



Aalto University
School of Business

Management Information Systems

37C00100 – Spring 2019– April 2

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Topics in today's lecture

- Data, text and web mining, including
 - Research profiling and visualization
 - Opinion mining and Sentiment analysis
- Course wrap-up, including
 - Digital maturity research revisited
 - Question types and examples in the exam
 - Online Kahoot quiz (multiple-option questions similar to exam)

Learning objectives

After this lecture, you should

- know how do data / text / web mining differ from each other
- know the basics of text mining and visualization
 - Special case of research profiling
 - examples and pointers what tools to use in various situations
- know what is sentiment analysis and opinion mining
- know where can you study more the MIS course topics
- know the question types in the exam

Data, Text, and Web Mining

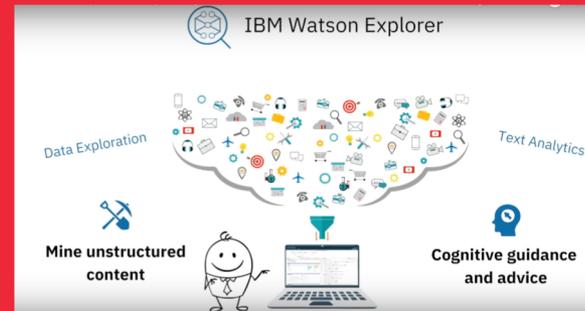
See an early text mining/big data example related to mobile phone brand discussion in Twitter at

<http://www.youtube.com/watch?v=PSq7hZ0shLs>



Or a newer Watson Explorer content miner example on car complaints data

<https://youtu.be/UEkBKHvaqcY>



Data, Text, and Web Mining

- **Data mining** is a process that uses statistical, mathematical, artificial intelligence, and machine-learning techniques to extract and identify useful information from large databases .
- **Text** from documents, e-communications, and e-commerce activities can also be mined.
 - *“Text mining or text analytics are broad umbrella terms describing a range of technologies for analyzing and processing semi-structured and unstructured text data.”* (Delen et al. 2012, p. 30)
- **Web mining**, or *Web-content mining*, is used to understand customer behavior, evaluate a Web site's effectiveness, and/or quantify the success of a marketing campaign.



Examples of data mining applications for identifying business opportunities

- **Retailing and sales.** Predicting sales, determining correct inventory levels and distribution schedules among outlets, and loss prevention.
- **Banking.** Forecasting levels of bad loans and fraudulent credit card use and which kinds of customers will best respond to new loan offers.
- **Manufacturing and production.** Predicting machinery failures; finding key factors that control optimization of manufacturing capacity.
- **Healthcare.** Developing better insights on symptoms and their causes and how to provide proper treatments.
- **Broadcasting.** Predicting which programs are best to air during prime time and how to maximize returns by interjecting advertisements.
- **Marketing.** Classifying customer demographics that can be used to predict which customers will respond to a mailing or Internet banners or buy a particular product as well as to predict other consumer behavior.

Text-Mining

- Textual data comprises **up to 80% of all information** collected – important to utilize it too!
- Text-mining helps organizations find the “hidden” content of documents, e.g. useful **relationships/patterns, sentiments/opinions** etc.
- Content that is mined include unstructured data from documents, text from emails and log data from Internet, among others.
- May be major source of competitive advantage (see e.g. Technology intelligence article at https://www.thevantagepoint.com/resources/articles/CI_May-Jun_05_Brenner.pdf).

Extra links: Text Analytics. Bridging the gap between quantitative and qualitative information

<http://www.informs.org/ORMS-Today/Public-Articles/June-Volume-39-Number-3/Text-analytics>

Text Analytics: Your Customers are Talking About You

http://www.cio.com/article/335715/Text_Analytics_Your_Customers_are_Talking_About_You

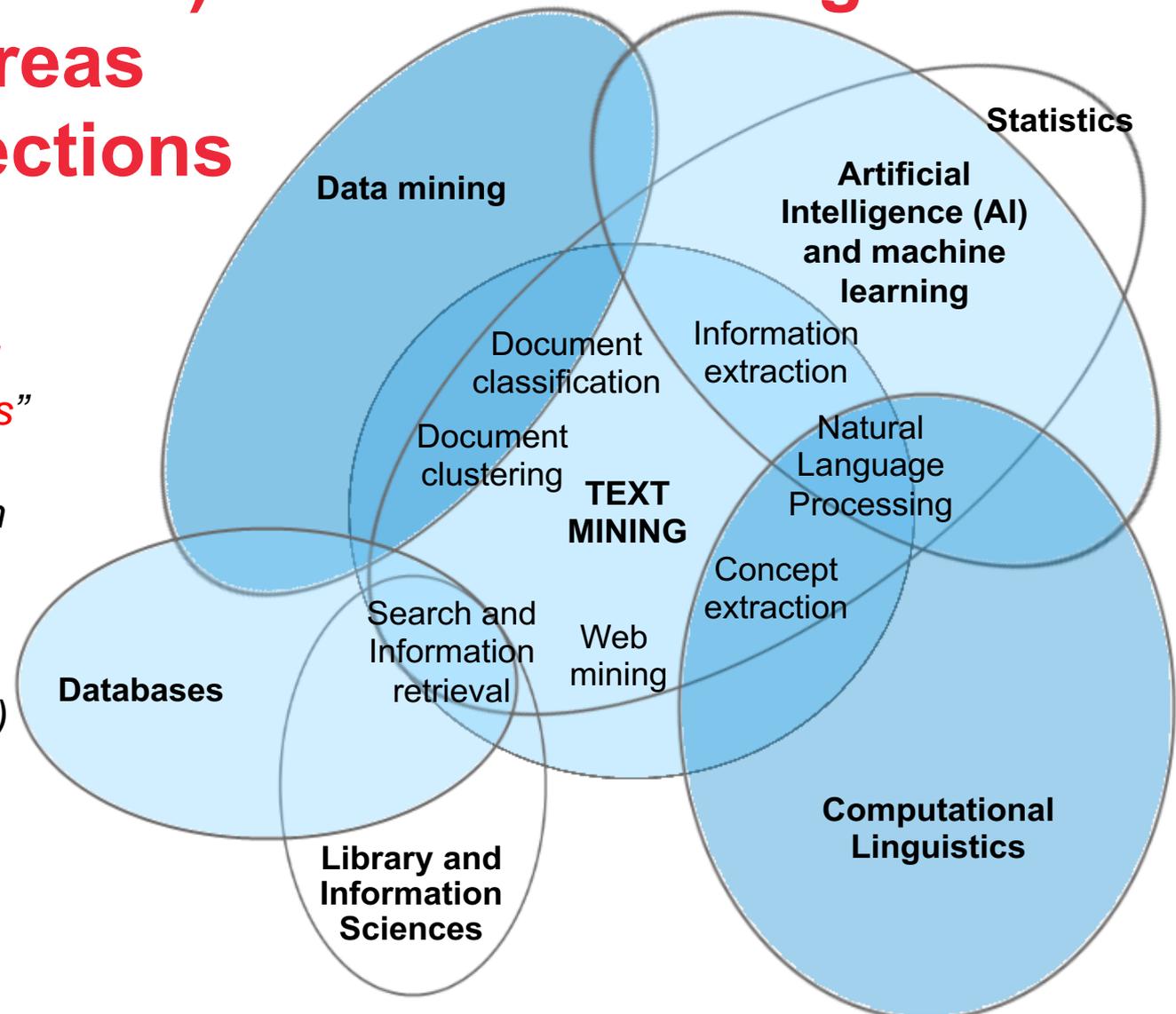
'Chief Listeners' Use Technology to Track, Sort Company Mentions

http://adage.com/digital/article?article_id=145618

Intersection of Text Mining and six related fields (bolded text). Seven technologies or practice areas at the intersections

*“The unifying theme behind each of these 7 technologies is **the need to “turn text into numbers”** so that powerful analytical algorithms can be applied to large document databases.”*

(Delen et al. 2012, p. 29)



Example from turning text into numbers: matrix of Authors & keywords, data downloaded from Scopus in CSV format (tool used: VantagePoint by SearchTechnology)

VantagePoint - Experience52389.vpt

Home Refine Analyze Report Editors View Help

New Analysis Dataset Open Save Save As Close Create Sub-dataset List Matrix Find Select All Copy Paint Manage Sheets Delete Sheet

File Edit Sheets

Title Window: Title, 0 Titles, 0 Selected

Analyst Guide: VantagePoint Analyst Guide, How-to Videos, Getting Started: Text-mining and VantagePoint, How-to Instructions: Common Analyses, Go to:

Reset		Authors																					
		# Records																					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
		5299	4071	2698	1336	1231	1062	918	836	692	651	550	504	464	455	452	435	435	424	409	408	399	389
Author Keywords		Show Values >= 1 and <= 46																					
		Cooccurrence # of Records																					
# Records		Experience	user experience	Experiential learning experiences	Quality of Experience	patient experience	Lived experience	phenomenology	qualitative research	Usability	learning	education	Qualitative	Adverse childhood experiences	design	experience sampling	Student experience	Customer Experience	emotion	Quality of Experience (CoE)	depression	gender	
8	74	Tscheligi M.	3	45	1					4					3				2				
9	71	Li J.	4	12		1	2	2	1		1	1			1			2	1	4			
10	69	Zhang H.	2	3			4		1											4			
11	68	Li Y.	7	2	1		2		1					1				1	1	3	1		
12	66	Zhang J.	6	6	1		2	1				1					1	1	1				
13	63	van Os J.							1												4		
14	62	Zhang L.	5	11	2		3	1			1		1				8		2	5		1	
15	61	Li X.	7	9		1	3									2				1	1		
16	61	Szczerbicki E.	2	1																			
17	60	Wang W.	5	10	1	5	5	2						2	1					4	1		
18	59	Myin-Germeys I.							2												1		
19	59	Zhang X.	3	12	1		3			1							11		1	1	2	3	
20	58	Lee J.	2	10	1			1		2		1				1						1	
21	52	Yang Y.	2	9	2		2	1	2		2								1	1	3		
22	51	Chen Y.	4	13	1	1	7	1								1			2	1	1		
23	51	Kim S.	3	6	1	1	2								1								
24	50	Liu J.	3	6	1	2	2				1							1	1	1			
25	50	Wang Z.	1	3			8												1	1		1	
26	49	Chen X.	3	10	1		3	1								2	1			1			
27	49	Hassenzahl M.		25						2						2	1		3				
28	46	Wang H.	6	10		1	2			1					1	1				2			
29	45	Obrist M.	2	25																			
30	44	Liu X.	4	8	1	1	3					1				2			1		3		
31	43	Li H.	3	7	2	1										1							
32	43	Sanin C.	1																				
33	42	Jr.		6	3	2	3	1									1	1					
34	41	Li Z.	3	5		1	2			1													
35	40	Wang L.	3	1			4				1	1						1					
36	39	Chen Z.	1	3		2	6				1												
37	39	Kim Y.	6	11	1		1			2												1	
38	38	Vaanänen-Vainio-Mattila K.		32												2							
39	37	Chen H.	5	4									1						1	7			
40	37	Silvia P.J.															9		3		1		
41	37	Xu Y.	1	1			5													1		1	
42	36	Chen J.	1	5		1	1	1							1				1	2			
43	36	Elliott M.N.						26														1	
44	36	Kim H.	1	7	1		5									1							

