

Information and Communications Technology for Competitive Intelligence

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Using Web Link Analysis to Detect and Analyze Hidden Web Communities **(Chapter 3)**

Introduction

The World Wide Web contains a huge amount of interconnected Web pages that are authored and made available by millions of different individuals. Consequently, it provides new opportunities for using the hyperlink structure as a creative data source for identifying and analyzing snapshots, continuously and historically, of a company's implicit stakeholder communities who share common interests in a firm. The snapshots provide bits and pieces of a jigsaw puzzle that can be assembled into patterns of relations, activities and early warning signs of developments about a firm's external environments. More importantly, capturing disperse intelligence data about a company's implicit online communities of stakeholders should therefore be possible given the right web mining and analysis methodologies.

The hyperlinks are reflections of social interactions between stakeholders and a company. Collectively, they represent an underlying social structure of linked communities. These hyperlinked communities are implicit and 'natural' in that they are self-organizing (Flake, et al., 2002).

To illustrate the notion of implicit hyperlinked communities, consider for instance the community of web users interested in Porsche Boxster cars (Kumar, et al., 1999). There are numerous explicit online communities that are readily available and easy to identify such as the Porsche newsgroup and Porsche owners listserv. Porsche owners subscribe to the listserv and receive their messages via email. On the other hand, there are web users who create content and provide hypertext links to Porsche Boxster resources (www.porsche.com/english/boxster). These users may not be registered parties in the Porsche newsgroup or listserv but they share in various areas of interests in Porsche Boxster cars. This gave rise to different web pages, e.g. www.porschefaq.com and www.autopicture.com/porsche, that are hyperlinked to a web site (www.porsche.com/english/boxster). According to Kumar et al., these users can be considered as members of implicit hyperlinked communities because the communities are not obvious (hidden), lack definite membership, have spontaneously evolved, and have an implied social structure.

Since hyperlinked communities are implicit, they are often overlooked as unobtrusive data sources for intelligence analysis. Because explicit communities such as listservs and newsgroups are easier to identify, extensive analyses of contents from such communities vis-à-vis technological, sociological, managerial, and competitive intelligence perspectives have been reported in the literature (Hagel & Armstrong, 1997; Kassler, 2000; Preece, 2000).

This chapter describes a framework for detecting and analyzing relationships and activities of a company's implicit web communities. It expands the number of competitive analysis techniques for competitor profiling. More specifically, it identifies and categorizes a company's stakeholders and maps the value-add embedded in the firm's products and services with the interested stakeholder groups.

The case study in this chapter focuses on two research questions. Using the social structure of the web's hypertext links: (1) Can one identify the relationships and interests of implicit web communities to a specific company? (2) How are the implicit communities, especially external stakeholders (non-customers), using the enterprise's web resources? The focus on external stakeholders is based on Hoyt's (2002) assertion that the biggest challenges facing companies comes from outside of the organization. As part of their competitive intelligence strategies, firms need early warning systems that support the scanning of external environments to pick up on signs of change. This requires that firms

gather, analyze and synthesize data about their competitors and external environmental activities.

This chapter also provides a brief review of the related literature and a conceptual framework to address the aforementioned questions. To demonstrate its feasibility, the framework was applied to MicroStrategy, Inc., a business intelligence software vendor. According to an industry survey, Microstrategy, Inc. (2000), a publicly-traded company with headquarters in the US, is recognized as among the top ten influential business intelligence companies. Additional information about Microstrategy is presented in a later section. Finally, this chapter summarizes the results and competitive intelligence implications.

Related Literature

Citation Analysis

Hyperlink analysis research has its roots in citation analysis of journal articles, legal cases and patents to identify seminal contributions and interactions (Borgman & Furner, 2002; Kleinberg, 1998). Citation analysis is based on the assumption that if a publication is cited often then it ought to be important. Citations in journal articles provide pointers (endorsements or recommendations) to other significant prior publications (Cronin, et al., 1998). On the web, pointers or referrals are provided by hypertext links.

Citation analysis is an area of bibliometrics that focuses on citation patterns that reveal who is writing what, what is popular, and which journals and authors are cited the most (*Beginner's, nd*). Bibliometrics is a quantitative methodology used for analyzing the impact of authors, publications and citation behavior. If X publishes a paper that is cited 25 times in five years and Y publishes a paper on the same subject and is cited only five times in five years, which paper is more influential? In competitive intelligence, bibliometrics is used to identify new competitors and emerging research areas that are under investigation (Zanasi, 1998). This involves using data mining to exploit patent and citation databases that are available via the Internet.

The premier citation databases are the Social Sciences Citation Index and the Science Citation Index published by the Institute of Scientific Information (ISI). Since the databases capture authors' organizational affiliations, they are often used to analyze what competitors are publishing and how the publications are being used (ISI, 1999). In comparison, Alta Vista and Google search engines support link searches that mimic the citation capability similar to those provided in the ISI databases. For instance, link searches are being conducted by CI professionals at Fuld & Co. and AstraZeneca Pharmaceutical, Canada (Kassler, 1998).

