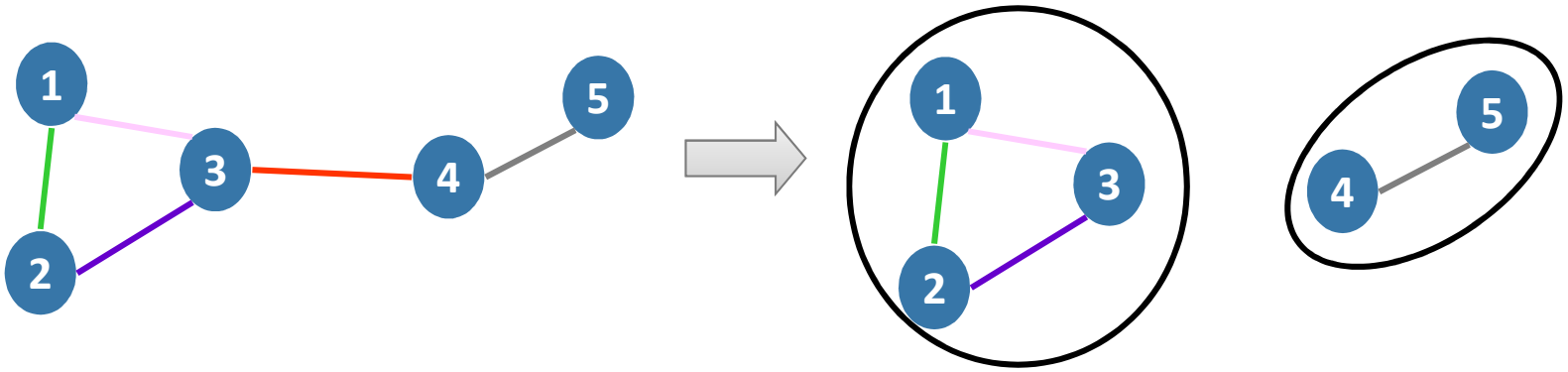


Link	Shortest paths that run through the link	EB
L_{34}	1 ⟺ 4, 2 ⟺ 4, 3 ⟺ 4, 1 ⟺ 5, 2 ⟺ 5, 3 ⟺ 5	6
L_{12}	1 ⟺ 2	1
L_{13}	1 ⟺ 3, 1 ⟺ 4, 1 ⟺ 5	3
L_{23}	2 ⟺ 3, 2 ⟺ 4, 2 ⟺ 5	3
L_{45}	1 ⟺ 5, 2 ⟺ 5, 3 ⟺ 5, 4 ⟺ 5	4

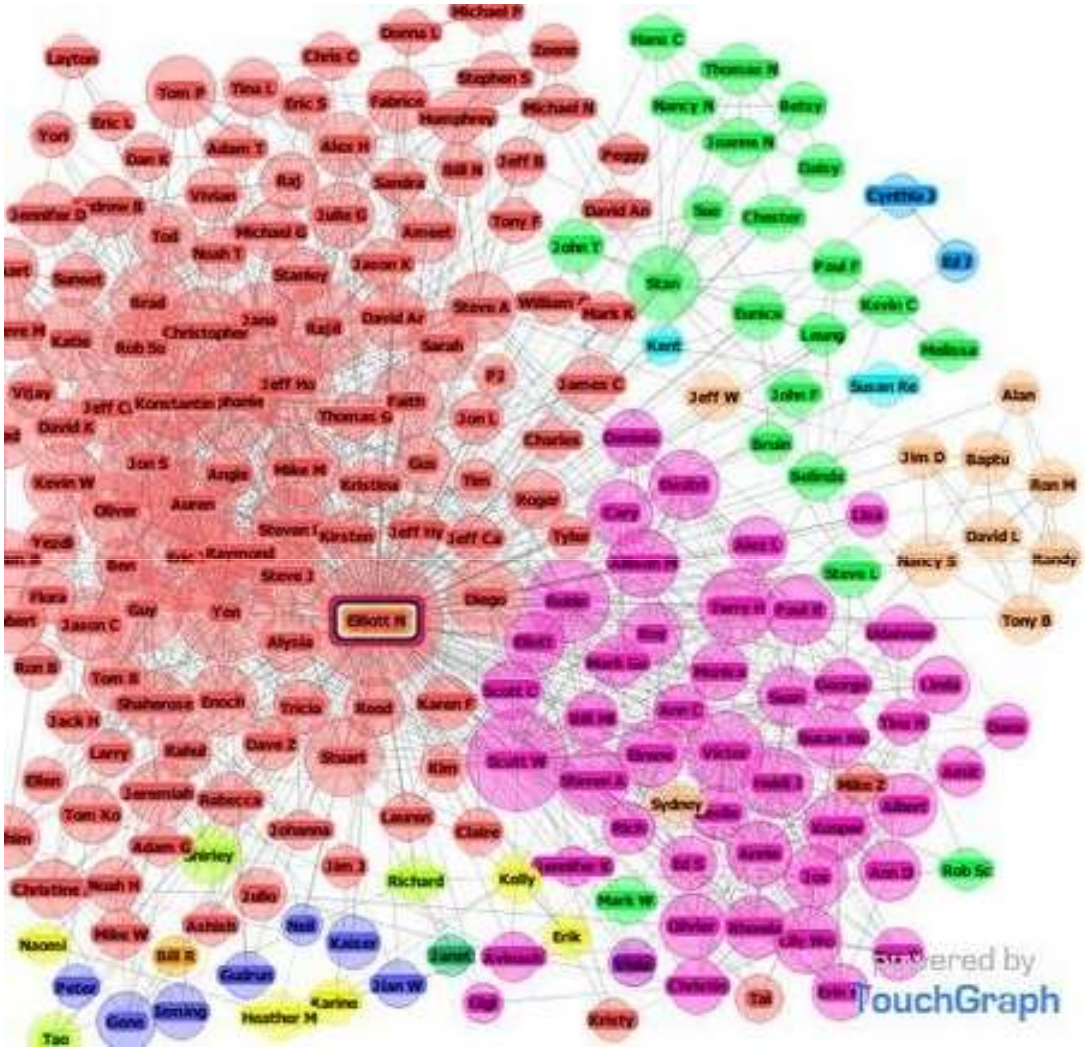
Link-based Object Clustering – Edge Betweenness Algorithm

Explanation

When clusters of a network are only linked by a few inter-cluster links, then all of the shortest paths run through these links. Consequently the links which connect the clusters have a high Edge Betweenness. By eliminating the links with the highest Edge Betweenness, the clusters are separated from each other and a cluster structure of the network is created.