Example of
Natural Language Processing (NLP)
 Words from article titles are parsed both
 as single words and multi-word phrases
 along with frequencies their frequencies

(Scopus data, tool: VantagePoint)

# Instances	Title (NLP) (Phrases)	Multi Word Phrases
2883	experience	<input type="checkbox"/>
1068	effects	<input type="checkbox"/>
1052	role	<input type="checkbox"/>
937	impact	<input type="checkbox"/>
725	Learning	<input type="checkbox"/>
714	user experience	<input checked="" type="checkbox"/>
687	effect	<input type="checkbox"/>
658	Development	<input type="checkbox"/>
605	study	<input type="checkbox"/>
600	qualitative study	<input checked="" type="checkbox"/>
604	quality	<input type="checkbox"/>
585	influence	<input type="checkbox"/>
542	patients	<input type="checkbox"/>
530	case study	<input checked="" type="checkbox"/>
477	children	<input type="checkbox"/>
464	use	<input type="checkbox"/>
442	relationship	<input type="checkbox"/>
411	Case	<input type="checkbox"/>
372	experiential learning	<input checked="" type="checkbox"/>
358	Analysis	<input type="checkbox"/>
357	research	<input type="checkbox"/>
325	life	<input type="checkbox"/>
308	Implications	<input type="checkbox"/>
297	Evidence	<input type="checkbox"/>
287	living	<input type="checkbox"/>
283	perceptions	<input type="checkbox"/>
277	students	<input type="checkbox"/>
278	women	<input type="checkbox"/>
273	practice	<input type="checkbox"/>
257	adverse childhood experiences	<input checked="" type="checkbox"/>
262	time	<input type="checkbox"/>
237	application	<input type="checkbox"/>
236	review	<input type="checkbox"/>
224	challenges	<input type="checkbox"/>
221	education	<input type="checkbox"/>
224	care	<input type="checkbox"/>
215	factors	<input type="checkbox"/>
214	Knowledge	<input type="checkbox"/>
210	systematic review	<input checked="" type="checkbox"/>
208	attitudes	<input type="checkbox"/>
206	teaching	<input type="checkbox"/>
202	China	<input type="checkbox"/>
192	depression	<input type="checkbox"/>
188	Assessment	<input type="checkbox"/>
187	experiential avoidance	<input checked="" type="checkbox"/>
188	meaning	<input type="checkbox"/>

The manager's agenda

- *“It goes without saying that the most immediate agenda with respect to Big Data is operational. **People responsible for market research, process engineering, pricing, risk, logistics, and other complex functions need to master an entirely new set of **statistical techniques**.** .. Non-specialist managers need to understand enough about the possibilities and pitfalls of Big Data to translate its output into practical business benefits. **Data visualization** is emerging as critical **interface** between the specialist and the non-specialist.”*

Text mining example 1 (mining McKinsey Global Institute's Big Data report PDF). Tool used: DataRangers' TextMiner

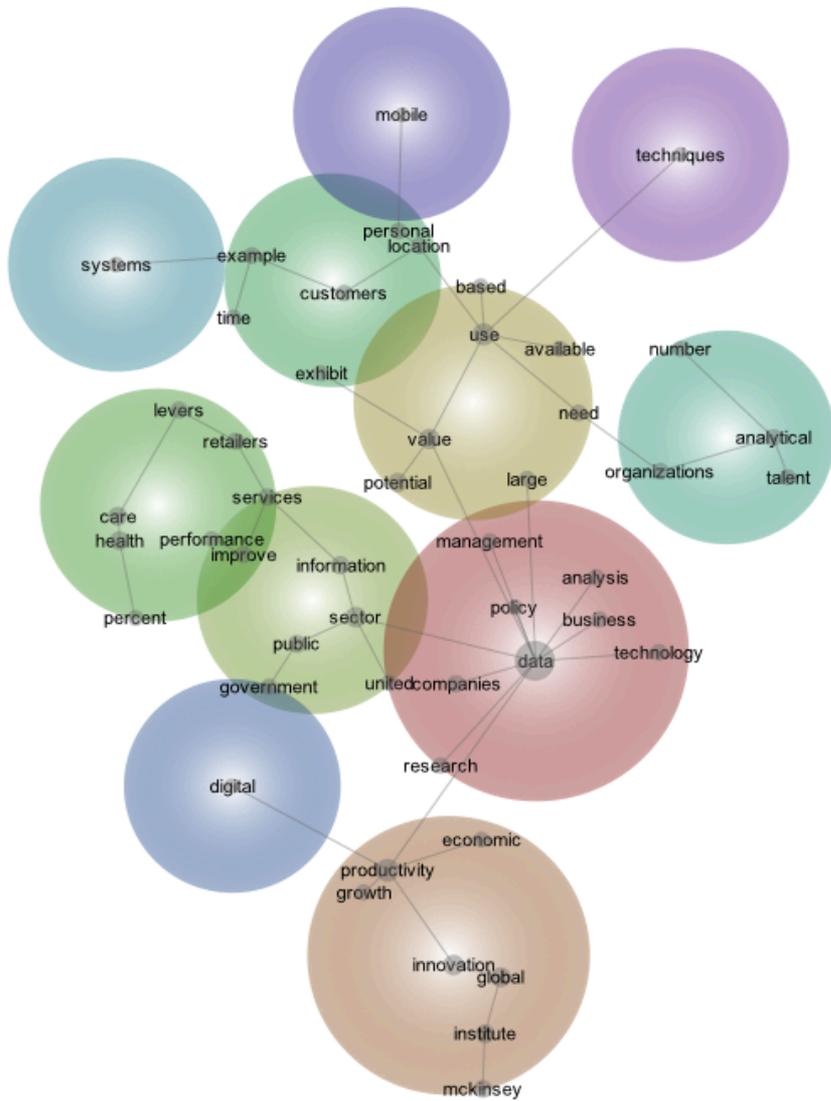
The screenshot displays the DataRangers' TextMiner interface. The main window is titled "DR-TextMiner - MGI_big_data_full_report.pdf". The interface includes a menu bar (File, Edit, View, Tools, Wizard, Help) and a toolbar with various icons. The central area is divided into several panes:

- Word list:** A table showing the frequency and percentage of words. The word "serv*" is highlighted in blue.
- Graph:** A network graph showing relationships between words. Nodes are labeled with words like "serv*", "valu*", "produc*", "sector*", "health*", "tran*", "public*", "inform*", and "provid*". Edges are labeled with connection counts.
- Search:** A search bar containing the text "big data" and a "Search" button.
- Document list:** A list of document snippets, with the first one starting with "75 - are already making better decisions by analyzing".
- Document:** A pane showing a snippet of text from the document, starting with "are already making better decisions by analyzing entire datasets from customers, employees, or even sensors embedded in products. Innovating new business models, products, and services Big data enables companies to create new products and services, enhance existing ones, and invent entirely new business models. Manufacturers are using data obtained from the use of actual products to improve".

At the bottom of the interface, there is a status bar showing "Total documents: 1141", "Selected documents: 173", and "Memory: 15 / 496 MB".

PDF available at http://www.mckinsey.com/Insights/MGI/Research/Technology_and_Innovation/Big_data_The_next_frontier_for_innovation

Text mining example 2: mining McKinsey Global Institute's Big Data report PDF (tool used: Leximancer by Leximancer.com)



← Themes Concepts Thesaurus Pathway Query →

Thematic Summary Detail Export

Theme	Connectivity	Relevance
data	100%	<div style="width: 100%;"></div>
productivity	79%	<div style="width: 79%;"></div>
use	64%	<div style="width: 64%;"></div>
sector	62%	<div style="width: 62%;"></div>
health	45%	<div style="width: 45%;"></div>
example	34%	<div style="width: 34%;"></div>
analytical	22%	<div style="width: 22%;"></div>
systems	04%	<div style="width: 4%;"></div>
digital	03%	<div style="width: 3%;"></div>
mobile	03%	<div style="width: 3%;"></div>
techniques	03%	<div style="width: 3%;"></div>

THEME: data
(data, companies, technology)

data (Hits: 1561)
Big data—a growing torrent
[more...](#)

companies (Hits: 155)
Given that European economies are similar to each other in terms of their stage of development and thus their distribution of firms, we believe that the average company in most industries in Europe has enough capacity to store and manipulate big data. In contrast, the per capita data intensity in other regions is much lower.
[more...](#)

technology (Hits: 139)
Big data techniques and technologies
[more...](#)