Hyperlink Analysis

Borgman and Furner (2002) define hyperlink analysis as a method for analyzing data collected primarily in the form of web links. The volume of incoming links pointing to a web site (inlinks) indicates the popularity of the site, while that of the links coming out (outlinks) of a web site indicates the richness or perhaps the variety of topics covered (Zaiane, 1999).

Borgman and Furner identify two types of hyperlink analysis: relational and evaluative. Relational link analysis yields indicators of levels of connectedness or strength of the relationships among subjects such as documents, people, journals, etc. and addresses the question "Who is related (linked) to who?" Historically, information retrieval studies have explored link analysis from a relational perspective to identify authoritative documents (those closely related to the query statement) (Yang, 2002). The use of link information to improve search performance on the web has been demonstrated by such examples as Google and IBM's Clever project (Chakrabarti et al., 1999; Kleinberg, 1998).

Kleinberg took relational link analysis a step further by using the hyperlinked induced text search (HITS) to calculate the value of each query. The link-based model supports web searching by identifying authoritative web pages for broad topics. Using the HITS algorithm, Kleinberg's team has produced over a dozen studies that attempt to enhance the technique and use it to identify online communities from link

topology (Chakrabarti et al., 1999; Gibson, Kleinberg, & Raghavan, 1998; Hypersearching, 1999).

Although there has been a significant amount of work directed at analyzing and building online-communities (Preece, 2000; Stanoevaka-Slabeva & Schmid, 2000), the online community (or hyperlinked structures) subjects in the Clever project are never assumed to have been constructed in a centralized or planned fashion. Instead, the communities are a consequence of the way in which web content creators link to one another in the context of topics of interest (Gibson et al., 1998). This perspective of hyperlinked community is the foundation for this study.

The concept that link structure can be used to identify implicit communities was also investigated by researchers from Xerox PARC and NEC Research Institute (Flake et al., 2002). Xerox's researchers analyzed links and the information side effects to predict social relationships between students who were listed on Stanford's and MIT's web sites (Adamic & Adar, 2001). Inlinks were collected using Google and AltaVista search engines. Information side effects such as the words and phrases mentioned by the users were extracted from their homepages and analyzed for a glimpse into the social structure of university communities. For this chapter, inlinks and their information side effects are explored and categorized to identify the interests and activities of stakeholder communities.

In order for the Xerox and IBM researchers to explore link relations, sophisticated techniques for web mining of hyperlink structures, content and web usage have been developed (Garofalakis et al., 1999; Zaiane, 1999). Web mining involves the application of data mining processes to large collections of web data. The relational link analysis studies discussed thus far represent initial attempts at applying web mining to hyperlink structure.

Evaluative link analysis, on the other hand, aims to measure the level of importance, influence, or quality of web sites. It is used to rank documents, persons, organizations, or nations (Almind & Ingwersen, 1998; Borgman & Furner, 2002; Smith, 1999). The analysis is aimed at the question "Whose research or influence is better, or has greater impact, than whose?" Almind and Ingwersen coined the term 'webometrics' for applying bibliometrics techniques to links (Thelwall, 2001).

Table 1 provides a summary of major applications of citation and link analysis. Citation analysis techniques are commonly used for analyzing scholarly communications in many disciplines while web link analysis applications have been limited to mainly information retrieval.

Table 1 - Summary of Citation and Link Analysis Approaches

Type of Analysis	Application	System	Object of Analysis
Citation Analysis	Information Retrieval, Scientific Activity Assessment, Patent Analysis, Diffusion of Intellectual Property, Study State of Discipline	Science Citation Database, Social Science Citation Database, Patent database	# papers, # citations, # co-citations impact factors (of scholarly communications)
Link Analysis: Relational	Information Retrieval, Social Network	Google, Clever, Social Network of Stanford (Adamic), TwURL (Gerhart)	# inlinks, # outlinks, domains, relations, interests, level of relevance & evolution
Link Analysis: Evaluation	Information Retrieval, Library Science	Google, ResearchIndex (Flake)	Indicators: # inlinks, # outlinks, # co-citations impact factors

Online Communities

As mentioned earlier, implicit communities evolve spontaneously and do not neatly fit into the traditional

classification of online communities as described by Lazar and Preece (1998). Nor do they follow the defining properties of virtual communities as portrayed in Hagel and Armstrong's (1997) research in which they describe online communities as having: a clear and distinctive focus, tight integration of content and communication, strong support for member-generated content, access to competing publishers and vendors, and commercial orientation. They highlight that online communities have basic needs: interest, relation, transaction, and fantasy that should be nurtured.