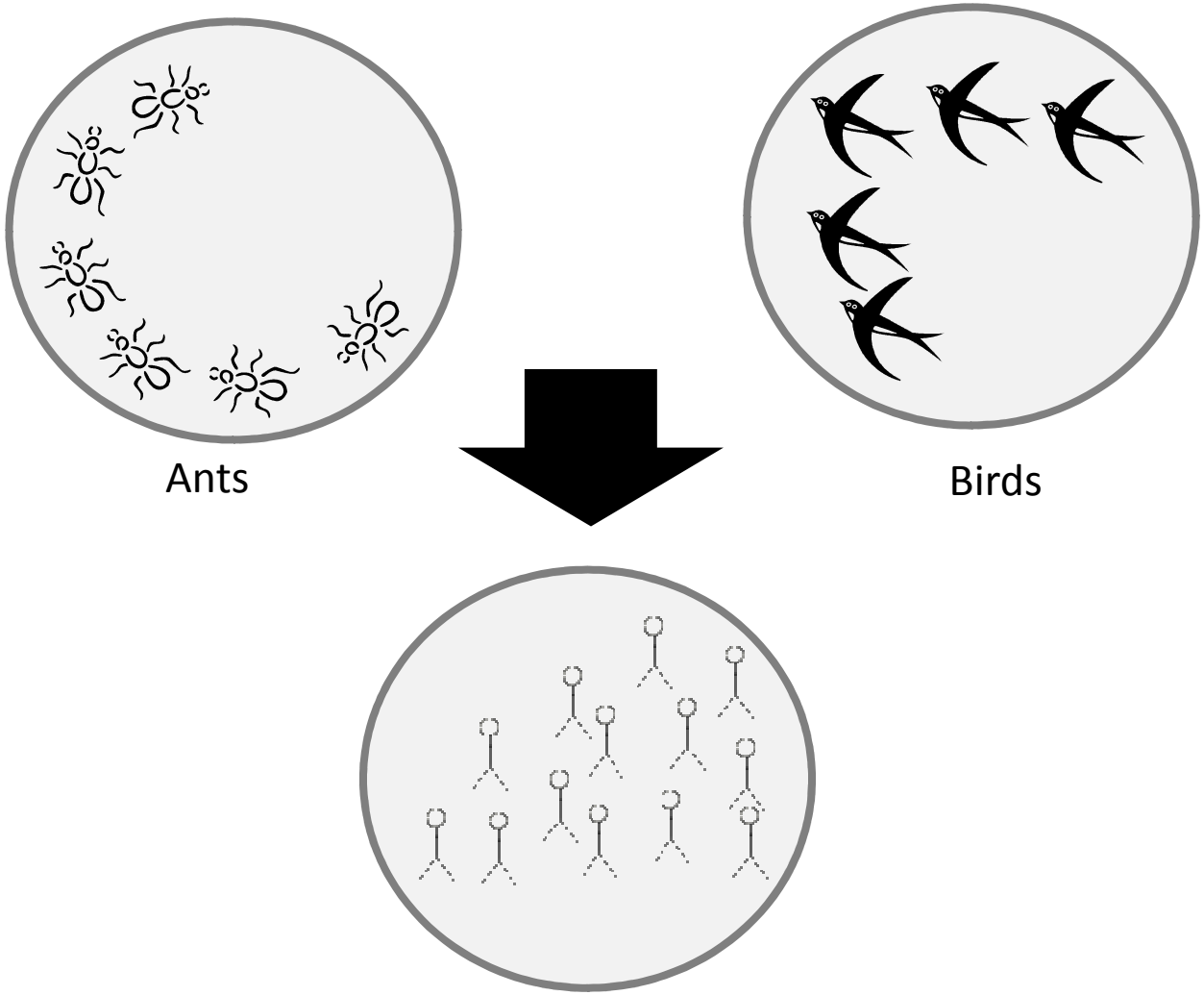


Clustering of Friends in Facebook



Agenda

- **Social Media**
  - Virtual Communities
  - Social Commerce
  - Enterprise 2.0
- **Social Media Analysis**
  - Opinion Mining
  - Network Mining
  - Swarm Intelligence
  - Early Warning
- **Social Media Marketing**
  - Viral Marketing
  - Opinion Control



Opinion Formation in Online Communities

Swarm Intelligence

Definition

Swarm intelligence can be defined as a phenomenon which arises from the social structure of interacting agents over a period of time if the number of problems solved collectively is higher than the number of problems solved individually.

Preconditions

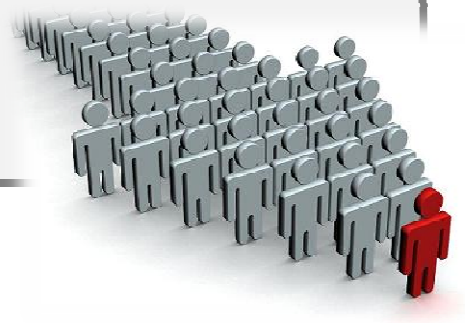
- Interaction
- Capability of problem-solving

Characteristics

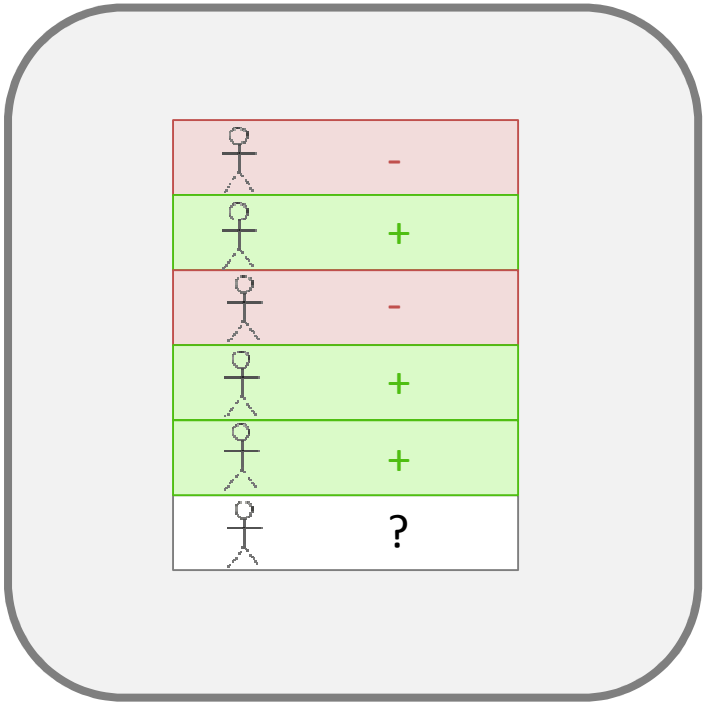
- Flexibility
- Robustness
- Self-Organization

Swarm Intelligence in Web 2.0

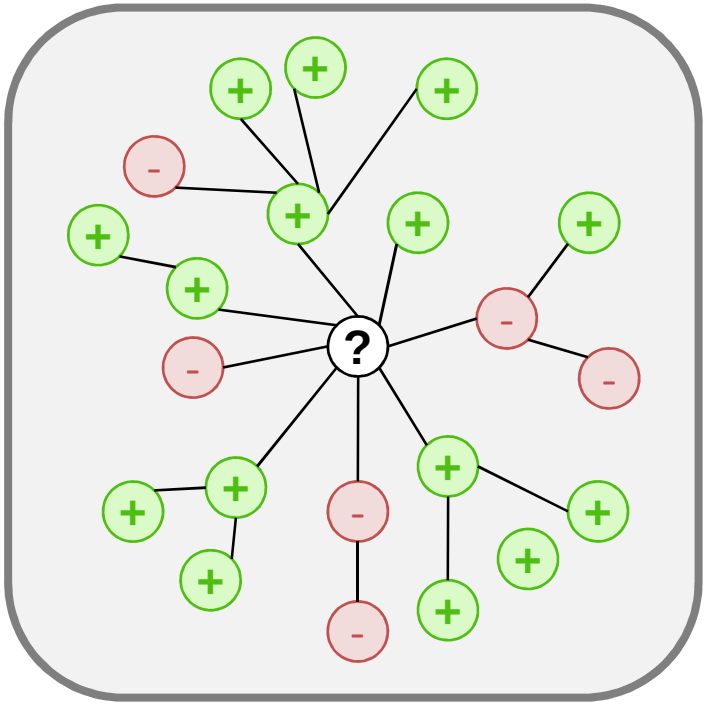
- **Colonies of social insects**: Ants, bees, wasps, and termites are able to achieve complex tasks such as picking up material or finding food by means of cooperation.
- **Collaborative groups of humans**: Due to the collective process of exchanging information and opinions during a discussion, the combined knowledge of the community becomes more valuable than the sum of the individual knowledge of all community members.
- **Web 2.0**: A wider range of people can connect more easily and more rapidly to exchange information in online discussions.