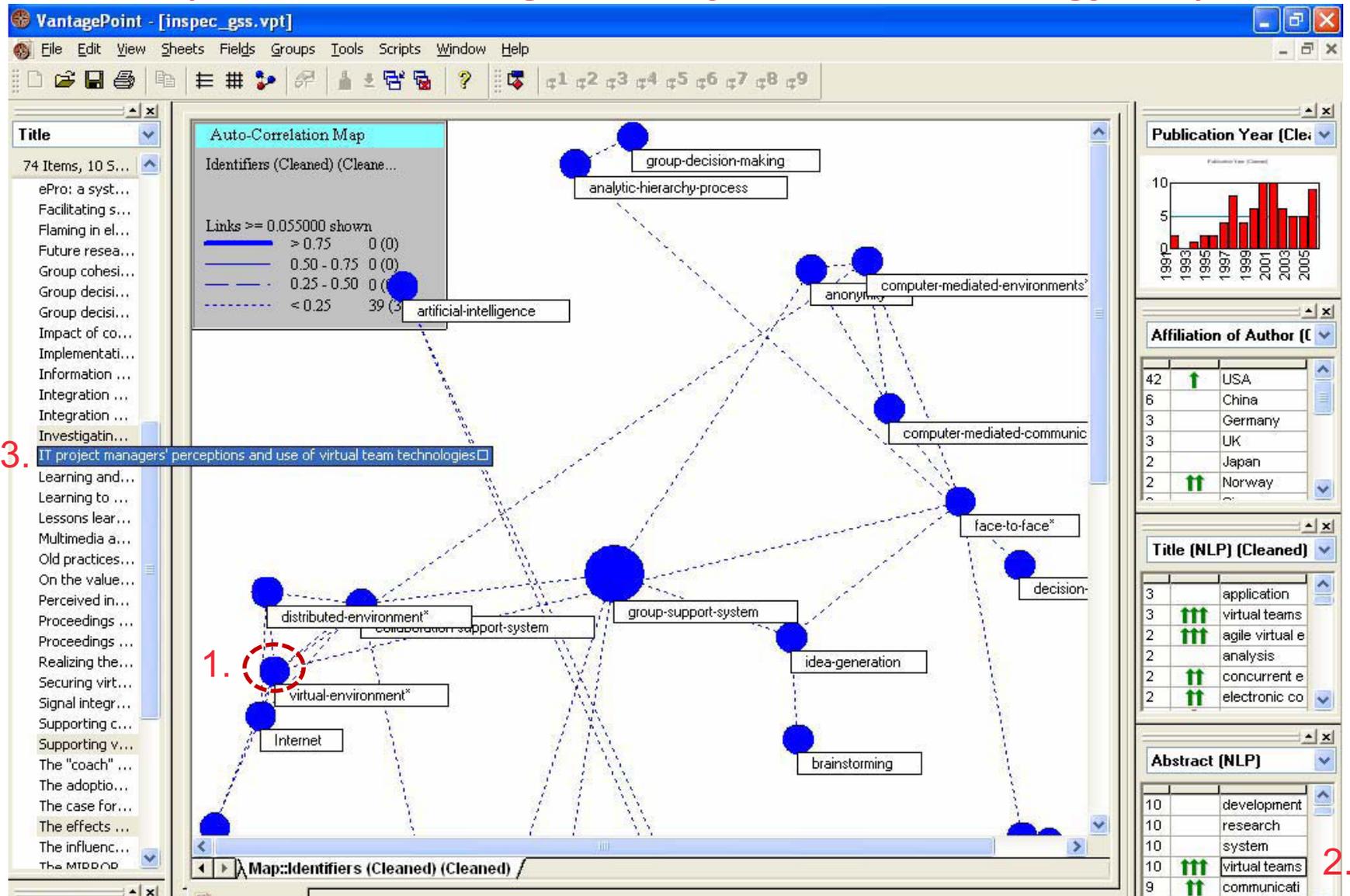
[Back to top](#)

THEME: productivity
(productivity, innovation, global, institute, mckinsey)

productivity (Hits: 408)
See the appendix for our productivity calculation.
[more...](#)

innovation (Hits: 291)
managerial innovations that complement IT investments in order to drive labor productivity gains. In some cases, a lag between IT investments and organizational adjustments has meant that

Text mining example 4: Mining *structured* scientific data on GSS research (tool used: VantagePoint by SearchTechnology Inc.)



Source: Bragge et al. (2007), "Enriching Literature Reviews with Computer-Assisted Research Mining. Case: Profiling Group Support Systems Research", PDF available at

<https://www.computer.org/csdl/proceedings/hicss/2007/2755/00/27550243a.pdf>

The data in bibliometric/scientometric studies is *structured* (fielded) text data from literature databases (or patent databases)

PT J
AU Park, EM
 Seo, JH
 Ko, MH
AF Park, Eun-Mi
 Seo, Joung-Hae
 Ko, Mi-Hyun
TI The effects of leadership by types of soccer instruction on big data analysis
SO CLUSTER COMPUTING-THE JOURNAL OF NETWORKS SOFTWARE TOOLS AND APPLICATIONS
LA English
DT Article
DE Big data; Crawling; Textmining; Leadership; Korea nation football team
ID ATHLETICS; BEHAVIOR; SPORTS

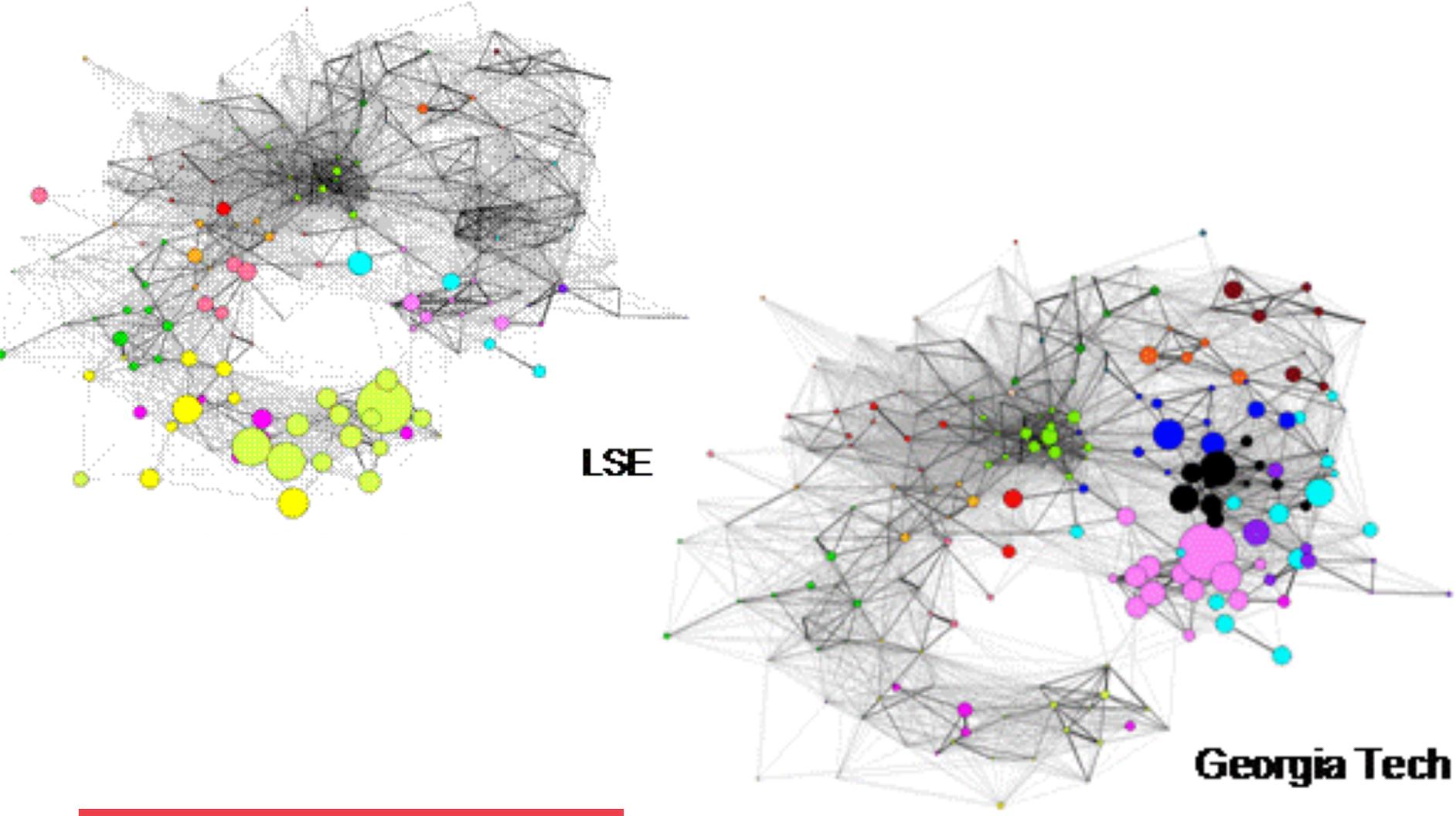
AB The purpose of the present study is to figure out football coaches' leadership styles. So far, numerous of coaches have coached South Korea's national team. Compared to other countries, the Korea Republic national team has changed coaches relatively often. In particular, owing to the result-centric Korean culture, if the national team had deplorable results in a specific match, the head coach would be fired right away. Of course, there were some successful and popular coaches. However, many other coaches ended up in a failure in the Korean national team. Therefore, there must be a difference in leadership styles between the successful and unsuccessful coaches. In this context, it would be critical to find out the traits of the successful coaches' leadership. Using text-mining techniques, the present study aims to establish different leadership type of football coaches. To this end, we analyzed the South Korean national football team coaches' leadership styles using text-mining techniques applied to the analysis of NAVER news. Our results suggest that successful leaders have important leadership elements, such as communication, trust, and belief.

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CR Bass B.M., 1985, BASS STOGDILLSHDB LE
 Bass M., 1995, MULTIFACTOR LEADERSH
 Burns J. M., 1978, LEADERSHIP
 Byung E.Y., 2014, J SPORT LEIS STUD, V56, P133
 CHELLADURAI P, 1984, J SPORT PSYCHOL, V6, P27
 Chelladurai P., 1982, TASK CHARACTERISTICS
 CHELLADURAI P, 1983, J SPORT PSYCHOL, V5, P371
 Cho B.N., 2006, BUS EC REV, V37, P1229
 Cho B.S., 2010, J COACH DEV, V12, P83
 Cho W.J., 2006, KOREA J SPORTS SCI, V15, P317
 Choi B.A., 2007, J COACH DEV, V9, P381
 CONGER JA, 1987, ACAD MANAGE REV, V12, P637, DOI 10.2307/258069
 DANIELSON RR, 1975, RES QUART, V46, P323
 Doherty AJ, 1996, J SPORT MANAGE, V10, P292
 Erle F.J., 1981, THESIS
 Fiedler Fred Edward, 1967, THEORY LEADERSHIP EF
 House P.J., 1971, ADM SCI Q, V16, P321
 Jin SC, 2015, CLUSTER COMPUT, V18, P999, DOI 10.1007/s10586-015-0452-x

PT=Publication type
AU=Authors
AF=Authors with full names
TI=Title of the article
AB=Abstract
CR=Cited references,
Etc.

