Intelligent Systems in Management: Challenges and Future Directions

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INTELLI 2013

Historical Data Points
World Congresses on ES
[Liebowitz, 1991-1998]

- Typically, 1000 attendees from 40-45 countries at each WCES
- Leading ES applications worldwide (Engineering: 35%; Business: 29%)
- Leading business global ESA: Finance, production management, general management, accounting/auditing, marketing/sales, electronic commerce, int. business, and HRM
- Business ES applications showed a sizable increase (29-40%)

# "ES in Business: Applications and Future Directions for OR"
[Metaxiotis, 2003]

- Marketing, Banking & Finance, Forecasting, Real Estate Valuation, SCM, HRM, etc.
- Benefits from ES in business include:
  - More accurate decisions
  - Time gains
  - Flexibility
  - Improved quality
  - Effecting training
  - Minimization of human inconsistencies
  - More efficient use of resources

HICSS-38 (2005) Decision Technologies for Management Track

- Agent Technology, Int. Systems for Mgt Sprt
- Data and Process Mining: Business Impact and Application Challenges
- Int. Decision Support for e-Logistics and SCM
- Location Technology in Business
- Mobile Commerce
- Mobile Computing and Public Services in Critical Situations
- Modeling Knowledge Intensive Processes
- Virtual Environments for Advanced Modeling

ESWA (covers all intelligent systems) 1.8 million article downloads in 2011
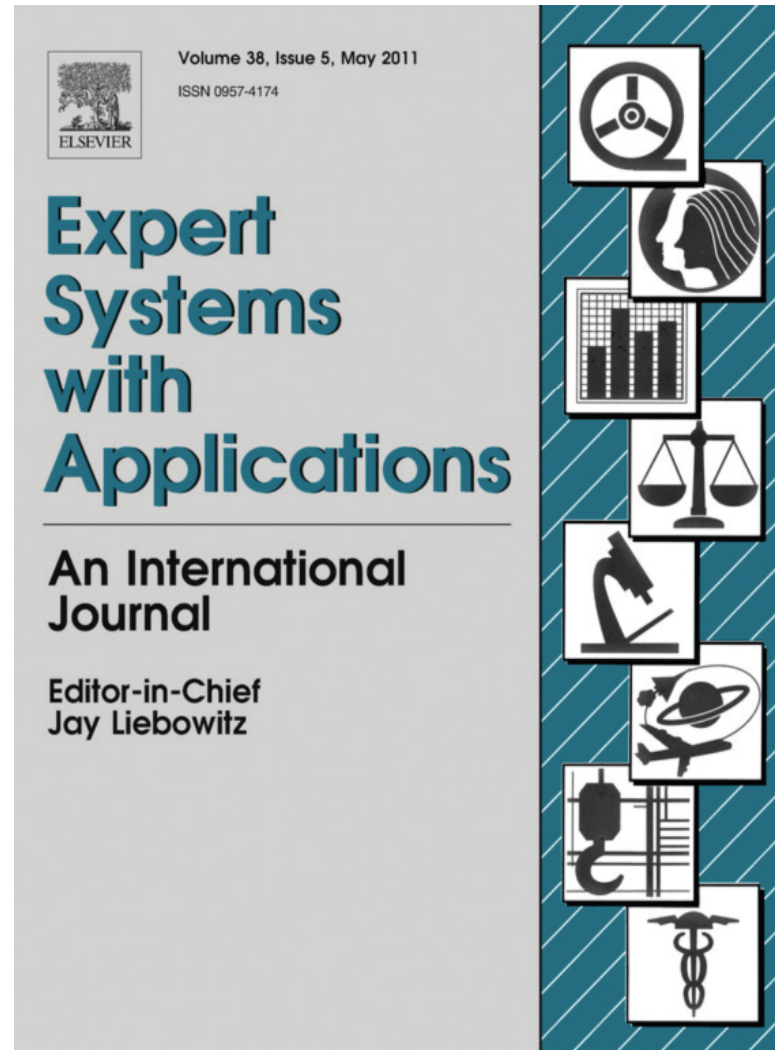
1,816 Submitted Articles in Bus & Mgt to ESWA from 2006-2012 (May 3)

- **Journal : Expert Systems with Applications Date : 03 May 2012:**
- 2006:   53
- 2007:   64
- 2008:   152
- 2009:   395
- 2010:   312
- 2011:   484
- 2012:   356 (as of May 3)