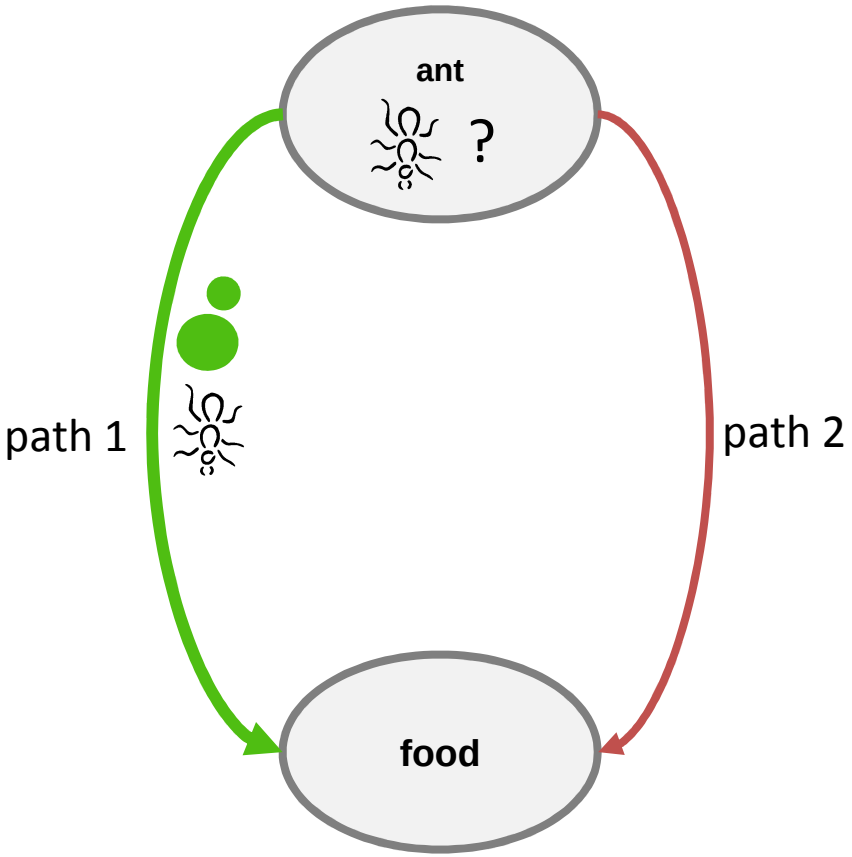
Opinion Prediction in Threads

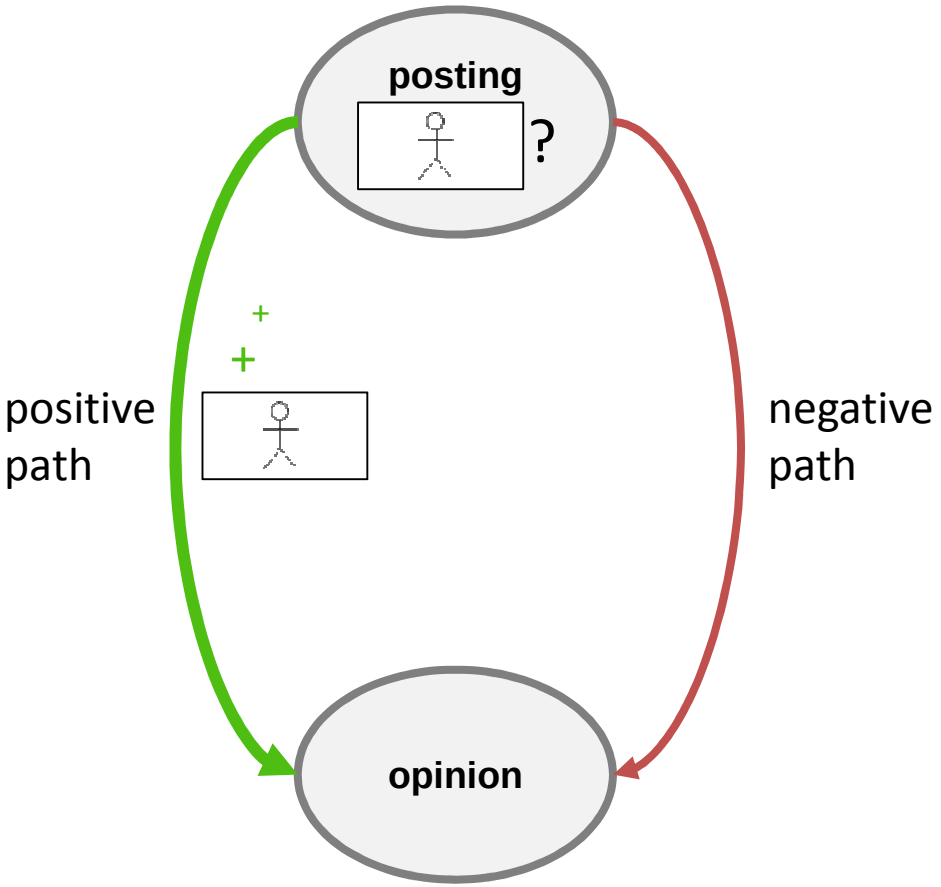


Opinion Prediction in Social Networks

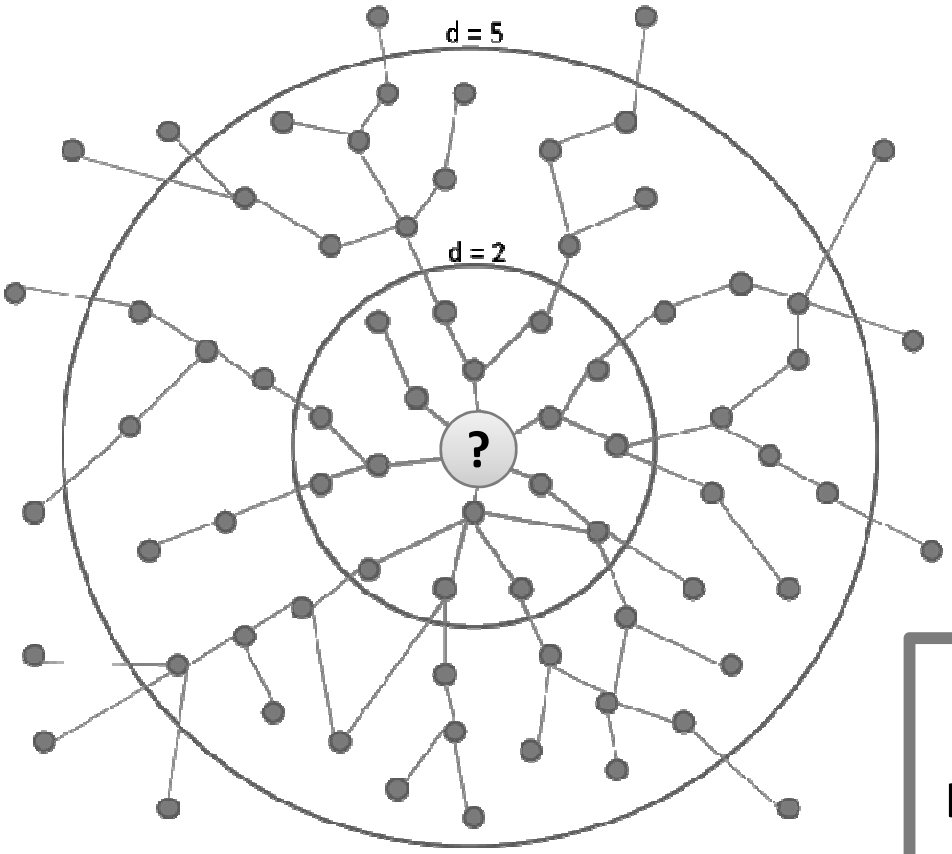


Swarm-based Opinion Prediction in Threads





Swarm-based Opinion Prediction in Social Networks



If opinion of neighbors = positive and opinion of leader = positive and own experience = low **then** opinion = positive