Text mining example 5b: Research published by LSE and Georgia Tech scholars overlaid on the previous global science map – easy to compare profiles



Source: Rafols et al. 2010, "Science overlay maps: a new tool for research policy and library management", JASIST, <http://www.leydesdorff.net/overlaytoolkit/overlaytoolkit.pdf>

Dynamic Feedback System / Reflections: answers filtered clicking 'assignment' on the word cloud

- in this case a simple word cloud is useful!

Courses

Select your course

Management Information Systems

Students' reflection on course topics

Course topics

Filter by selecting a topic	No
Introduction to Management Information Systems	1
Assignment: Business Technology Trends	2
Collaborative IS and Knowledge Work	3
Assignment: Electronic Brainstorming and Voting with Stormboard	4
Gamification at Work	5
Assignment: Basics of Programming with Gamified Codecademy	6
Service Design: Process and Methods	7
Assignment: Service Design in Practice	8
Assignment: Building a Chatbot with Watson Assistant	14
Assignment: Exploring Data with Cognos Analytics	16
Text/Web/Data Mining and Research Profiling	17
Assignment: Visualizing Data with Tableau Public	18
Assignment: Text Mining with Leximancer	19

Word cloud, click a word to filter



Filtered responses

the near future

A good practical way of learning what to do. Assignment was pretty simple but I learned a lot

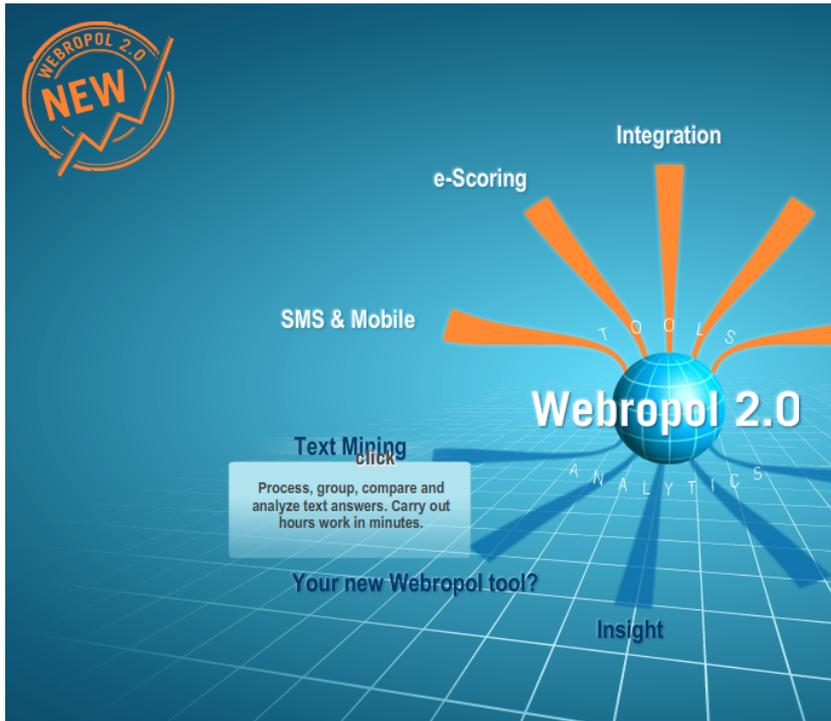
A very good assignment. I was able to chose a topic that I wanted to learn. Codecademy is a great platform. Presenting this tool to students was very useful.

A very simple but useful glimpse of programming, fun assignment!

Compared to the instructions the assignment topic was a bit confusing. They did not really apply to the case imparitcar.

Course structure and themes were presented and rationalized very well. The presentation supported assignment 1.

Text mining is nowadays integrated to web survey products for analyzing open-ended questions



Sources:

<http://atyoursurveys.blogspot.com/2009/12/webropol-brings-text-mining-to-its.html>

<http://w3.webropol.com/our-product/analyse-and-visualise/>

WEBPOL

WEBPOL

THE OFFICIAL WEBROPOL BLOG

AT YOUR SURVEYS

Monday, 7 December 2009

Webropol brings Text Mining to its online survey software



We have some exciting news for you! As first in the world, [Webropol](#) brings Text Mining capabilities to online survey software. Working as part of the Webropol toolset, the Text Mining solution allows for analysis, classification and grouping of textual answers based on occurring themes, keywords and respondent background data. Thanks to this toolset organisations

can now process and analyse unstructured survey data more quickly, thoroughly, and objectively than ever before.

"It is unfortunate how often one runs into situations where managers would like to ask customers for free feedback, but will not do so in the fear of having to read sheet after sheet of answers. The Text Mining solution opens up completely new ways to use unstructured data for business intelligence purposes when hours worth of manual work is done in minutes.", says UK Country Manager **Mukesh Bassi** from Webropol.

By comparing textual answers based on other responses and on background data managers get an insight into how feedback, suggestions, and ideas vary depending on e.g. employee satisfaction or customer life cycle. This will also help organisations set up and fine-tune their numeric customer and employee metrics to measure the things that are the most relevant.

"The Text Mining solution suits excellently both short surveys, and more complex research, especially when you are asking respondents for their ideas, feedback, or advice. It is virtually impossible to collect all ideas unless you gather answers in free form", Mukesh points out.

The Text Mining solution works as part of the Webropol survey software, but data can be brought for analysis from external sources as well.



Welcome to At Your Surveys!



"Webropol is easy, quick and reliable to use"

THE OFFICIAL WEBROPOL BLOG

[Webropol](#) is an online solution for conducting surveys, gathering data, managing feedback, and reporting data.

Last year 30 000 users in 2000 organisations conducted surveys and gathered information in 17 languages exceeding 5 million responses.

[Visit our website!](#)



Open source/free software for text mining



- RapidMiner, <https://rapidminer.com/products/studio/> or <https://rapidminer.com/solutions/text-mining/>
 - Tutorial on using it, e.g.:
<http://auburnbigdata.blogspot.fi/2013/03/text-processing-tutorial-with-rapidminer.html>
 - Google for other tutorials (including youtube videos)
- A list of other options
<http://www.kdnuggets.com/software/text.html#free>

KNIME Analytics platform is another option (open source)

However, if you have skills in coding, use Python or R (recommendation by out data-mining prof. Pekka Malo)



PRODUCTS / SOLUTIONS / LEARNING / PARTNERS / COMMUNITY / ABOUT

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/ Retail

/ Cross Industry

/ Government

Solutions

KNIME is used in a wide variety of areas. We are providing a number of templates (or blue prints) for example applications for some of these areas below. We will keep adding to this list over time (and if you have an interesting addition, why don't send us an email?). Note that on our [example server](#), you can also access wealth of workflows that demonstrate how to use some of the techniques, such as test and network mining in a more application agnostic way.

Customer Intelligence



- [Churn Analysis](#)
- [Churn Prediction](#)

Social Media



- [Social Media Sentiment Analysis](#)
- [Social Media Leader/follower Analysis](#)

Finance



- [Credit Scoring](#)



Web mining

- Web mining is the application of data mining techniques to discover actionable and meaningful patterns, profiles, and trends **from Web resources**.
- Web mining is used to understand customer behavior, evaluate a Web site's effectiveness, and quantify the success of a marketing campaign.
 - Research example: Bragge, J., Kallio, H. and Sunikka, A. (2012), "An Exploratory Study on Customer Responses to Personalized Banner Messages in the Online Banking Context", *Journal of Information Technology Theory and Application*, 13(3).
 - Experiment on a Finnish online bank, **3 different bank services were promoted with personalized marketing messages on the online bank** (after authentication to the service), *see next slide*
 - Predictive analytics was used for selecting experiment customers for group 2
 - **Click-stream analysis** was used to study the results (comparisons were made to default banners, and to direct mail marketing campaigns).

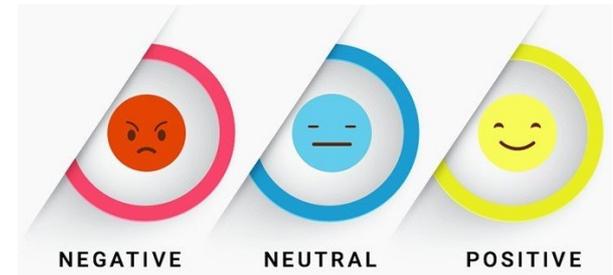
Research example of web mining, continued

Table 1: Three Online Study Groups

	Group 1. Net bank statement (NBS)	Group 2: Loan	Group 3: X-card
Promotional message	Message 1 (M1): Problems with archiving? Switch your bank account statement to the net.	M2: Have you considered that credit loans from banks are less expensive?	M3: Your X-card is about to expire. You can switch easily to Y-card on the net.
Number of customers	281	300	293
Criterion for customer selection	Customers had no electronic bank account statement service.	Customers only had mortgage loans from the bank.	The bank card that the customers were using was about to be withdrawn from the market.
Picture used in the personalized banner			

Source: Bragge, Sunikka and Kallio (2012), *JITTA*

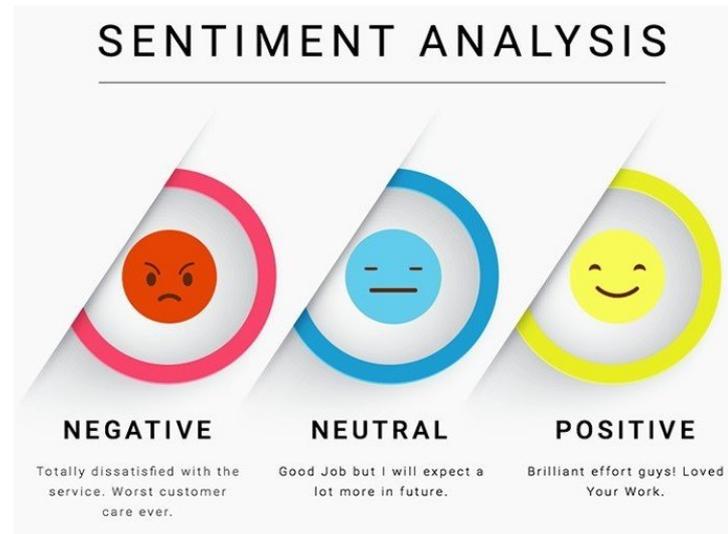
Sentiment analysis



- “Sentiment analysis is a type of text research aka mining. It applies a mix of statistics, natural language processing (NLP), and machine learning to identify and extract subjective information from text files, e.g., a reviewer’s feelings, thoughts, judgments, or assessments about a particular topic, event, or a company and its activities as mentioned above.