ESWA Published Papers in Recent Years (Techniques vs Regions)
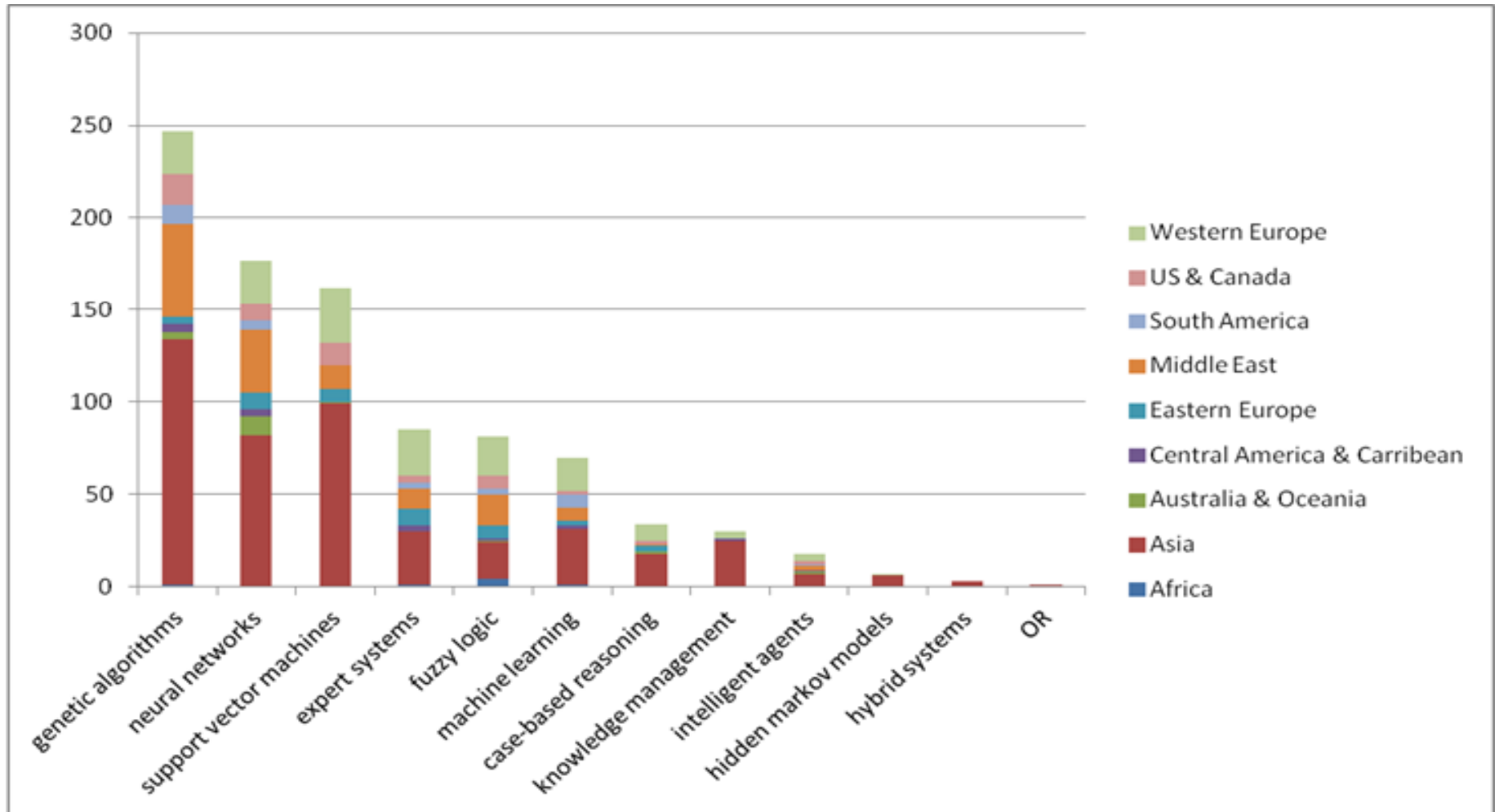
Here are the top fifty corporations, based on the number of downloads:

- Petrobras - Petroleo Brasileiro S.A.
- Samsung Advanced Institute of Technology
- The Boeing Company
- Ford Motor Corp. SD/EI
- Electricite de France / Gaz de France
- Samsung Electronics Semiconductor
- Mitre Corp
- LG Display R&D Center
- Instituto Mexicano Petroleo
- Hyundai Heavy Industries Co., Ltd.
- Petroliam Nasional Berhad (PETRONAS) - HQ
- Nokia Group
- 3M Company
- Roche Holding Ltd
- GlaxoSmithKline (former Glaxo Wellcome)
- KESLI - Korea Electric Power Research Inst.
- Mimos Berhad
- ArcelorMittal
- Eli Lilly and Company
- Johnson & Johnson Global
- FUNDACION TECNALIA - Fecyt A/C Mbr#67
- Hyundai Motor Corporation/South Korea
- Anglo Operations
- Science Applications International Corp (-SAIC-)
- ICELAND NATIONAL - Siminn Iceland Telecom

POSCO Technical Research Laboratories
Dow-Chemical Company
Samsung SDI Co Ltd
LG Electronics SeoCho R&D Campus
CJ Corp. Institute of Science & Technology
Hewlett Packard Company
Cummins Inc
Corporacion Mexicana de Investigacion en Materia (COMIMSA)
Pfizer Inc.
Merck Sharp & Dohme Corp.
Air Liquide SA
Fujitsu Ltd.
E.I DuPont de Nemours and Company
Dong-A Pharmaceutical Co., Ltd
Bae Systems Plc
Alcoa, Inc.
Bharat Petroleum Corporation Limited
ICELAND NATIONAL - Vodafone Iceland
Instituto Mexicano del Petroleo - PEMEX
Sanofi Aventis France
Veolia Environnement Sa
SK Hynix Inc.
Vale - Instituto Tecnologico Vale
Hanwha Chemical Res & Develop Ctr
Kumho Petrochemical Co., Ltd

"Business Intelligence Success and the Role of BI Capabilities" (Isik et al., 2011)

- 116 BI professionals surveyed
- Users are generally satisfied with BI overall and with BI capabilities

MS in Business Intelligence & Analytics (Stevens Institute of Technology)

- Financial Decision Making
- Strategic Data Management
- Data Warehousing and Business Intelligence
- Process Analytics and Optimization
- Financial Enterprise Risk Engineering
- Multivariate Data Analytics
- Experimental Design
- Knowledge Discovery in Databases
- Statistical Learning & Analytics
- Social Network Analytics
- Web Analytics
- Industry Practicum (select one)
  - Applied Analytics in the Life Sciences
  - Algorithmic Trading Strategies

"Special Session on Int. Systems in Business Decision Making" (U. of Granada, 2011)