Agenda

- **Social Media**
  - Virtual Communities
  - Social Commerce
  - Enterprise 2.0
- **Social Media Analysis**
  - Opinion Mining
  - Network Mining
  - Swarm Intelligence
  - Early Warning
- **Social Media Marketing**
  - Viral Marketing
  - Opinion Control

Early Warning

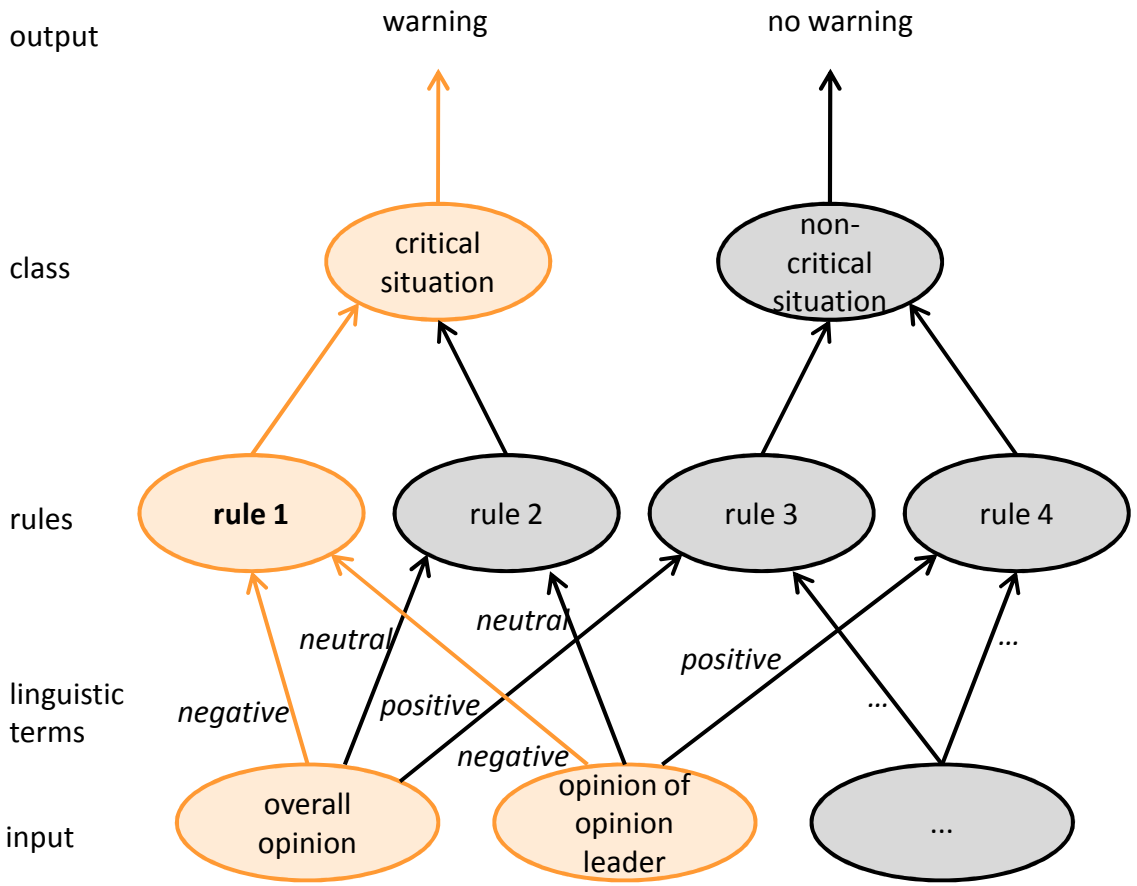
Problem

- Opinions on Web 2.0 have a high influence on consumers‘ purchasing decisions
- Negative opinions may harm the company‘s image and sales volume

Aim

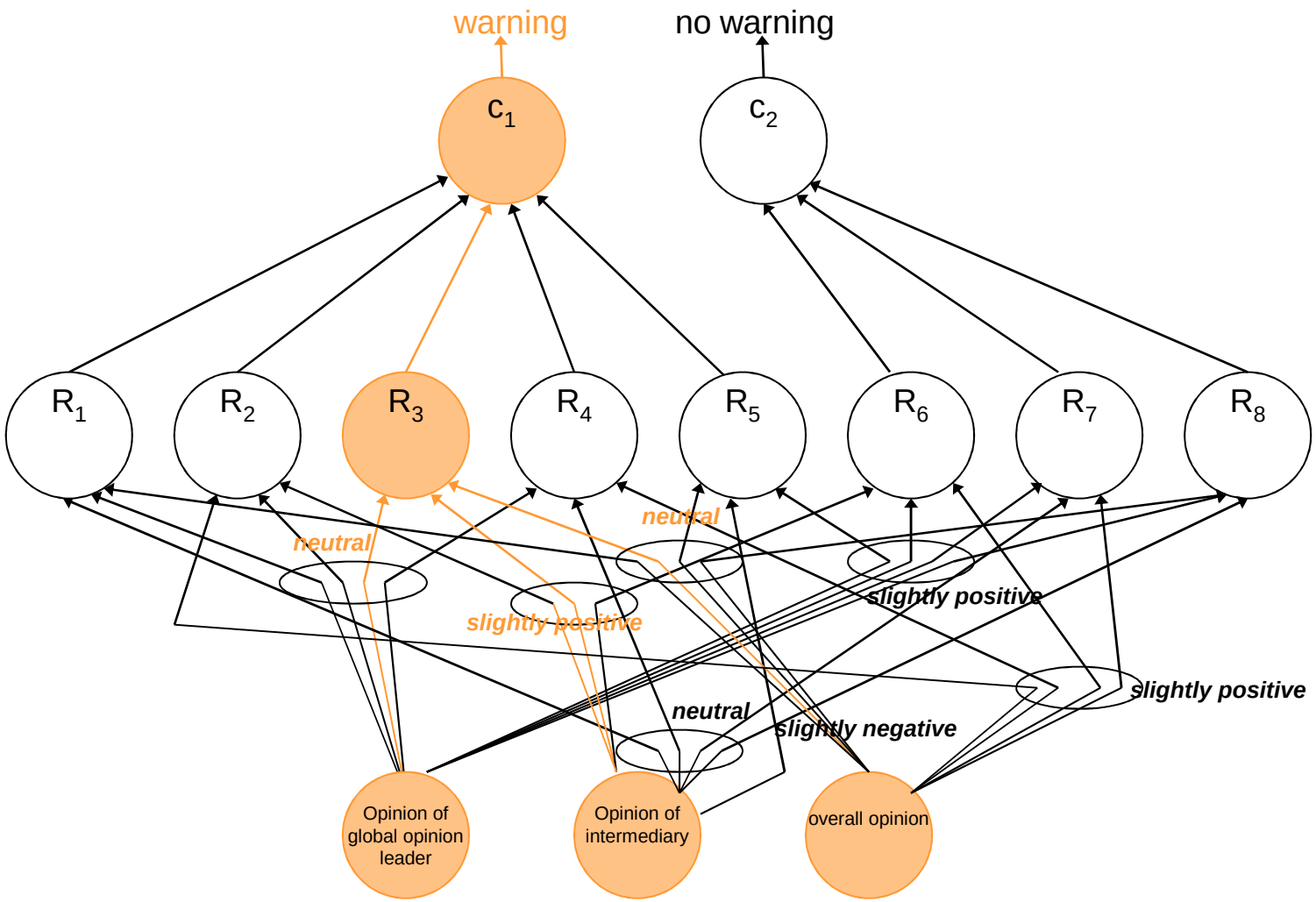
- Early warning in case of critical situations is crucial
- If managers are alerted at an early stage they are able to take preventive actions