Interests are business assets that drive stakeholders to react and interact in cyberspace. They can be viewed from a value creation perspective as business assets - tangible and intangible - that stimulate the development of relationships. Tangible assets are associated with financial and physical resources while the intangible organizational assets include leadership, systems, and culture (Boulton, Libert, & Samek, 2000). Generally, managers lack insight on how external communities are using their enterprise's assets to create value.

As stakeholders interact in respect of the assets, they form relations based on value-adding features of said assets. Freeman suggests that relations be examined from a stakeholder's perspective (Elias & Cavana, 2000). He describes stakeholders as any group of individuals who maybe affected by the achievement (or underachievement) of the enterprise's objective. This is especially important since organizations design web pages to project a certain image and culture. External stakeholders express their perceptions about the enterprise through their hyperlink comments (Chakrabarti et al., 1999). Stakeholders can be organized into transactional (internal stakeholder) and contextual (external stakeholder) environments (Elias & Cavana, 2000; Wallin, 2000). The stakeholder perspective concept is used to identify and categorize relations of implicit communities in this study.

The value-creating activities vis-à-vis the information assets of a company by implicit communities provide insights to the de-facto role that each community member plays. A new way of examining further the enterprise's relationships with these communities can thus be achieved. Rayport and Sviokla (1995) classify such activities as gathering, selecting, synthesizing, and distributing valuable information within the context of the customer's marketplace needs. These virtual value activities are generic strategies that companies use from a marketing perspective to enhance information (Hanson, 2000). For this study, they are used to identify activities that linked community members engage in to create value.

Competitive Analysis

Competitive intelligence is the process of enhancing marketplace competitiveness through a greater understanding of a firm's competitors and competitive environment (SCIP, 2002). Several authors classify the competitive intelligence process into a four-stage cycle: (1) planning and direction, (2) data collection, (3) analysis, and (4) dissemination (Kahaner, 1998; Rouach & Santi, 2001). Hypertext link analysis is pertinent to the data collection and analysis stages because it supports the requirements of identifying, locating and synthesizing qualitative information for competitive analysis. The activities and interests of implicit community members can also provide insight for competitive intelligence.

The data collection stage involves several techniques such as environmental scanning. It encompasses collecting both primary (interviews and survey) and secondary (literature search) information on the political, economic, technological, and social arenas (Shaker & Gembicki, 1999). These collection approaches include in-person interviews, gathering traditional print and online resources. Obtaining online material information is aided by metasearch engines and intelligent agents used to mine data from the Internet (Joureston, 2000; Shaker & Gembicki, 1999). To deal with the challenges of seeking resources via the Internet, Burwell (1999) provides a compendium of tools for online CI and includes a discussion of 'soft information'. 'Soft information' is non-statistical intelligence gathered from non-traditional sources such as editorial pages and online discussions groups. Usenets and listservs are examples of online discussion groups and used as cyber-listening posts to gather opinions (Burwell, 1999; Kassler, 2000). Although the hypertext link analysis can be considered as a technique for gathering 'soft information', it was not included in the compendium.

Fuld & Company, a CI consultancy firm, uses hypertext link analysis to identify competitors' relationships. Search engines such as HotBot, Alta Vista and Google support what Kassler (2000) calls the 'reverse link look-up' for links leading into a firm's web site. The links indicate either official or unofficial relationships. Although the proliferation of Internet is resulting in lots of attention being focused on data collection, the development of appropriate analytical processes is essential for CI and for formulating corporate strategy (Fleisher & Bensoussan, 2003). CI analysis is defined as the multi-faceted means by which information is interpreted to produce intelligence for organizational action (Fleisher & Bensoussan, 2000). It provides an abundance of techniques such as competitor profiling and issues analysis that enable organizations to analyze the strengths and weaknesses of current and potential rivals in order to identify opportunities and threats. Table 2 provides a summary of analytical techniques for profiling competitors.

Table 2 - Competitor Analysis Techniques

Technique	Usage	Example
Advertising Analysis	Identify demographics competitors are targeting & where the competitors may be headed	(Britton, 2002)
Alliance Networks Analysis	Assess strength of competitors' alliance networks	(deMan, 2002)
Competitor Profiling	Provide a picture of the strengths & weaknesses of current & potential rivals.	(Whitehead, 2002); (Fleisher & Bensoussan, 2003)
Corporate Culture Analysis	Understand competitors' leadership styles & culture of the firms	(Herring, Klein, Harris, & Bourey, 2002)
Futures-based Analysis	Use as a forecasting tool to analyze changes in irrational competitor actions	(Glitman, 2000); (Mogel, 2002)
Media Analysis	Use as a diagnostic tool to measure & compare media coverage of competitors. Also, can use for comparing actual press coverage to company's press releases.	(Naylor, 2002); (Stott, 1993)
Opportunity Assessment	Identify opportunities and threats as part of an early warning system. Used for SWOT analysis.	(Hoyt, 2002) (Alampalli, 2002); (Patchett, 2002); (Holder, 2001)