- Competitive intelligence
- Trend analysis
- Risk assessment
- Business strategic/marketing planning
- CRM (Customer Relationship Management)
- ERP (Enterprise Resource Planning)
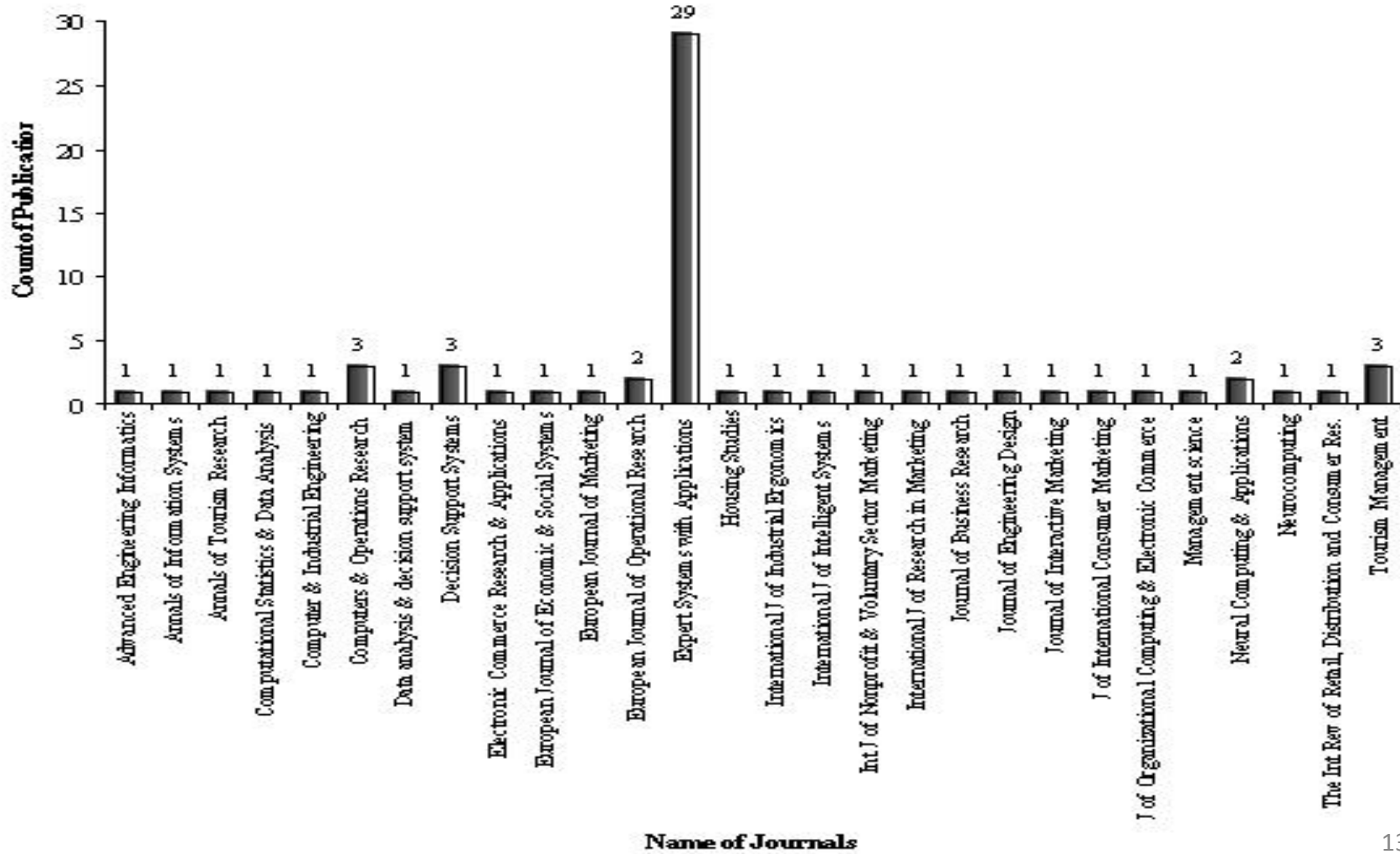- SCM (Supply Chain Management)

Count of NN Articles from 2001-2010 [Chattopadhyay et al., 2011]
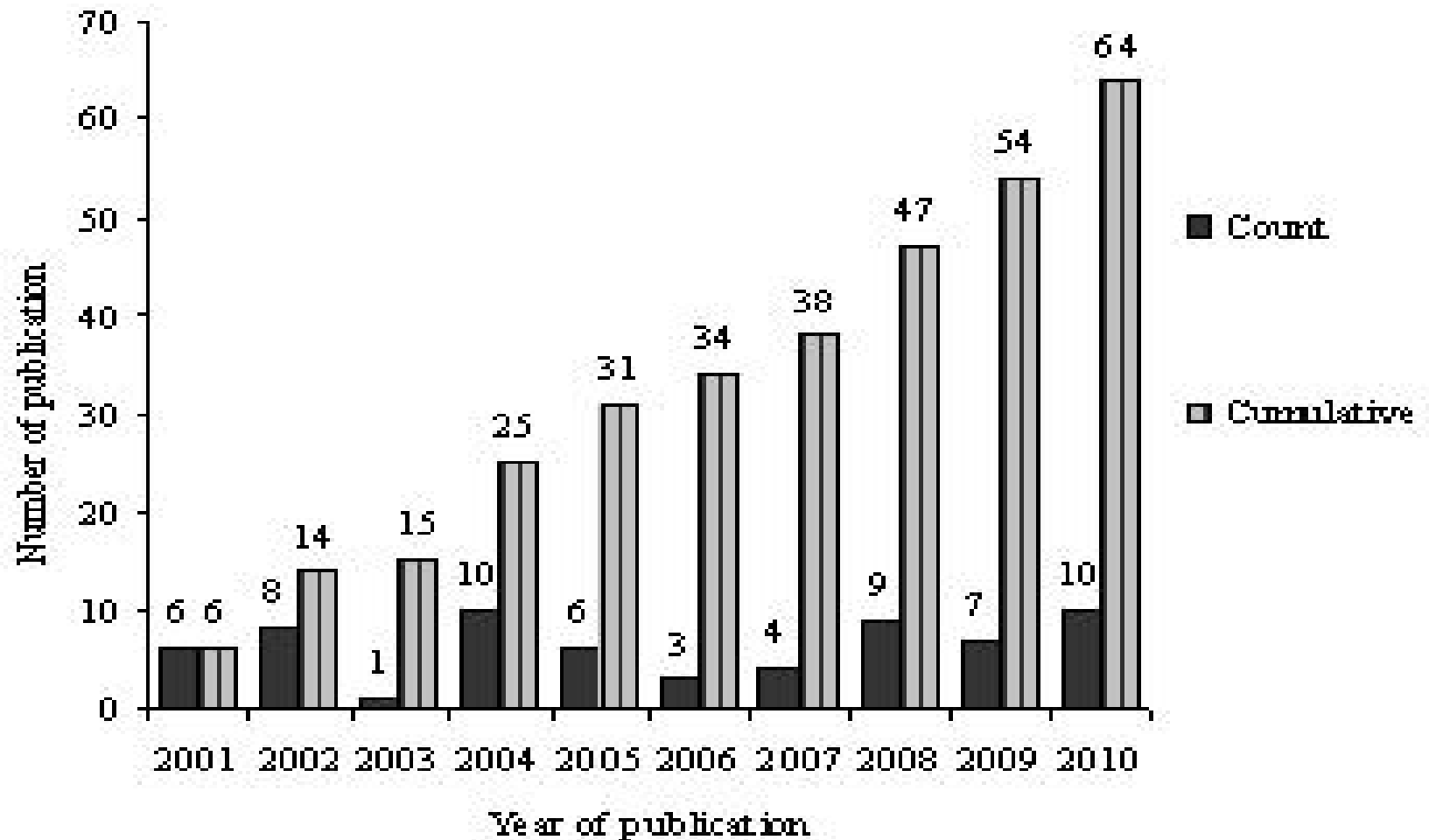
NN Articles Per Journal (2001-2010) [Chattopadhyay et al., 2011]