Fuzzy Perceptron – Learning Rules for Early Warning



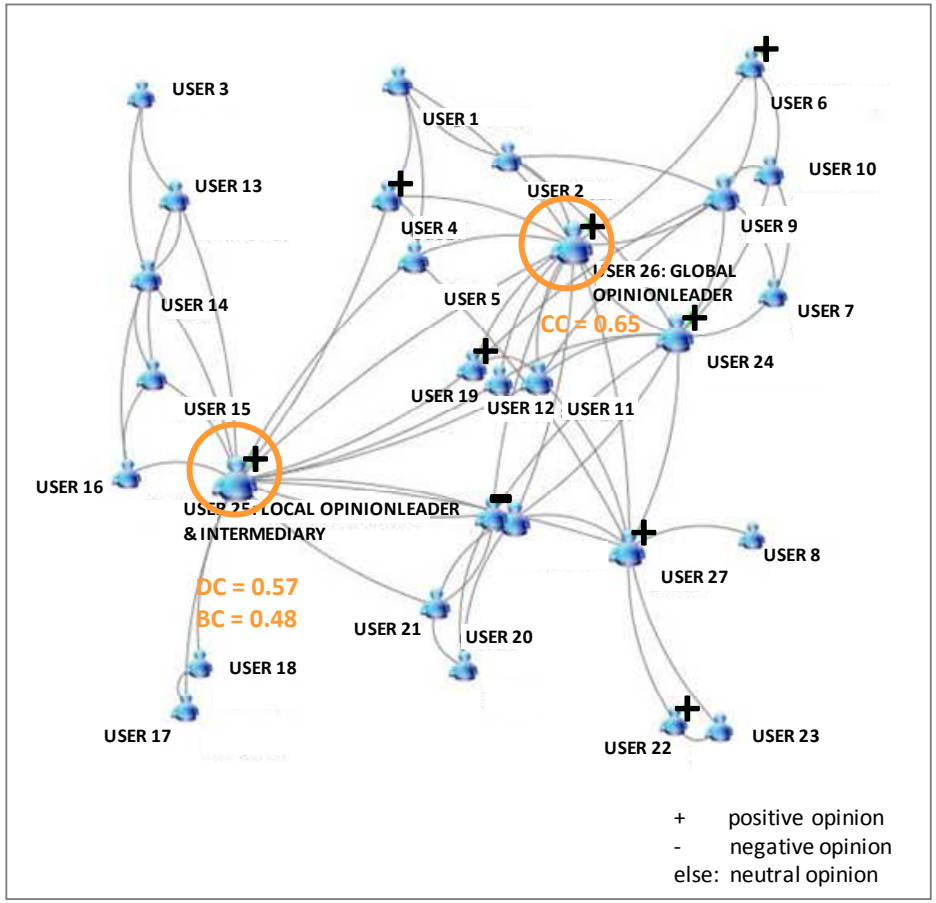
rule 1
if overall opinion is negative
and opinion of opinion leader is negative
then situation is critical

Fuzzy-Perzeptron



Classification of Situations

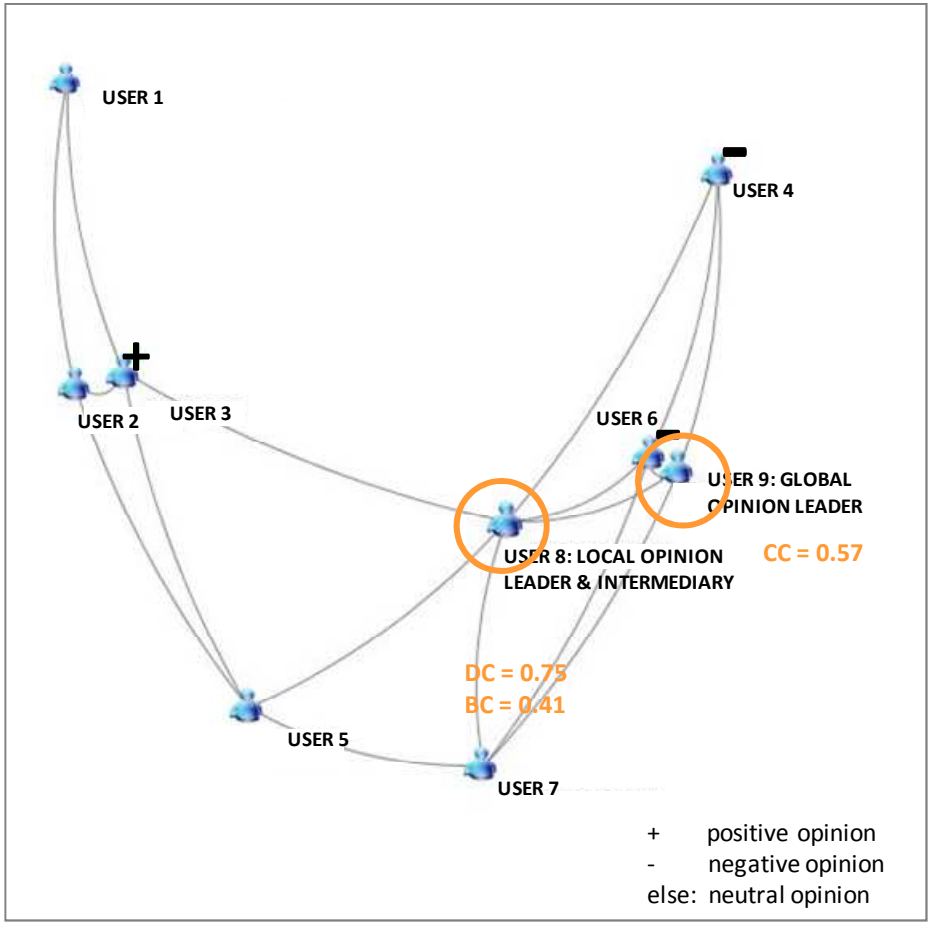
Non-critical situation



Opinion of local opinion leader and intermediary: positive
Opinion of global opinion leader: positive
Speed of opinion diffusion: 0.18
Likelihood of opinion diffusion: 0.42
Overall opinion: 0.24

Classification of Situations

Critical situation



Opinion of local opinion leader and intermediary: neutral
Opinion of global opinion leader: neutral
Speed of opinion diffusion : 0.36
Likelihood of opinion diffusion : 0.47
Overall opinion : -0.11

Agenda

- **Social Media**
  - Virtual Communities
  - Social Commerce
  - Enterprise 2.0
- **Social Media Analysis**
  - Opinion Mining
  - Network Mining
  - Swarm Intelligence
  - Early Warning
- **Social Media Marketing**
  - Viral Marketing
  - Opinion Control