This analysis type is also known as *opinion mining* (with a focus on extraction) or *affective rating*. Some use the term *sentiment classification* and *extraction* as well. Regardless of the name, the goal of sentiment analysis is the same: **to know a user or audience opinion on a target object by analyzing a vast amount of text from various sources.”**

Use cases of sentiment analysis



- Brand monitoring
- Competitive research
- Flame detection and customer service prioritization
- Product analysis
- Market research and insights into industry trends
- Workforce analytics / employee engagement monitoring

Opinion mining and sentiment analysis, book and other resources by Distinguished Computer Science Prof. Bing Liu



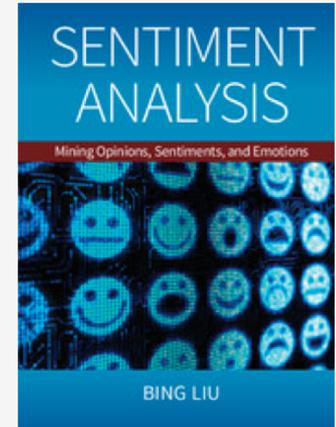
Opinion Mining, Sentiment Analysis, and Opinion Spam Detection

Feature-Based Opinion Mining and Summarization
(or Aspect-Based Sentiment Analysis and Summarization)

[Detecting Fake Reviews](#)

(Media coverage: [The New York Times](#), [The Economist](#), [BusinessWeek](#) and [more ...](#))

[Opinion Lexicon](#) ----- [Datasets](#) ----- [Talks](#) ----- [Publications](#)



New Book:  [Sentiment Analysis: mining opinions, sentiments, and emotions](#). Cambridge University Press, 2015.

Book: [Sentiment Analysis and Opinion Mining](#) (Introduction and Survey), Morgan & Claypool, May 2012.

See "Feature-Based Opinion Mining and Summarization" in [Microsoft Live/Bing Search](#) and [Google Product Search](#) ([paper](#)).

- **Note:** I don't know the techniques used by [Microsoft Live/Bing](#) (9/28/2007), but [Google has a paper](#). To see the model, please check out (Hu and Liu, KDD-2004) and (Liu et al, WWW-2005) below, or the books above (better). Try search for a camera and click on reviews. You will see summarized user opinions on product features/aspects in a bar chart.

NLP Handbook Chapter: [Sentiment Analysis and Subjectivity](#), 2nd Edition, Eds: N. Indurkha and F.J. Damerau, 2010.

Opinion Parser: my sentiment analysis system has been licensed to two companies.

- The system analyzes **sentiments**, **opinions** and **emotions**, extracts **sentiment targets: entities, topics** and their **aspects/features**, and handles **comparative sentences**.
- I cannot make the system open-source due to its commercial use. If you want to know how it works, please read [my new sentiment analysis book](#), which gives a lot of details.

Tutorial: [Sentiment Analysis Tutorial](#) - ([references](#)), given at [AAAI-2011](#), August 8, 2011 - ([Check out the new book](#))

Interesting Piece from [New Republic](#): If you want to be a successful novelist, should you be sentimental in your writing or not?

Recent Keynote and Invited Talks (not updated) ([Older Talks](#))

1. Invited Talk. "Sentiment Analysis with Lifelong Learning." ETS, December 7, 2015.
2. Invited Talk. "Sentiment Analysis with Lifelong Learning." Brigham Young University, December. 3, 2015.
3. Keynote speech. "Sentiment Analysis, Lifelong Learning and Intelligent Personal Assistants." The 2015 Conf. on Technologies and Applications of Artificial Intelligence (TAAI-2015). Taiwan, Nov. 20-22, 2015.
4. Invited talk. "Sentiment analysis and lifelong machine learning." Frontiers in Computational Mathematics: AMS Central Fall Sectional Meeting. October 2-4, 2015.

<https://www.cs.uic.edu/~liub/FBS/sentiment-analysis.html>

Comprehensive review article on OM&SA

ca. 8000 citations in Scholar.google.com!

Opinion mining and sentiment analysis

Bo Pang¹ and Lillian Lee²

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² *Computer Science Department, Cornell University, Ithaca, NY 14853, U.S.A., llee@cs.cornell.edu*

Abstract

An important part of our information-gathering behavior has always been to find out what other people think. With the growing availability and popularity of opinion-rich resources such as online review sites and personal blogs, new opportunities and challenges arise as people now can, and do, actively use information technologies to seek out and understand the opinions of others. The sudden eruption of activity in the area of opinion mining and sentiment analysis, which deals with the computational treatment of opinion, sentiment, and subjectivity in text, has thus occurred at least in part as a direct response to the surge of interest in new systems that deal directly with opinions as a first-class object.

This survey covers techniques and approaches that promise to directly enable opinion-oriented information-seeking systems. Our focus is on methods that seek to address the new challenges raised by sentiment-aware applications, as compared to those that are already present in more traditional fact-based analysis. We include material on summarization of evaluative text and on broader issues regarding privacy, manipulation, and economic impact that the development of opinion-oriented information-access services gives rise to. To facilitate future work, a discussion of available resources, benchmark datasets, and evaluation campaigns is also provided.

Sentiment analysis research on *financial news* has been done at our ISM department by prof. Pekka Malo's group

Learning the Roles of Directional Expressions and Domain Concepts in Financial News Analysis

Abstract—Rapid development of natural language processing technologies has paved way for automatic sentiment analysis and emergence of robo-readers in computational finance. However, the technology is still in its nascent state. Distilling sentiment information from unstructured sources has turned out to be a complicated and strongly domain-dependent problem. To emulate the human ability to recognize financial sentiments in natural language by using machines, we need to provide them with (i) necessary ontological knowledge on the relevant domain-concepts; and (ii) learning strategies that help the machines to combine this knowledge with the syntactic structures extracted from text. In this paper, we present a knowledge-driven tree kernel framework for sentence-level analysis of financial news sentiments. Comparisons with linear kernels and classical lexicon-based systems suggest that significant performance gains can be achieved by incorporating information on financial concepts and their grammatical context. The framework is decomposable into learning, knowledge and syntactic structure components. Contribution of each part is separately examined using a human-annotated phrase-bank with close to 5000 sentences collected across a number of financial news sources. The proposed sentiment analysis framework is flexible and can be applied also outside financial domain. To evaluate cross-domain performance, a further comparison of the algorithms is done with datasets from non-financial domains including movie reviews and general political discussions.

I. INTRODUCTION

Sentiment analysis is often viewed as a strongly domain dependent problem [23]. An expression which can be considered to have a clear prior-polarity (or sentiment) in one domain

need to be considered: what are the conceptual rules that govern the formation of sentiments in finance; how much and what type of background information should be provided; what ~~grammatical information is relevant in finance; what kind of~~

Good Debt or Bad Debt: Detecting Semantic Orientations in Economic Texts

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- Malo, P., Sinha, A., Takala, P., Ahlgren, O. and Lappalainen, I. (2013): "Learning the Roles of Directional Expressions and Domain Concepts in Financial News Analysis." To appear in: *Proceedings of IEEE International Conference on Data Mining Workshops (SENTIRE-2013)*. IEEE Press.
- Malo, P., Sinha, A., Takala, P., Korhonen, P. and Wallenius, J. (2013): "Good debt or bad debt: Detecting semantic orientations in economic texts." *Journal of the American Society for Information Science and Technology*.
- Latest research of Malo et al. "Non-parametric Structural Change Detection in Multivariate Systems", <https://arxiv.org/abs/1805.08512>

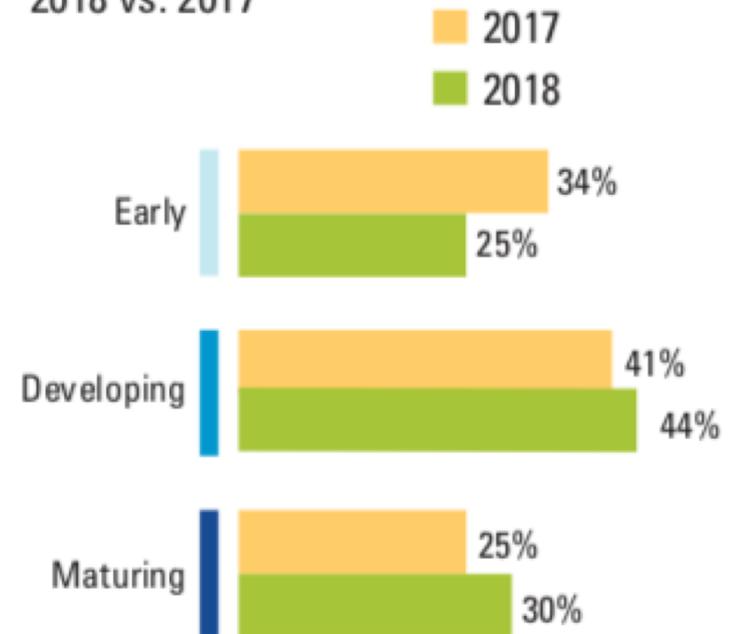
Brief course wrap-up

MIT SMR / Deloitte survey on companies' digital maturity - revisited from first lecture

Current digital maturity
Percentage of all 2018 study survey respondents



Digital maturity improvement
2018 vs. 2017



Source: Kane et al. (2018), "Coming of age digitally", *MIT Sloan Management Review* with Deloitte Digital, <https://www2.deloitte.com/content/dam/Deloitte/nl/Documents/technology/deloitte-nl-consulting-coming-of-age-digitally.pdf>

***Survey of over 4300 respondents and 17 interviews in 123 countries & 28 industries in Fall 2017.**

What is the biggest difference between working in a digital vs. a traditional environment?

PACE OF BUSINESS: Speed, rate of change

23%

CULTURE AND MINDSET: Creativity, learning, risk-taking

19%

FLEXIBLE, DISTRIBUTED WORKPLACE: Collaboration, decision-making, transparency

18%

PRODUCTIVITY: Streamlined processes, continuous improvement

16%

IMPROVED ACCESS TO, USE OF TOOLS: Greater data availability, technology performance

13%

CONNECTIVITY: Remote working, always on

10%

OTHER/NO DIFFERENCE

1%

What is the most important skill organizational leaders should have to succeed in a digital workplace?