"The Research Core of the KM Literature"

(Wallace et al., Int. Journal of Info. Mgt., Vol. 31, 2011)

- Bibliometric analysis and a content analysis on KM literature based on 21,596 references from 2,771 source publications

- 27.8% used no identifiable research methods

- Of the remaining refereed articles:
  - 60% employed mainstream social sciences research
  - 40% used provisional methods as a substitute for more formally defined or scientifically-based research methodologies

KM Trends for 2012/2013 (APQC)

- Consumerization of IT
- Social media
- Age of analytics

Applying AI to KM: Expert Systems Technology

- **Knowledge elicitation techniques to acquire lessons learned (via structured/unstructured interviews, protocol analysis, etc.)**

- **On-line pools of expertise (rule or case-based)**

- **Knowledge representation techniques for developing an ontology**

Intelligent Agent Technology

Intelligent multi-agent systems with learning capabilities to help users in responding to their questions

Searching and filtering tools

User profiling and classification tools

Agent-Oriented Knowledge Management—AAAI Symposium (Stanford University)

Data Mining and Knowledge Discovery Techniques

Inductively determine relationships/rules for further developing the KM system

Help deduce user profiles for better targeting the KM system

Help generate new cases

Neural Networks, Genetic Algorithms, etc.

Help weed out rules/cases

Help look for inconsistencies within the knowledge repository

Help filter noisy data

IT-Based
KM Research Issues

--Develop "active" analysis and dissemination techniques for knowledge sharing and searching via "intelligent" agent technology (i.e., where "learning" takes place)

--Apply knowledge discovery techniques (e.g., data/text mining, neural networks, etc.) for mining knowledge bases/repositories

--Improve query capabilities through natural language understanding techniques

--Develop metrics for measuring value-added benefits of knowledge management

--Develop standardized methodologies for knowledge management development and knowledge audits

--Provide improved techniques for performing knowledge mapping and building knowledge taxonomies/ontologies

IT-Based KM Research Issues (cont.)

--Develop techniques for building collaborative knowledge bases

--Develop improved tools for capturing knowledge from various media (look at multimedia mining to induce relationships among images, videos, graphics, text, etc.)