Agenda

- **Social Media**
  - Virtual Communities
  - Social Commerce
  - Enterprise 2.0
- **Social Media Analysis**
  - Opinion Mining
  - Network Mining
  - Swarm Intelligence
  - Early Warning
- **Social Media Marketing**
  - Viral Marketing
  - Opinion Control

Using Social Networks for Marketing: Viral Marketing

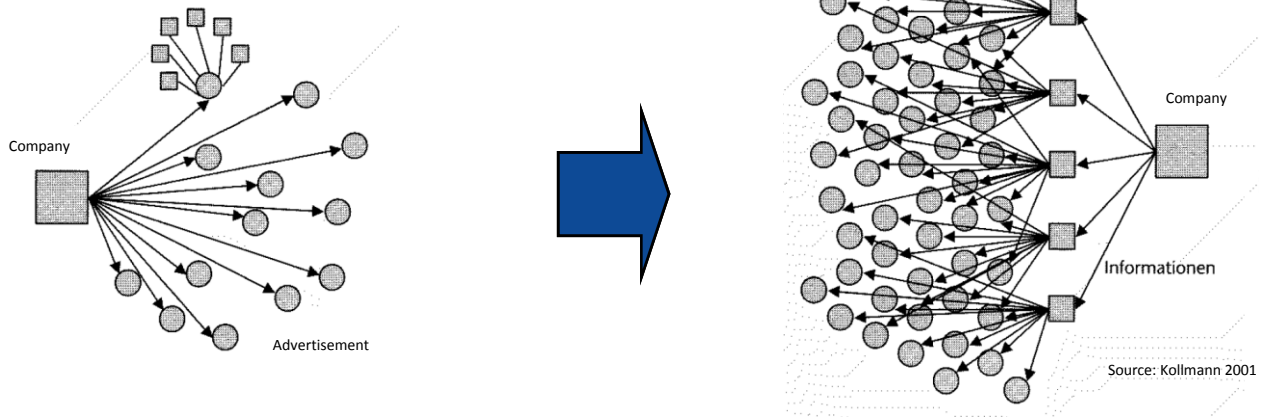
Definition

Any marketing technique that induces Web sites or users to pass on a marketing message to other sites or users, creating a potentially exponential growth in the message's visibility and effect.

The Virus of Marketing (Rayport 1996)

" Think of a virus as the ultimate marketing program. When it comes to getting a message out with little time, minimal budgets, and maximum effect, nothing on earth beats a virus."

Viral Marketing



Concept of traditional Online-Marketing
→ Paying for advertisement

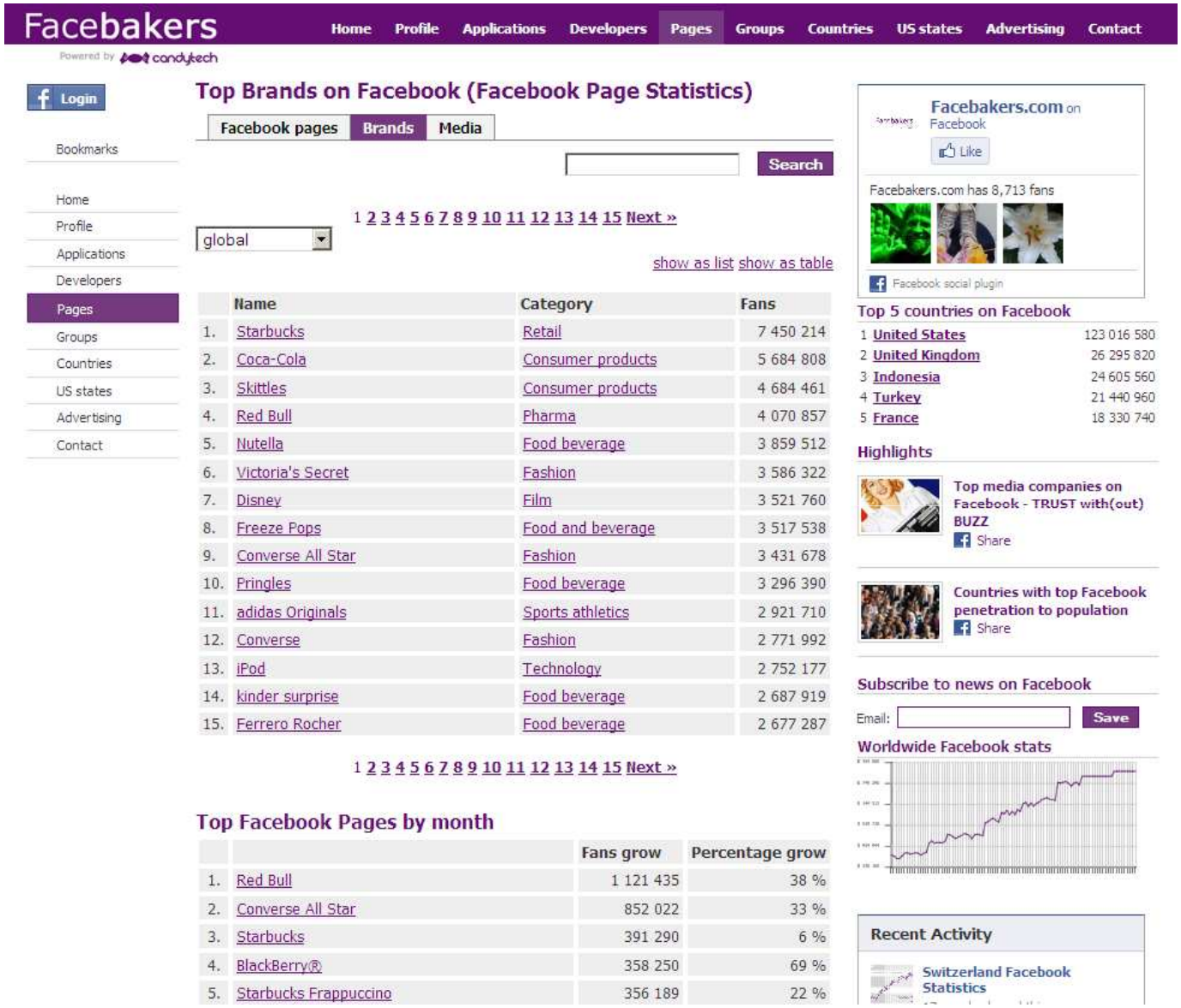
Concept of Viral-Marketing
→ Free information spreading

Viral Marketing

- cost-effective spreading of the message
- basic principle: word of mouth
- specific use of the net effects of the Internet
- attention: distribution is uncontrollable

Example: Viral Marketing on Facebook

Facebook as Virus Incubator



Facebakers

Home | Profile | Applications | Developers | Pages | Groups | Countries | US states | Advertising | Contact

Powered by candytech

Login

Bookmarks

- Home
- Profile
- Applications
- Developers
- Pages
- Groups
- Countries
- US states
- Advertising
- Contact

Top Brands on Facebook (Facebook Page Statistics)

Facebook pages | Brands | Media

Search

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 Next »

global

show as list show as table

	Name	Category	Fans
1.	Starbucks	Retail	7 450 214
2.	Coca-Cola	Consumer products	5 684 808
3.	Skittles	Consumer products	4 684 461
4.	Red Bull	Pharma	4 070 857
5.	Nutella	Food beverage	3 859 512
6.	Victoria's Secret	Fashion	3 586 322
7.	Disney	Film	3 521 760
8.	Freeze Pops	Food and beverage	3 517 538
9.	Converse All Star	Fashion	3 431 678
10.	Pringles	Food beverage	3 296 390
11.	adidas Originals	Sports athletics	2 921 710
12.	Converse	Fashion	2 771 992
13.	iPod	Technology	2 752 177
14.	kinder surprise	Food beverage	2 687 919
15.	Ferrero Rocher	Food beverage	2 677 287