In addition to tracking competitors, the social, technical, economic, and political environments must be monitored for opportunities and threats (Fleisher & Bensoussan, 2003; Mogel, 2002). Accordingly, these opportunities and threats often take the form of strategic issues. A strategic issue, according to Fleisher & Bensoussan, occurs when a difference (or gap) of beliefs, facts, or values between a company and stakeholders could significantly impact the organization's performance. Issue analysis is an analytical technique used to identify emerging issues using survey and content analysis and requires regular scanning of a company's environment.

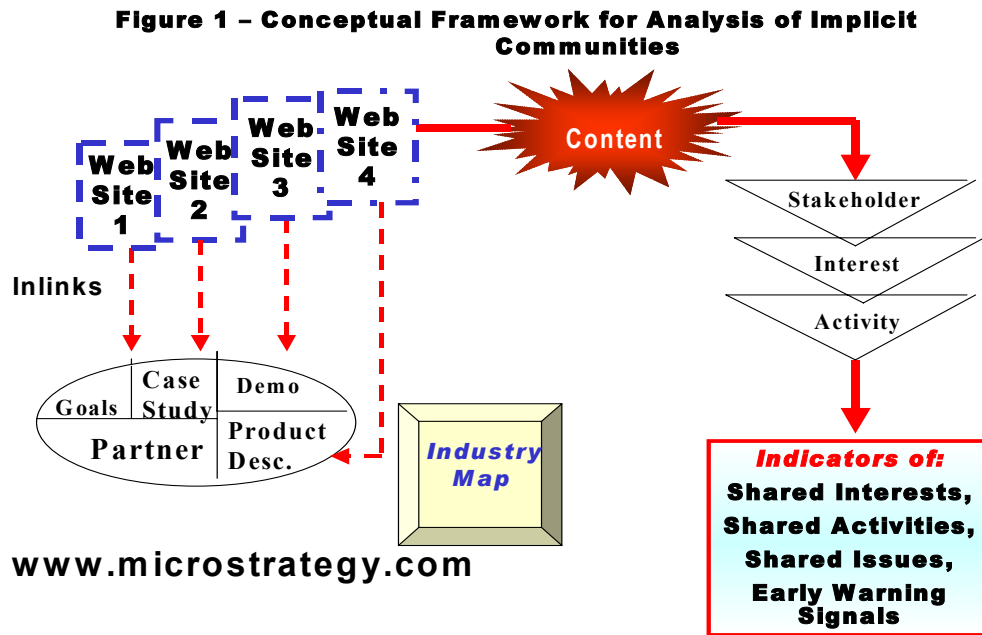
Analysis of emerging issues requires one to filter out essential pieces of information from noise and discern the connection between disparate people, places and events. This is also a requirement for intelligence organizations because they need to mine unstructured data such as emails to identify linkages and potential meaningful anomalies in the marketplace and online marketplace (Ignatius, 2002). Hoyt interprets the process of spotting anomalies, such as irregularities and surprises, as a starting point in an early warning system.

The literature shows that hypertext link analysis enables identification of implicit communities and has been applied extensively in information retrieval. However, limited studies analyze the links and information side effects to predict relationships and interests of community members. Although link analysis is useful for the data collection and analysis stages of the competitive intelligence process, the literature is bereft of empirical studies focusing on the use of link analysis for competitive intelligence.

In the following section, we provide a discussion of the conceptual framework for analyzing hidden communities of stakeholders and how such a framework was applied to the Microstrategy case.

Conceptual Framework and Background on MicroStrategy, Inc.

Figure 1 depicts the proposed conceptual framework for analyzing implicit communities. It builds on ideas from link analysis, online communities and competitive intelligence literature about analyzing shared interests and activities. The framework includes the following steps: (1) identify a target company and its URL for investigation, (2) create an industry map that identifies the company’s stakeholders such as customers, suppliers, etc. (3) conduct link search using the target URL, (4) code the link data, and (5) identify and analyze patterns.



The conceptual framework is applied to MicroStrategy, Inc., in an attempt to answer the following research questions using the social structure of the web’s hypertext links: (1) Can one identify the relationships and interests of implicit web communities to a specific company? (2) How are the implicit communities, especially external stakeholders, using the company’s web resources?

MicroStrategy was selected because it is a leading worldwide provider of business-critical systems such as e-business intelligence applications. It is recognized for the strength of its vision and the success of its customers and products (Simpson, 2000).

Keyword searches, industry reports, MicroStrategy’s press releases, case studies, white papers, and a database of over 210 partners/suppliers were examined to create an initial industry map of Microstrategy’s stakeholders. Table 3 provides a summary of the resources and corresponding target audience provided at MicroStrategy’s web site in April 2000.