TRANSFORMATIVE VISION: Knowledge of market and trends, business acumen, problem solver

22%

FORWARD-LOOKING: Clear vision, sound strategy, foresight

20%

UNDERSTANDS TECHNOLOGY: Prior experience, digital literacy

18%

CHANGE ORIENTED: Open-minded, adaptable, innovative

18%

STRONG LEADERSHIP: Pragmatic, focused, decisive

11%

OTHER: For example, collaborative, team builder

11%

Skills, what makes digital leadership different?

- **Transformative vision (22%)**
 - Ability to anticipate markets and trends, make savvy business decisions, and solve tough problems in turbulent times
- **Forward-looking perspective (20%)**
 - Having a clear vision, sound strategy and foresight
- **Digital literacy – understanding technology (18%)**
 - Respondents appreciate previous experience in a technology leadership role but also say **leaders need to have general digital literacy**, as opposed to hard-core tech skills like programming or data science.
 - digital literacy supports the two previous skills
- **Adaptability – the leader must be change-oriented (18%)** - that is, open-minded, adaptable, and innovative
 - Leaders can update their knowledge through formal continuing education, in-house training, cross-generational reverse-mentoring programs, or via numerous online programs.

About leadership - core skills stay the same!

Even though some things change with respect to digital leadership, not everything does. One of the **biggest pitfalls is to ignore the fundamentals of good leadership in the face of digital change.**

- **Clearly articulating the value that change will bring — and investing accordingly**
- **Owning the transformation**
 - **When executives delegate responsibility for digital business to the technologists, it is a recipe for near-certain failure.** The authors have seen technologists flawlessly implement enterprise social media or collaboration platforms without conducting any training or behavioral change initiatives to accompany the launch. Result: employees don't actually use it.
 - Digitally maturing companies are twice as likely to situate digital efforts in the CEO's office (and not in functional areas such as IT or marketing)
- **Equipping employees to succeed (time & space, training etc)**
 - In the context of their existing job responsibilities, employees typically don't have the time or the know-how to figure out new ways of working on the fly.

Strategy: Who leads digital progress?

Respondents in digitally maturing companies say their CEO's office is primarily heading up transformation efforts. In early-stage companies, it's often IT.

EARLY STAGE	DEVELOPING	DIGITALLY MATURING
Information technology 23%	CEO's office 31%	CEO's office 41%
CEO's office 22%	Information technology 20%	Information technology 16%
Marketing 10%	Marketing 9%	Marketing 7%
Operations 7%	Operations 7%	Product development 7%

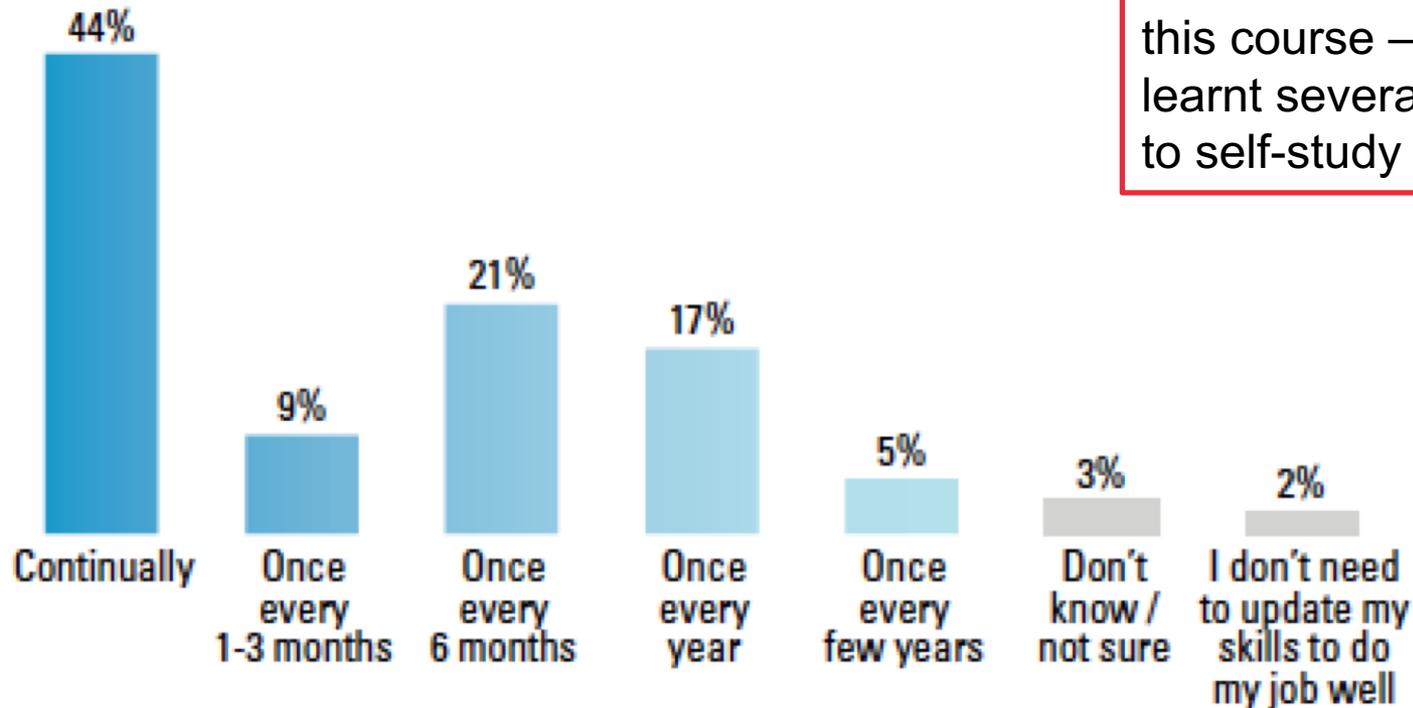
PERCENTAGES REFLECT THOSE RESPONDENTS RANKING THE CHOICE AS NO. 1.

Developing the Right Muscles, Mindsets, & Mettle

- **Hire digital leaders to get the ball rolling**
 - Make co-called anchor hires to catalyze the process
 - **Regularly refresh your senior team’s digital literacy.**
 - If a company’s leadership team graduated more than five years ago, the odds are strong that their digital literacy needs to be updated if it hasn’t been done already. **Data and analytics, AI, blockchain, autonomous vehicles, additive manufacturing, virtual and augmented reality, and other emerging technologies** are poised to radically reshape the **business environment over the next decade**. Certainly, most executives don’t have the time, skill set, or inclination to become sophisticated data scientists or software developers. **Nevertheless, virtually all executives are capable of understanding new technologies at a strategic level so that they can make decisions accordingly.**
 - **Create an environment where new leaders can step up**
 - No time to wait for marching orders to deal with every situation!
 - **Cultivate a culture of experimentation**
 - From “failure is not an option” to “*failing forward*” – enables learning by trial
 - **We need leaders who can “*be the change we seek*”**
-

Updating skills regularly is a must in the current digital environment!

How often do you need to update your skills to do your job effectively in a digital environment?



Percentages do not total 100 due to rounding.

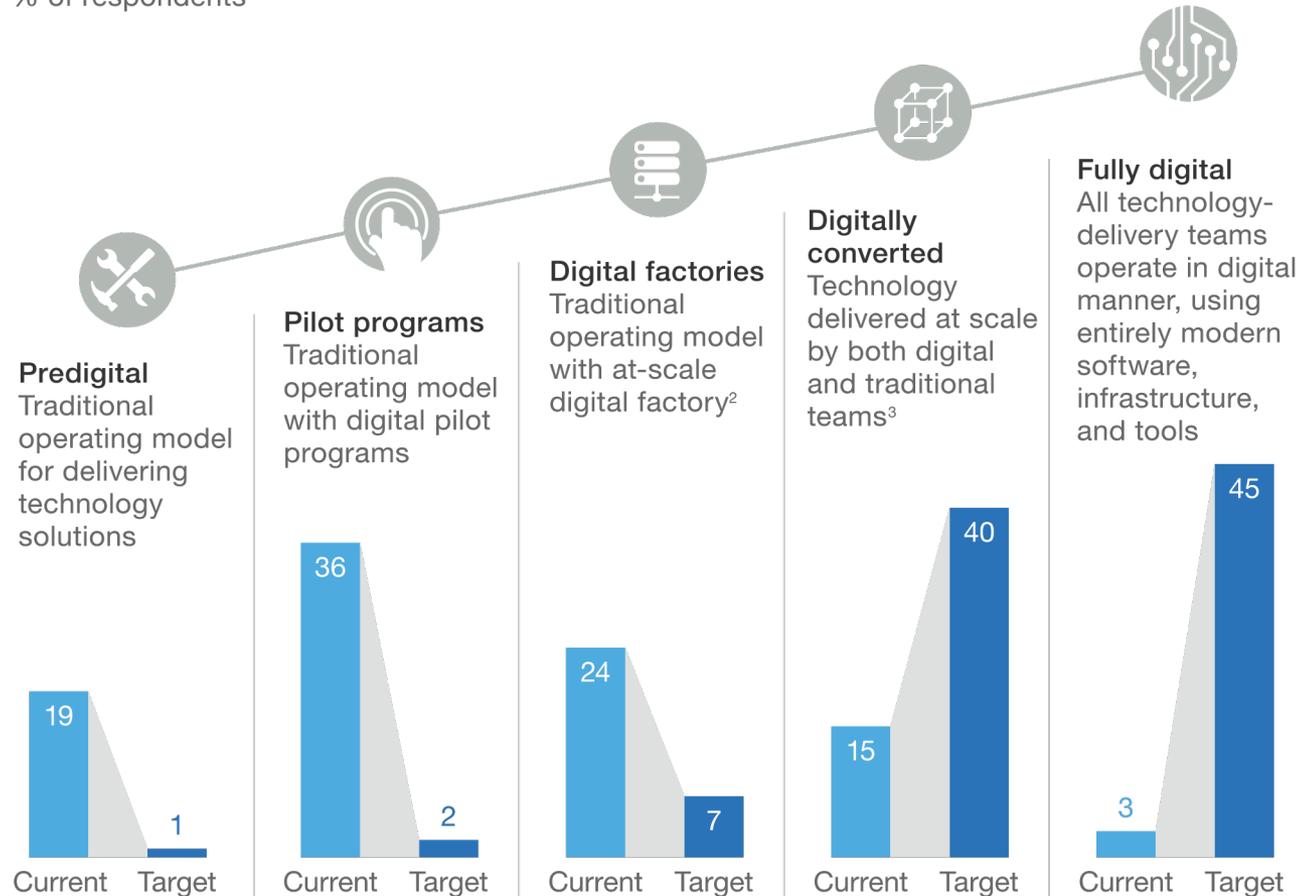
Besides learning the basics of several business technologies in this course – you have learnt several ways how to self-study them! 😊

McKinsey's latest digital survey (N=567)

- On average, respondents expect **40 % of their IT workforces will need to be fundamentally retrained or replaced** in the coming years to close the skill gap and meet the IT organization's future needs.
- The companies that are **best at core IT have made more progress** in becoming fully digital than other companies.
- The **best IT performers** have been much more **proactive in embracing changes** to their technology and to the ways people work.
- The best core IT performers are focusing more and performing better than others on **talent management**—, being effective at each part of the talent-management process, from workforce planning to engaging and retaining top talent. They estimate 29% need to be retrained or replaced (vs. 40% on average).