--Develop techniques for integrating databases to avoid stovepiping, functional silos

--Build improved software tools for developing and nurturing communities of practice

--Develop techniques for categorizing, synthesizing, and summarizing lessons learned (look at text summarization techniques)

--Explore ways to improve human-agent collaboration

--Explore human language technologies for KM (input analysis, extraction, question-answer, translation, etc.)

Sample People/Culture/Process-Based KM Research Areas

- **Interaction between knowledge codification and knowledge-sharing networks (Liu et al., 2010, ISR)**

- **Developing outcome measures for KM effectiveness**

- **Value network analysis**

- **Relationship between change management and KM**

- **How best to embed KM processes within the daily working lives of employees**

- **How best to develop formal KR strategies and programs**

KM Curricular Issues

- **The synergy between KM, BI, and CI ("Strategic Intelligence")**

- **Integrated, systems-view approach to KM**

- **Balance between people/culture, process, and technology**

- **Practice-based modules (capstones, theses, etc.—e.g., medical schools and now law schools)**

- **Multidisciplinary view of KM**

- **Synergy between KM and e-learning (UN)—**

- **http://polaris.umuc.edu/de/csi/2010_JayLiebowitz/ppt_syn/JayLiebowitz_index3.html**

Friday March 23, 2012 (IDC Smart Technology Conference 2012)

8:00 am – 8:25 am "The Next Stage of Computing: Intelligent Systems"

"The transformation of embedded devices to intelligent systems marks an emerging inflection point for system vendors, service providers, and technology suppliers to address. Over the next five years, this ongoing transformation of industries will result in a trillion dollar opportunity for intelligent systems."

Presented by Mario Morales,
Program Vice President,
Enabling Technologies and
Semiconductors at IDC

Sample Growth Areas for Intelligent Systems in Management

- Retail (Adidas, Macy's)
- Infrastructure Technologies (Mega-Cities, Knowledge Cities)
- Cybersecurity/Big Data/Analytics/Cloud Computing
- Healthcare Management