Table 3 - Resources at MicroStrategy’s Web Site

Resource	Target Audience
Case study	Customer, Investor, Partner, Public
CEO information	Customer, Investor, Partner, Public
Contact data - sales	Customer, Public
Corporate overview	Customer, Investor, Partner, Public
Course data (training)	Customer, Partner, Public
Demo (product)	Customer, Investor, Partner, Public

Invitation for firms interested in partnership	Customer, Investor, Partner, Public
Mass media ads (video & print)	Customer, Investor, Partner, Public
Partners list	Customer, Investor, Partner, Public
Partners database	Customer, Investor, Partner, Public
Partners Intranet	Partners
Press releases	Customer, Investor, Partner, Public
Product description	Customer, Investor, Partner, Public
Technical support	Customer, Partner
White papers	Customer, Investor, Partner, Public

Methodology

This link analysis methodology has similarities to the Xerox's study of web communities at Stanford and MIT {Adamic & Adar, 2001 #15}. In April 2000, link searches were conducted over a four-day period using AltaVista, HotBot and Google to identify inlinks to MicroStrategy's web site (Reid, 2003). For example, the Google Advanced search option was selected to conduct a link search. In response to the prompt that reads, "Find pages that link to the page", the URL www.microstrategy.com was typed into the query form. By clicking on the link from the results list, additional texts from the referral web site were captured. Three search tools were used to identify the largest number of inlinks that are available in the publicly indexed section of the Web.

It should be noted that the exact number of inlinks to MicroStrategy cannot be ascertained because some organizations deny access to search engine robots through the use of several techniques such as firewalls (Thelwall, 2001). The search engines are prevented from indexing the contents from those pages.

Coding

The unit of analysis in this study is a link (URL) and its associated text. Duplicate hits (same URL, same contents) were not counted as part of the sample. Data were content analyzed to develop codes based on the contexts. The data were reviewed line-by-line and coded to identify events such as e-business conferences, actions such as organizing, objects such as sponsors, and organizations such as CMP Media.

Miles and Huberman (1994) recommend using relevant theories in coding because it makes coding more manageable and ties it into a conceptual structure.

Wallin's framework provides a classification scheme that is organized from a stakeholder's perspective and indicates some relations that an enterprise has with its environmental actors. The industry map identified some of MicroStrategy's customers, competitors, and partners/ suppliers but not the external stakeholder (non-customer) groups. Boulton's et al. model was used to segment the interest categories while the classification of activities was adapted from Rayport and Sviokla's virtual value activities scheme. The classification scheme is summarized in Table 4.

Table 4 - Classification of Link Data

Category	Major Classification	Sub-Classification	Example
1. Stakeholder Type (Wallin)	Transactional (internal environment)	Actor that the firm interacts with & influence	Customers, Employees, Investors, Partners/ Suppliers
	Contextual (external environment)	Actor that the firm has no power or influence over	Associations, Educational Institutions, Government, Media, SIG

Category	Major Classification	Sub-Classification	Example
2. Interest (Asset) (Boulton, etal.)	Tangible	Physical assets	Property, Buildings, Inventory
		Financial assets	Cash, Debt, Expense, Investment
	Intangible	Products, Services	Product Features
		Customer assets	Customer base (buying power)
		Organization assets	Culture, Strategy, Leadership, etc.
3. Activity (Rayport & Sviokla)	Gather information		lists, directories
	Organize information		lists, directories
	Select information		reports, events
	Synthesize information		materials for press release
	Distribute information		product review reports

Experimental Results

A total of 1,154 links to MicroStrategy's web site were identified (see Table 5). Six hundred and thirty-three links from the host organization (MicroStrategy) were not included in the analysis because they are considered as self-citation (MicroStrategy linking to MicroStrategy). Another set of 76 duplicate links was excluded leaving a useful sample size of 445 inlinks.

Table 5: Total and Unique Links to MicroStrategy

Search Engine	Total No. of Links	Inlinks (less self-citation)	No. Unique Links (%)
AltaVista	185	185	157 (35%)
Google	872	240	218 (49%)
HotBot	97	96	70 (16%)
Total	1,154	521	445 (100%)

Table 6 shows that of the 445 inlinks, 264 (or 59%) companies (.com or .co) and organizations (.org) made up the largest group followed by 76 'others', 70 educational institutions (.edu, .ac), and 17 networks (.net). Fifty-six links from 17 non-US countries, which include those from: Germany, Austria, France, Switzerland, and United Kingdom, constituted 3% of the entire group. German was the most frequently cited foreign language. Three hundred eighty-nine (or 87%) links are from the U.S. while English was used in 418 (or 94%) sites.