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 Next »

Top Facebook Pages by month

		Fans grow	Percentage grow
1.	Red Bull	1 121 435	38 %
2.	Converse All Star	852 022	33 %
3.	Starbucks	391 290	6 %
4.	BlackBerry®	358 250	69 %
5.	Starbucks Frappuccino	356 189	22 %

Facebakers.com on Facebook

Like

Facebakers.com has 8,713 fans

Facebook social plugin

Top 5 countries on Facebook

1	United States	123 016 580
2	United Kingdom	26 295 820
3	Indonesia	24 605 560
4	Turkey	21 440 960
5	France	18 330 740

Highlights

Top media companies on Facebook - TRUST with(out) BUZZ

Share

Countries with top Facebook penetration to population

Share

Subscribe to news on Facebook

Email: Save

Worldwide Facebook stats

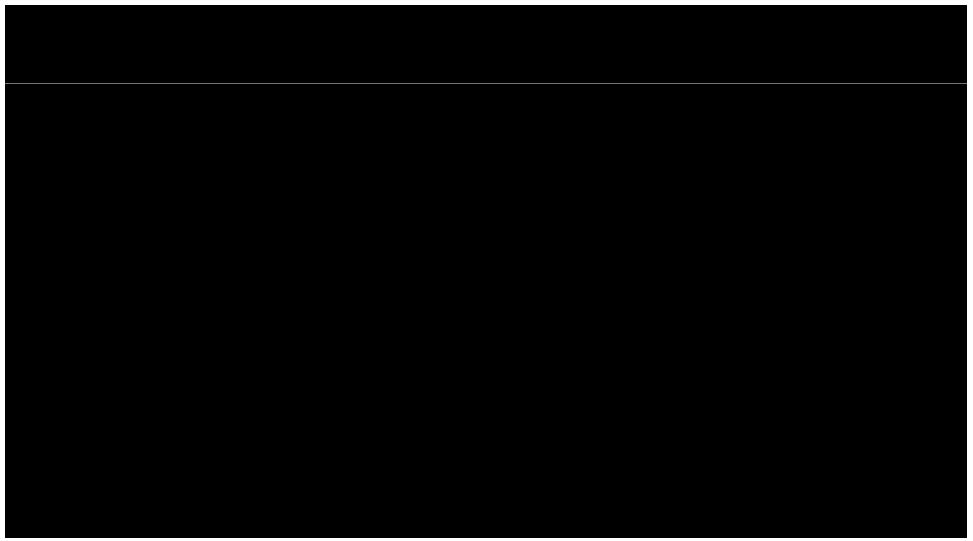
Recent Activity

Switzerland Facebook Statistics

Example: Viral Marketing on YouTube

Heineken Campaign

- only available on the internet, e.g., on YouTube
- more than 1,5 million views in the first two weeks
- possibility to share the video with friends in social networks
- several successful follow-up videos (e.g., a walking fridge)



Example: Swedish Broadcasting Commission

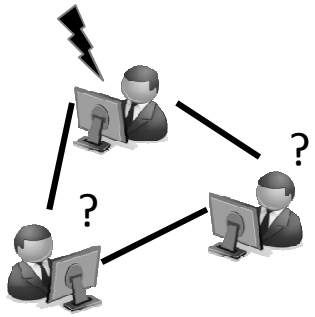
Example: Viral Marketing at Hornbach

Example: Viral Marketing at Blendtec

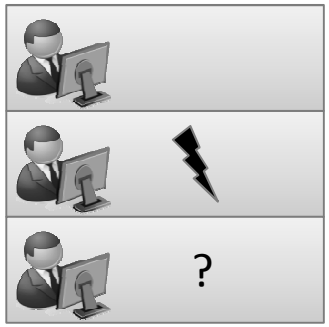
Agenda

- **Social Media**
  - Virtual Communities
  - Social Commerce
  - Enterprise 2.0
- **Social Media Analysis**
  - Opinion Mining
  - Network Mining
  - Swarm Intelligence
  - Early Warning
- **Social Media Marketing**
  - Viral Marketing
  - Opinion Control

Opinion Manipulation

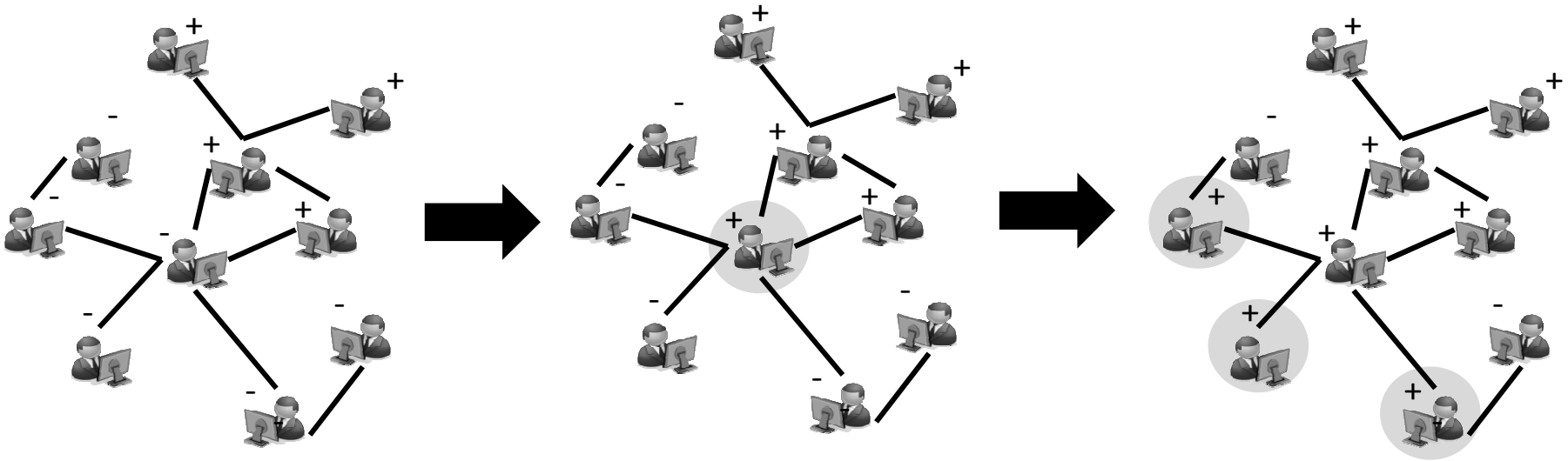


How will opinions develop if opinion leaders could be convinced to change their opinions?



How will opinions develop when new (known) messages are posted to a discussion board?