Respondents want their organizations to be digitally converted or fully digital, but less than 20% say they are there now

Current and target state of organizations' digital operating models,¹
% of respondents



¹These questions were asked only of respondents who said their organizations had pursued digitization in the past 2 years, and those who answered “don’t know” are not shown; n = 274.

²That is, a group of delivery teams is dedicated to building digital products and is largely separate from the traditional technology organization.

³Teams are not siloed or incubated and are governed by a single operating model.

Artificial intelligence (AI) readiness in European countries varies largely, and all EU countries are behind USA

Countries ranked by key components of AI-readiness index, %



”Tackling Europe’s gap in digital and AI”,
 McKinsey Global Institute, Discussion paper,
 February 2019, available at:
<https://www.mckinsey.com/featured-insights/artificial-intelligence/tackling-europes-gap-in-digital-and-ai>



Contents of the course book

PART I: FOUNDATIONS

Ch. 1 : Information Systems (IS) and the role of general and functional managers

Ch. 2 : IS Defined

Ch. 3 : Organizational IS and their Impact

PART II: COMPETING IN THE INTERNET AGE

Ch. 4 : The Changing Competitive Environment

Ch. 5 : Electronic Commerce: New Ways of Doing Business

PART III: THE STRATEGIC USE OF IS

Ch. 6 : Strategic IS Planning

Ch. 7 : Value Creation & Strategic IS

Ch. 8 : Value Creation with IS

Ch. 9 : Appropriating IT-Enabled value Over Time

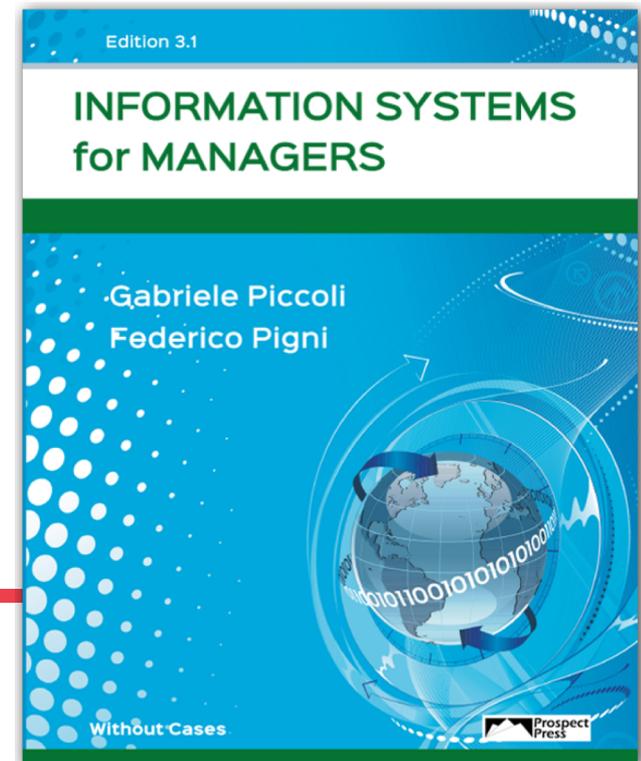
PART IV: GETTING IT DONE

Ch. 10 : Funding & Governance of IS

Ch. 11 : Creating IS

Ch. 12 : IS Trends

Ch. 13 : Security, Privacy & Ethics



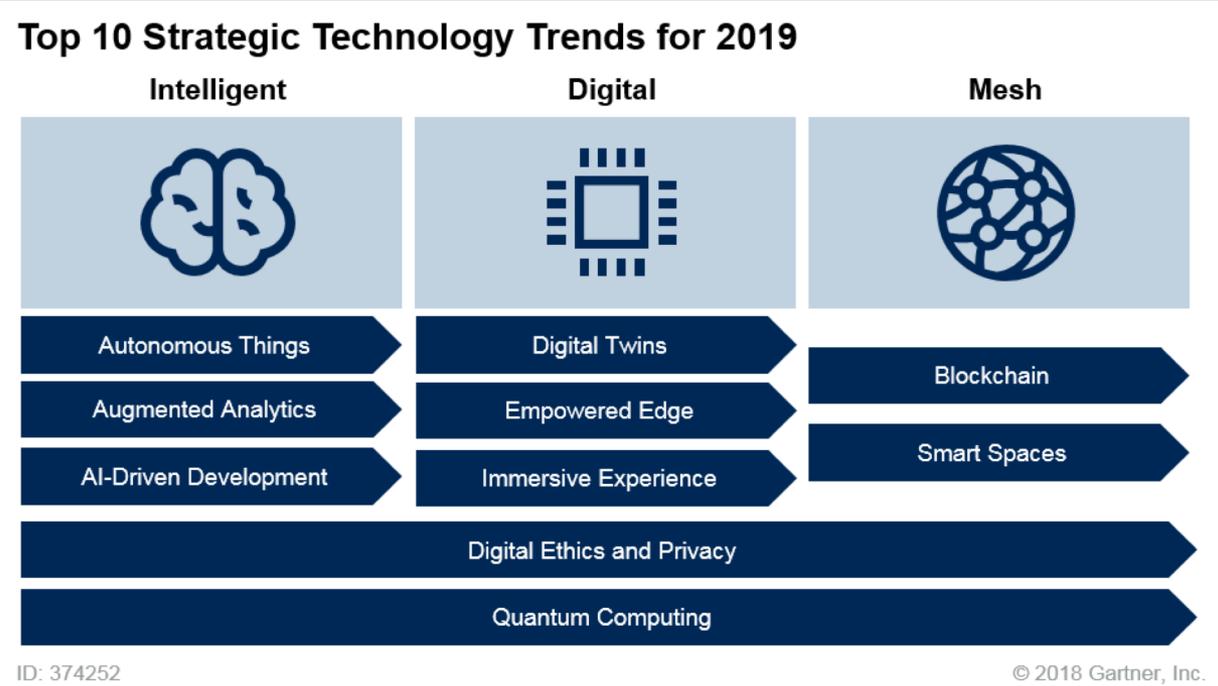
14 *Learning Objectives* set by the ACM and AIS for a course on the Foundations of IS (= MIS)

Students should learn to:

1. Understand how and why IS are used today.
2. Explain the technology, people, and organizational components of IS.
3. Understand globalization and the role IS has played in this evolution.
4. Understand how businesses are using IS for competitive advantage vs. competitive necessity.
5. Understand the value of IS investments as well as learn to formulate a business case for new IS, including estimation of both costs and benefits.
6. Know the major components of an IS infrastructure.
7. Mitigate risks as well as plan for and recover from disasters.
8. Understand how IS are enabling new forms of commerce between individuals, organizations, and governments.
9. Be aware of emerging tech's that enable new forms of communication, collaboration, and partnering.
10. Understand how various types of IS provide the information needed to gain business intelligence to support the decision making for the different levels and functions of the organization.
11. Understand how enterprise systems foster stronger relationships with customers and suppliers and how these systems are widely used to enforce organizational structures and processes.
12. Understand how organizations develop and acquire IS and IT.
13. Understand how to secure IS resources, focusing on both human and technological safeguards.
14. Evaluate the ethical concerns that IS raise in society and the impact of IS on crime, terrorism, and war.

MIS course has introduced top technology trends for 2019

Gartner:



Deloitte:

- AI-fueled organizations | 19
- NoOps in a serverless world | 39
- Connectivity of tomorrow | 57
- Intelligent interfaces | 71
- Beyond marketing: Experience reimaged
- DevSecOps and the cyber imperative | 1

Accenture:



- <https://www.gartner.com/smarterwithgartner/gartner-top-10-strategic-technology-trends-for-2019/>
- <https://www.accenture.com/us-en/insights/technology/technology-trends-2019>
- <https://www2.deloitte.com/insights/us/en/focus/tech-trends.html>

An aerial photograph of a city, likely Helsinki, showing a dense cluster of multi-story buildings with prominent red-tiled roofs. The buildings are arranged in a grid-like pattern with some irregularities. In the center-right, there is a large, circular, light-colored pond or plaza. The lighting suggests a bright day, with shadows cast by the buildings. The overall scene is a high-angle, wide-area view of an urban environment.

Course goal 1: SEE THE BIG PICTURE !

M. Souranto 2009

A wooden dock extends from the foreground into a calm lake. Two wooden benches are positioned on the dock, one on each side of a central path. The water is still, reflecting the clear blue sky and the distant forest. The overall scene is peaceful and serene.

T

Course goal 2: KNOWING IS RELAXING.

"T-SHAPED PEOPLE" ARE WANTED!

Hopefully the MIS course has been able to provide you the BIG picture of using IS & IT in organizations, and also to get you interested in studying them in more detail!



Pictures from a presentation by CEO Elina Björklund (Aalto BIZ alumna), showing the results of Reima's digital transformation she has lead since 2012.

- Keynote speech at Women in Tech Forum, October 11, 2017
See 30 min recording at:

<https://www.youtube.com/watch?v=jWSA21UHEHg>

Björklund was nominated Digital Leader of the Year 2017 and Aalto BIZ alumna of the year in 2018

<https://www.aalto.fi/news/introducing-the-school-of-business-alumna-of-the-year-2018-elina-bjorklund>



Reima 2011

Net sales 56 Meur
Wholesale 95%
Finland > 50%
2 Reima stores
No Ecommerce
4 brands

Reima 2017

110 Meur
75%
< 20%
45 Reima stores
15% of sales
2 brands



Choose the digital branch you are most interested in and develop deep skills in that!