Table 6 - Distribution of Links

Top Level Domain	Freq.	Cum Freq	%-age	Cum %-age
1. net	17	17	3.7	3.7
2. org	18	35	4.0	7.7
3. edu, ac	70	105	15.4	23.1
4. others (.es, .it, .hn)	76	181	17.1	40.7
5. co, com	264	445	59.3	100.0
Country				
1. Japan, Korea, Singapore, S. Africa (1 each)	4	4	0.9	0.9
2. Czech Rep., Spain, Honduras, Ireland, Sweden (2 each)	10	14	2.2	3.1
3. Canada, Netherlands, Italy (3 each)	9	23	2.0	5.1
4. France	4	27	0.9	6.0

Top Level Domain	Freq.	Cum Freq	%-age	Cum %-age
5. Switzerland	4	31	0.9	6.9
6. United Kingdom	4	35	0.9	7.8
7. Austria	7	42	1.6	9.4
8. Germany	14	56	3.1	12.6
9. USA (default)	389	445	87.4	100.0
Language Used				
1. Japanese	1	1	0.22	0.22
2. Italian	2	3	0.45	0.67
3. Spanish	2	5	0.45	1.12
4. Dutch	4	9	0.90	2.02
5. French	4	13	0.90	2.92
6. German	14	27	3.15	6.07
7. English	418	445	93.93	100.0

Relations of Implicit Communities

The results are focused around the initial question: can one identify relationships and interests of implicit web communities of MicroStrategy? Table 7 presents the distribution of 445 stakeholders by individual sub-groups. Of these, 208 (or 46.7%) links make up the internal stakeholder communities while the remaining 237 (or 53.3%) links constitute the external stakeholder communities.

Table 7 - Distribution of Links

Stakeholder Group	Sub-Groups	Links (Freq.)	Sub-Group			Overall		
			Cum. Freq.	%-age	Cum. %-age	Cum. Freq.	%-age	Cum. %-age
Internal	Partner/ supplier	183	183	87.9	87.9	183	41.1	41.1
	Customer	15	198	7.2	95.1	198	3.4	44.5
	Employee	7	205	3.3	98.5	205	1.6	46.1
	Investor	3	208	1.4	100.0	208	0.6	46.7
External	Educational Inst.	85	85	35.8	35.8	293	19.1	65.8
	Media	81	166	34.18	70.0	374	18.2	84.0
	Portal	35	201	14.8	84.8	409	7.2	91.9
	Public/ Person	11	212	4.6	89.4	420	2.5	94.4
	Recruiter	11	223	4.6	94.1	431	2.4	96.8
	Unknown	8	231	2.4	97.4	439	1.8	98.6
	Reviewer	5	236	2.1	99.6	444	1.1	99.8
	Competitor	1	237	0.4	100.0	445	0.2	100.0

Partner/supplier (183), educational provider (85) and media (81) altogether accounted for 78% of all links. The largest sub-group is the partner/supplier with 183 links from 87 unique organizations such as Net Perceptions, IBM and washingtonpost.com. It should be noted that several unique links might actually emanate from a single organization. Although MicroStrategy's web site provided a database of over 210 partners/suppliers, most of which were identified as US partners, the inlink data we collected showed foreign partners/suppliers (not identified in MicroStrategy's database) such as a South African partner. This link turned out to be a mirror site for MicroStrategy's press releases. The mirror site is useful because of the current trend of redirecting one's competitors to a bogus site that looks like an official site.

Customer, another internal stakeholder, was made up of 15 (or 3.4%) links originating from five organizations. One such instance is the Ohio Department of Education. It has 11 links to MicroStrategy's web site as it demonstrates and markets its interactive report card service for parents, educators, policymakers, and the general public.

The employee stakeholder community constituted seven (or 2.6%) links and includes employees such as Michael Saylor, MicroStrategy's CEO. Another example is an employee who provided a description including pictures of his experiences in MicroStrategy's new employee training program (boot camp). The six-week boot camp and annual corporate retreat are cited as ways that MicroStrategy invests in its human capital. For the investor stakeholder sub-group, there were three (or 0.6%) links such as the link from Capital Investors which refers to Saylor's biographical data at MicroStrategy's web site.

For the external stakeholders, the educational institution sub-group was represented by 85 (or 19.1%) links and included 49 unique organizations from 11 different countries such as the Royal Institute of Technology, Sweden, Telecom Paris, and University Kwangwoon Technology, Korea. Eight universities had several links to MicroStrategy from different departments such as the Database Research Group and the Career Center of the University of California, Berkeley. The media sub-group constituted 81 (or 18.2%) links and included national, international and trade press such as *Fortune*, *DBMS Magazine*, and *Nouveau*.