Smarter Healthcare

- **Personalized health via mobile devices**

- **Use of intelligent systems**

- **Standard data representations for data sharing and data mining purposes.**
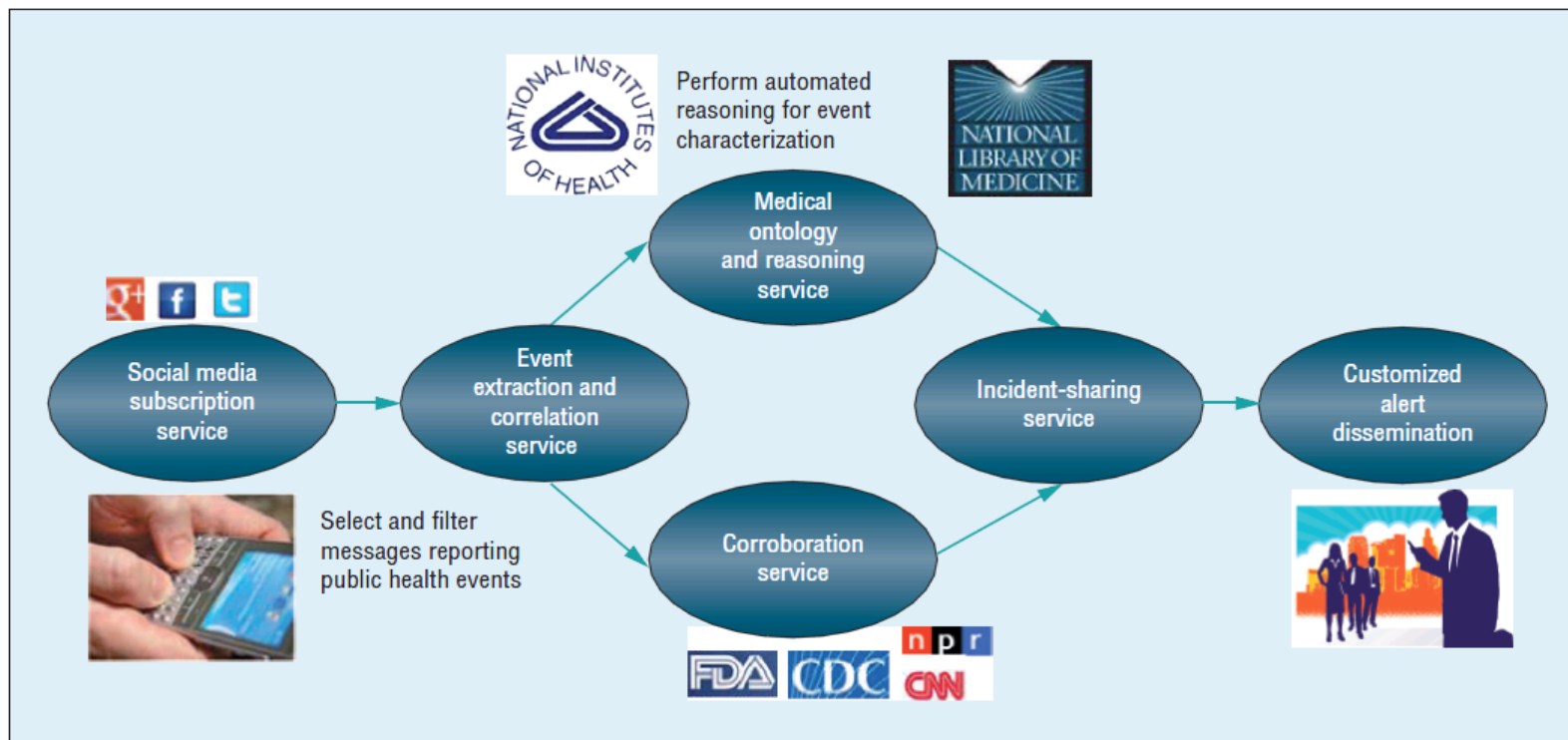
Figure 3. Public health surveillance process. This process uses social media feeds such as tweets and Facebook postings to detect and track public health emergencies.
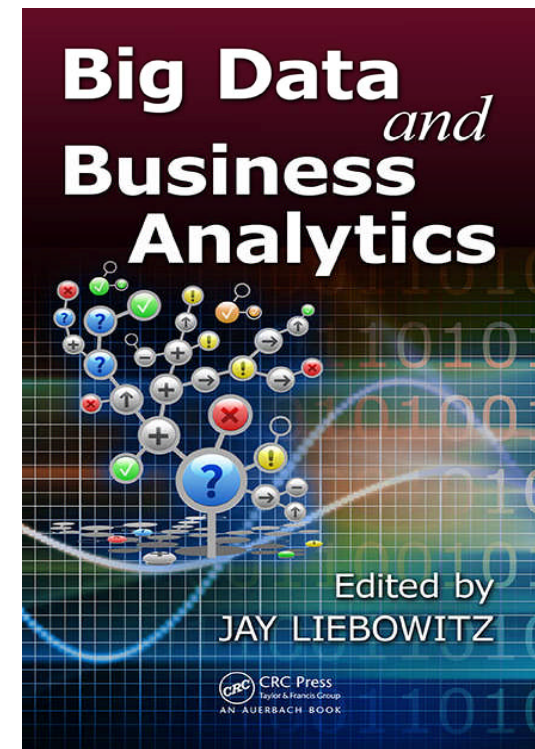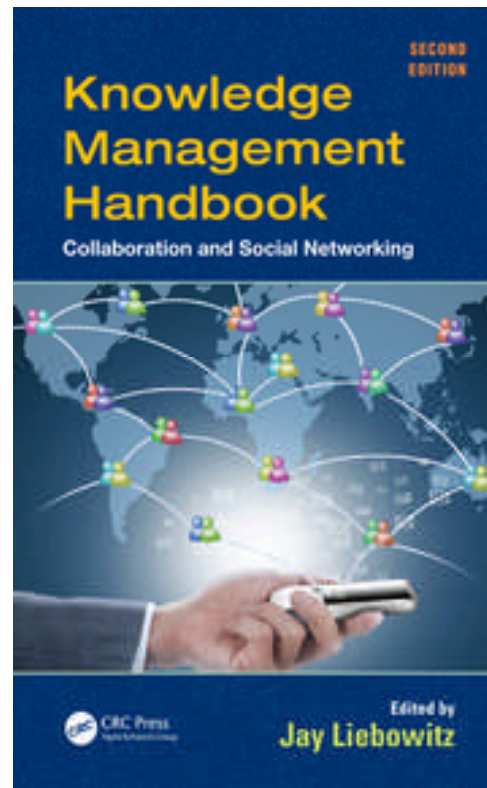
that adversaries could use to profile a   groups such that each group has at   relational or graph-structured data:

GRAZIE!