J. Bragge 2016

Further learning options at our Information & Service Management (ISM) department

Many issues dealt briefly in this broad introductory course can be studied more thoroughly in our dedicated courses:

- e.g. **Programming 1 & 2, Information Systems Development, Data Resources Management, Business Intelligence, Strategic IT Management, Information Economy, Data Science for Business I & II, DigitalISM Challenge, Book exam on Digital transformation, Project management and consulting practice**
- see course offerings at our ISM Bachelor and Master programs on the next two slides for 2018-2020, and on the web:
 - <https://into.aalto.fi/display/fikandibiz/Tieto+ja+palvelujohtaminen+2018-2020>
 - <https://into.aalto.fi/display/enism/Programme+studies+2018-2020>

Information and Service Management, **BSc**, 2018-2020

Specialization studies 12 + 48 cr

	I Period Fall	II Period Fall	III Period Spring	IV Period Spring	V Period Spring
Pakolliset: (6+12 ECTS)	30A02000 Tilastotieteen perusteet*		30A03000 Talousmatematiikan perusteet		35A00200 Tuotantotalouden perusteet
			30C00600 Tilastotieteen jatkokurssi		30A02000 Tilastotieteen perusteet*
Suosittelut valinnaiset	37C00400 Programming I (MOOC)	37C00450 Programming II (MOOC)	30C00200 Econometrics		30C00350 Mathematics II
Yhteiset opinnot: Valitse 4 kurssia (24 ECTS) ja suorita niiden lisäksi CAPSTONE kurssi	35C03000 Process Analysis and Management	27C01000 Business Decisions 1	37C00200 Capstone: IS Development	35C04000 Global Logistics & Distribution Networks	30C02000 Negotiation Analytics
Pakollinen opinnäytetyö (12 ECTS)	57C99901, 57C99902, 57C99903 Bachelor's Thesis, Bachelor's Thesis Seminar and Maturity Test		57C99901, 57C99902, 57C99903 Bachelor's Thesis, Bachelor's Thesis Seminar and Maturity Test		

Information and Service Management 2018-2020

	I Period	II Period	III Period	IV Period	V Period	Other intensive courses / \$book exams
Core courses: Choose 3 courses (18 ECTS)	35E00750 Logistics Systems and Analytics TU-E2000 Aalto Introduction to Services P		30E02000 Business Decisions 2	37E00100 Information Economy		35E00650 Quantitative Models for SCM/OM
Elective courses: Choose 4 courses (24 ECTS)	35E03000 Sustainable Supply Chains 27E02000 Models in Marketing 37E01600 Data Resources Management 30E00400 Simulation	35E00550 Quality and Performance Management 35E00800 Intellectual Property Rights 37E00200 Strategic Information Technology Management	35E02000 Procurement & Strategic Sourcing 30E03000 Data Science for Business I 37E01600 Data Resources Management	35E00350 Sales & Operations Planning 30E03500 Data Science for Business II 30E00800 Time Series Analysis	35E08000 Service Business Models 35E00400 Coordination of Supply Chains 27E01000 Decision Making and Choice Behavior 37E01500 Project Management and Consulting Practice 30E00300 Productivity and Efficiency Analysis	37E01400 Essential Literature in Information System Science: I, II, IV 37E01000 Current Topics in Information Systems Science
Capstone: Choose 1 course (6 ECTS)		57E00600 Capstone: Digital-ISM Challenge		57E00500 Capstone: Business Intelligence		
Compulsory courses	57E99910, 57E99905, 57E99903 Master's Thesis, the Seminar and Proficiency Test		57E99910, 57E99905, 57E99903 Master's Thesis, the Seminar and Proficiency Test			

3 Focus areas in ISM Master's programme

- Information Systems
- Business Analytics
- Supply Chain Management / Logistics
- <http://studyguides.aalto.fi/biz/2017-13/fi/master-of-science-degree-studies/study-programmes/information-and-service-management.html>

Note: our MSc Capstone course DigitalISM Challenge kicks off for the 5th time again on October 28, 2019!

BASIC INFO REGISTER WHAT IS THIS? WHY TO JOIN? PROGRAM WHAT WILL I GET? ORGANIZATIONS LOCATIONS PREVIOUS ROUNDS

Thank you to all DigitalISM Challenge 2018 participants!

See the highlights from video below



Read more at: <https://www.digi-challenge.fi> and <https://www.aalto.fi/news/helsinki-family-centres-the-finest-to-administration-and-order-in-the-backdoor-come>

New: Aalto level minor (24 cr) for MSc students!

Analytics and Data Science

The goal of ADS is to educate students on how to become proficient in making sense of big data, and how to apply data analysis skills on their domain of expertise.

See **latest** course list (updated yearly) at <https://into.aalto.fi/display/ensivuaineet2018/Analytics+and+Data+Science>

Compulsory course			
	ICS- E4010	Introduction to Analytics and Data Science	2 CR
At least one course from Statistical foundations subarea:			
SF	BeCs-114.1311	Introduction to Bayesian Statistics	3
SF	BeCs-114.2601	Bayesian Modeling	5
SF	MS-C2104	Introduction to Statistical Inference	5
SF	MS-C2128	Prediction and Time Series Analysis*	5
SF	30E00800	Time Series Analysis* (*alternative to previous)	6
At least one course from Computational methods subarea:			
CM	T-61.3050	Machine Learning: Basic Principles	5
CM	T-61.5060	Algorithmic Methods of Data Mining	5
CM	T-61.5010	Information Visualization	5
CM	CSE-E5430	Scalable Cloud Computing	5
CM	T-110.5121	Mobile Cloud Computing	5
At least one course from Business analytics/Applications:			
BA	Mat-2.3134	Decision Making and Problem Solving	5
BA	23E47000	Digital Marketing	6
BA	30E03000	Data science for Business	6
BA	37E01600	Data Resources Management	6
BA	57E00500	Capstone: Business Intelligence	6
AP	BeCs-114.4150	Complex Networks	3-6
AP	BeCs-E4101	Mathematical Modeling of Social Dynamics	3-6
AP	Maa-123.3585	Spatial Data Mining	3-5
AP	Maa-123.3530	Visual Analysis	4
AP	Mat-2.2103	Design of Experiments and Statistical Models	5
AP	Mat-2.4177	Seminar on Case Studies in Operation Research	5
AP	S-89.5150	Speech Recognition	5

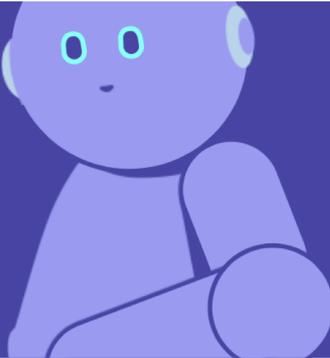
Recommended for further studying ISM topics on AI:

<http://www.elementsofai.com>

- can be included e.g. in voluntary degree studies by ISM students (apply credits at <https://into.aalto.fi/pages/viewpage.action?pageId=329844>)

 Elements of AI

[Start course](#) [FAQ](#) [International](#) ↓

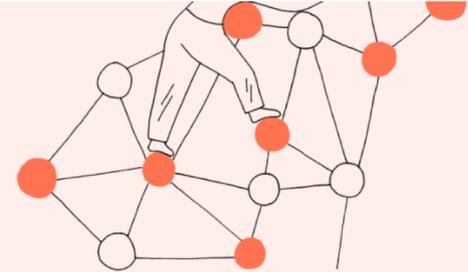


Part 1

Introduction to AI

An Introduction to AI is a free online course for everyone interested in learning what AI is, what is possible (and not possible) with AI, and how it affects our lives – with no complicated math or programming required.

[Explore the course](#) →



Part 2, coming in 2019

Building AI

Building AI is a free online course where you'll learn more about the actual algorithms that make creating AI methods possible. Some basic [Python programming](#) skills are recommended to get the most out of the course.

Sign up for our newsletter to be the first to know when the course is out.

<http://www.elementsofai.com>

May 10, Visualizing *knowledge* conference at Aalto (early bird student price 25e until April 11)



Visualizing Knowledge brings together a diverse group of practitioners to discuss data visualization from multiple perspectives. This year's event is centered around the symbiosis between natural sciences, information design and visual narratives with the key concept of senses – from human senses to machine sensors.

The one-day conference features researchers, educators and professionals from disciplines related to information design and science, while a showcase will exhibit new talents from information and visual communication design research and education. Supporting the conference are workshops that invite the speakers and audience to learn about state-of-the-art tools and methods in data visualization.

DATA SENSATIONS.

 CONFERENCE: 10 MAY, 2019
WORKSHOPS: 8 & 9 MAY, 2019

 DIPOLI, AALTO UNIVERSITY
ESPOO, FINLAND

[SUBSCRIBE TO OUR NEWSLETTER](#)

Hints for the exam

- The format of the exams for this course is the following:
 - Section I: Fill-in missing words/terms to ten sentences (10 points)
 - E.g: _____ is a 'team sport' which requires input from several employees such as data engineers, data scientists, business analysts and app developers.
 - Section II: Small question (3 points)
 - Section III: One essay question (12 points) that requires holistic and reflective thinking
 - all students are able to answer it at some level if they have attended the course and read the slides or the book (i.e. the question is NOT about a single specific technology or issue)
 - Section IV: Multiple-option questionnaire (35 points)
 - Questions from the lectures and the book (but no financial accounting questions)
 - *Examples presented at the Kahoot quiz, 2 questions same as in the exam*

Points and grading

- A minimum of 50% from the exam (max 60) and the assignments (max 40) is required to pass the course, i.e. at the minimum **30 + 20 = 50** points. Bonus points are counted on top of the total points if the minimum is achieved.
- Grade **5** = 90 points and over
- Grade **4** = 80-89 points
- Grade **3** = 70-79 points
- Grade **2** = 60-69 points
- Grade **1** = 50-59 points
- Fail = under 50 points - or less than the 50% minimum in either part

Link to school's course feedback survey on MIS course will be sent to you April 3, please provide your feedback by April 23!

There were many new things at the course (some lectures and assignments, video recording of the lectures, pilot use of Dynamic Feedback System) - so it will be very important to hear your feedback on the course as a whole!

All students who submit their feedback*, **will receive 2 points towards the course grade** 😊

If you have lost your personal link to the survey, ask me via email the public link to it.

**Thank you for your interest towards MIS
& good luck for the exam and future studies!**