The portal sub-group consisted of 35 (or 7.2%) links and included firms like Yahoo and MSN. The technical portal, such as, 'Open Directory - Computers' provided a gateway to database products descriptions, specialized discussion forums, white papers, and annotated analysis of current news. The public/ personal sub-group has 11 links (or 2.5%) from personal home pages that focus on providing a personal view of developments in the business intelligence industry. A more interesting sub-group is the reviewer with five (or 2.4%) links concentrating on critical assessment of MicroStrategy's products, services, and strategies. This included the OLAP Report that reviews about 30 software products. The smallest sub-group is the lone link from a competitor. It is interesting to note that MicroStrategy's traditional competitors, such as IBM and Sybase, have partnerships with the firm.

Eight links in which relationships cannot be identified were classified as 'unknown'. Initially, there were 50 such links whose relationships with MicroStrategy could not be identified. Each one was subjected to additional keyword searches in several databases such as Dow Jones Interactive, Yahoo, Meta-crawler, CNN, Techweb, Whois, and Lexis-Nexis. After this additional 'screening', eight (or 2%) firms' relationship could not be ascertained. Four of them have been found to be dead links while the other four provided no clues as to their relationship with MicroStrategy. The eight firms were then labeled as 'unknown'. Since most of these companies are in the information technology industry, they should be further analyzed through other means.

Interests of Stakeholders

Table 8 presents the sub-groups making up the hyperlinked communities and their interests in both the tangible and intangible resources of MicroStrategy. Overall, 245 links (or 55%), predominantly the partner/supplier (179) and educational provider (33) sub-groups, cite the product and services segment of MicroStrategy's web site.

The assets of interest from the internal stakeholder sub-groups are fairly understandable. Partners/suppliers are firms that officially endorse MicroStrategy's products and services for the 'network effect' while the employees cited and referred to the same resources to support the marketing of their expertise (Stewart, 2001). Customers cite information on their project development activities with MicroStrategy whereas the three investor-links cite the financial and biographical data resources of MicroStrategy.

Table 8 - Relations and Interests of Stakeholders

Communities	Assets of Interest				Sub-Totals
	Tangible*	Intangible (Information)			
	Financial	Products & Services	Customer capital	Organizational	
<i>A. Internal Stakeholder Community (208 links)</i>					

Partners & Suppliers		179		4	183
Customers			15		15
Employees		7			7
Investors	3				3
<i>B. External Stakeholder Community (237 links)</i>					
Educational Institutions		33	8	44	85
Media	18	9		54	81
Portal	4		3	28	35
Public/ Personal		3		8	11
Recruiter		11			11
Unknown	2	3		3	8
Reviewer				5	5
Competitor				1	1
TOTALS	27	245	26	147	445

*For tangible assets, none of the links' associated texts mentioned physical asset such as buildings, equipment, etc.

Another asset drawing a lot of interest is the organizational resource, with 147 (or 33%) links. Majority of these links are from the media (54), educational provider (44), and portal (28) sub-groups. Organizational resources are intangible assets such as business intelligence (BI) systems, organizational brand, and strategy. Interests in MicroStrategy's intellectual capital, to some extent, may accrue to her charismatic and visionary CEO. In a highly competitive market dealing with expensive high-end software products, MicroStrategy's CEO is known for his plans to make interactive database access as common as the telephone (Yang, 1999).

As a reaction to the foregoing, six web sites from media and public stakeholders voiced their reservations of the CEO's vision of 'consumerism of database' - that is, a database that can function like a crystal ball on your desk. The issues focused on privacy and implementation. For example, Lewis Perelman, President, Kanbrain Institute, provided an analysis of his in-depth interview with Michael Saylor, that focused on Saylor's vision of making interactive database on the web as common as the telephone. The critical analysis was published in *Fastcompany* magazine and as an editorial on Perelman's web site.

Saylor's reputation for being a net visionary is also reflected in other web sites. Moreover, nine web sites mention support for Saylor's strategic announcement about establishing the 'first free cyber-university'. Some of these were from Germany and Austria while other US-based web sites were from non-IT groups such as seniorwomen.com. One web site, slashdot.org, classified as a portal, had over 100 messages discussing how the CEO could operationalize his vision of a free cyber-university. Key suggestions include using an open platform approach like Linux and the Cooper College's model of free education.

Activities of Stakeholders

Having summarized the relations and interests of the hyperlinked communities, the second research question focuses on how stakeholders are using MicroStrategy's resources. Overall, the stakeholders frequently used MicroStrategy's web site to organize directories, create and disseminate news stories and press releases, and distribute information about conferences/exhibitions as summarized in Table 9. Eighty-seven partners/suppliers used inlinks to MicroStrategy as inputs for organizing partnership and/or subject directories (webliographies). Some partner/supplier web sites were referencing the same strategic alliances. For instance, Baan and the Distributor Information Systems Corporation (DISC) linked to solution partners that include MicroStrategy, IBM and Oracle.