Changing the Opinions of Leaders

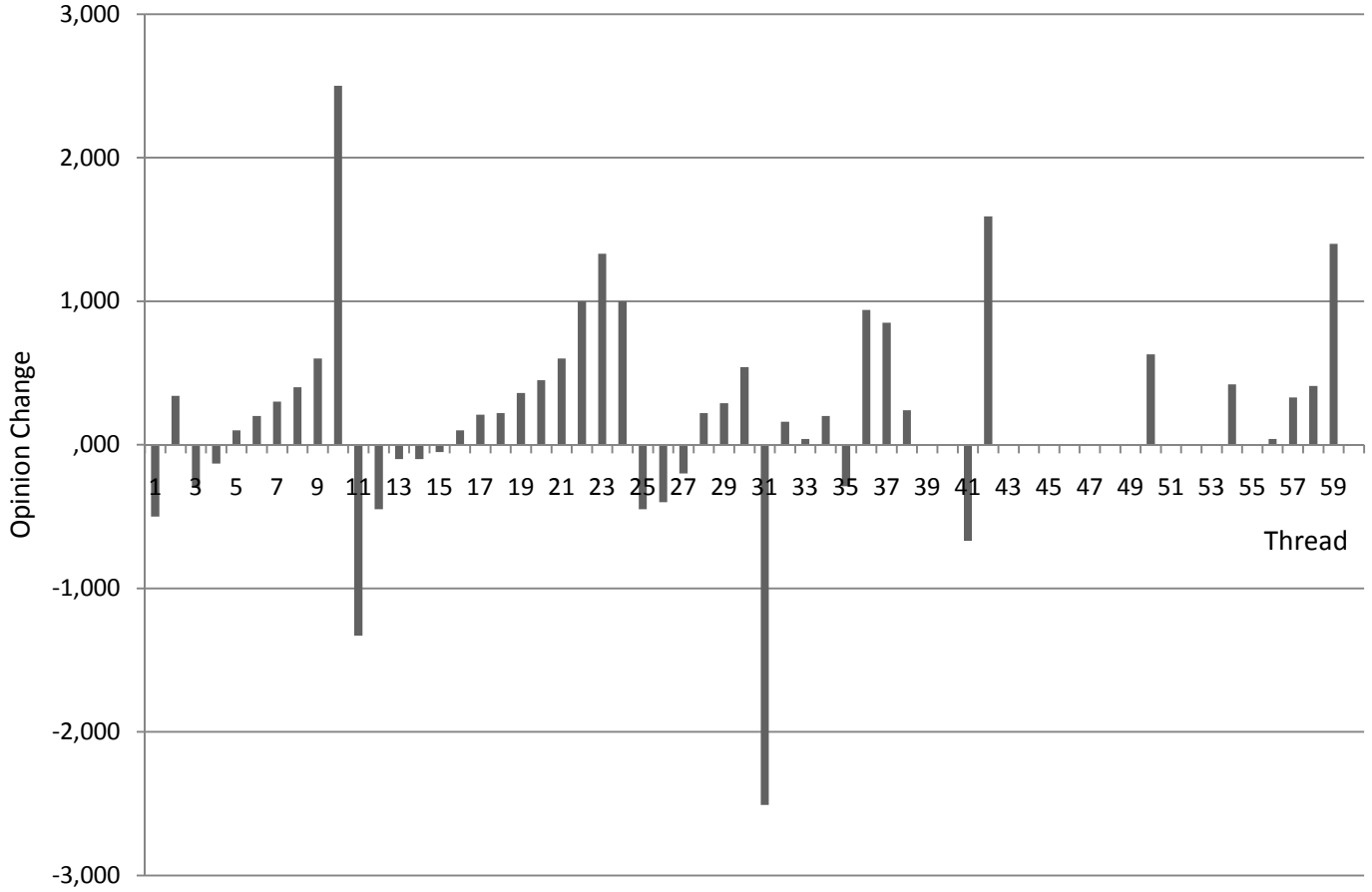


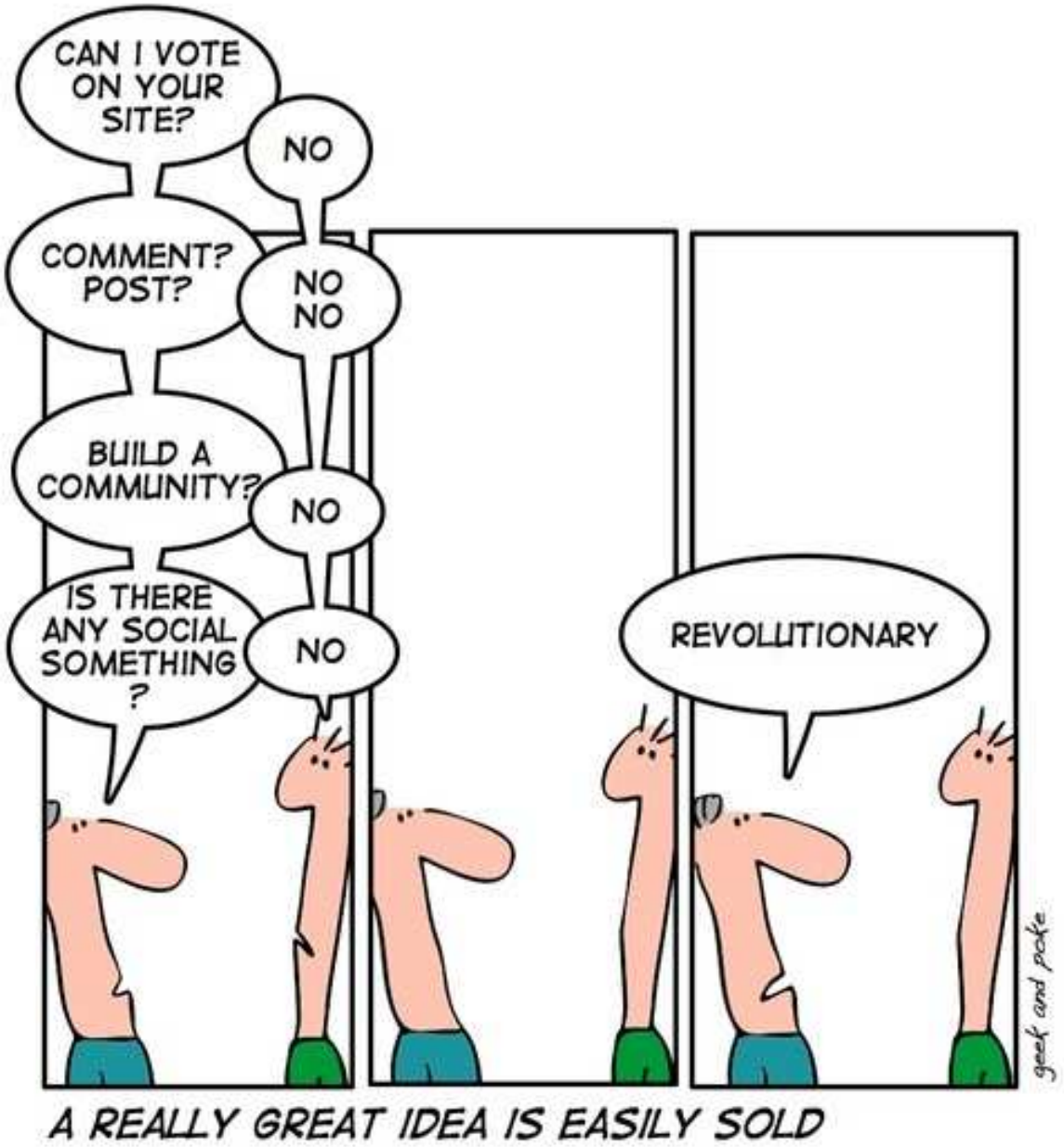
Detect rules of opinion formation

Change opinions

Apply rules of opinion formation to adjacent users

Effectiveness of Manipulative Messages




CAN I VOTE ON YOUR SITE?
NO
COMMENT? POST?
NO NO
BUILD A COMMUNITY?
NO
IS THERE ANY SOCIAL SOMETHING ?
NO
REVOLUTIONARY
geek and poke
A REALLY GREAT IDEA IS EASILY SOLD

GlobeNet 2011

St. Maarten, January 23-28, 2011

Social Media Analytics

Prof. Dr. Freimut Bodendorf

Institute of Information Systems

University of Erlangen-Nuremberg, Germany

WI