Table 9: Usage of MicroStrategy's Web Site

Community	Activity	Freq.
<i>A. Internal Stakeholder Community (208 links)</i>		
Partners/ Suppliers (183)	Organize lists of suppliers & partners, and webliographies	87
	Synthesize case studies, press releases, online forum & magazine materials	43
	Distribute advertisements, product reviews, sponsorships of trade shows & conference	53
Customer (15)	Organize list of BI product vendors	5
	Synthesize press releases	2
	Distribute product demo materials	8
Employee (7)	Organize list of BI product vendors	2
	Synthesize online forum materials	4
	Distribute info. on training	1
Investor (3)	Organize investor relation & press release materials	3
<i>B. External Stakeholder Community (237 links)</i>		
Education Provider (85)	Organize directory of technology firms & guide to BI resources	59
	Synthesize case studies, press releases, online forum & magazine materials	21
	Distribute press release & conference materials	5
Media (81)	Organize directory of technology firms	8
	Synthesize press release materials	62
	Distribute info. on job ads & trade shows	11
Portal (35)	Organize directory of BI firms	14
	Synthesize online forum materials	2
	Distribute info. on e-commerce services & news articles	19
Public (11)	Organize guide to BI resources	7
	Distribute product reviews and resumes	4
Recruiter (11)	Organize directory of BI firms and job vacancies	9
	Synthesize press release materials	2
Reviewer	Synthesize product reviews & critiques	5
Competitor	Organize directory of BI firms	1
Unknown		8

Some organizations have several relations with MicroStrategy. *Washington Post*, for instance, acted as a partner, advertiser and affiliate of MicroStrategy's subsidiary -- strategy.com. The partners/suppliers link their partnership directories, press releases, white papers, and trade shows (web pages) to MicroStrategy's web site. Through this, they promote and publicize their official affiliations with MicroStrategy.

In reference to how the 237 external stakeholders inlinks are using MicroStrategy's resources, the data show that 59 such inlinks are from universities that compile employment and business intelligence company directories. Twenty-one inlinks, from universities in US, Austria, Honduras and Canada, used case studies from various IT firms including those from MicroStrategy's web site for teaching their business and engineering courses while one university focused exclusively on MicroStrategy's cases such as Victoria Secret and Nielsen.

It was also found that the University of Saskatchewan (Canada) and the University of South Carolina used MicroStrategy's case studies in their management information systems courses. In a decision support systems course at the University of Colorado, the web-based syllabus provided 14 links to different case studies from MicroStrategy. In addition to linking to specific cases, students provided

reports on MicroStrategy's software applications. One University of Iowa student conducted a comparative analysis of OLAP architecture designs of MicroStrategy and Arbor - one of its competitors. The report included OLAP schematic images from MicroStrategy's web site.

Furthermore, media outfits such as Business Week Online, Webdo (Switzerland), and cnet.com were active in synthesizing newsbits regarding MicroStrategy's financial problems, decision support system (DSS) software, and its strategy of penetrating the consumer market by 'whispering data in their ear'. Business Week Online featured a company close-up on MicroStrategy's strategy of harnessing consumer data and pitted MicroStrategy with its 'new competitors' such as America Online, Yahoo, and AT&T (Yang, 1999). A major strategic difference is that MicroStrategy's subsidiary, strategy.com, is selling its customized proactive wireless information services to consumer companies, such as the washingtonpost.com, which in turn offer value-added services to their customers. The metaphor 'whispering data in their (customers') ears', synthesized by other media such as *Fastcompany* magazine, is used to illustrate the concept of real-time intelligence.

In addition to the praises, the media and reviewer sub-groups also provided critical feedback on MicroStrategy's advertisements and software products. For example, *The Bee Newspaper* (published in Sacramento, California, USA), cynical.com and two other sites criticized MicroStrategy's Superbowl 2000 television advertisements. The Superbowl ads were used to launch a new media campaign for expanding its customer base and targeting the masses. The Superbowl is a US football championship game that can be compared to the FIFA World Cup Championship. It caters to a large audience of people and provides a great opportunity for advertisers.

Some of the review sites provided video archives and their own professional critiques of MicroStrategy's 30-second ads. Other linked sites invited their users to submit feedback and vote on the best and the worst ads on those sites. Some of the review comments include: "What is MicroStrategy Selling?"; "Thoroughly Confusing!"; "Conclusion - don't buy the product".

In addition to reviews of advertisement, organizations used MicroStrategy's web site to create software product review reports such as the OLAP Report. Since the OLAP Report produces over 20 full reviews of about 30 products, it is directly linked to the software vendors for additional information needs.

Discussion

This section discusses the outcomes of issue analysis, early warning signals, and their CI implications. The hyperlinked communities' comments were content analyzed to see how they share information, dramatize stories and converge on shared issues about Microstrategy. The findings showed that the issues of interest to hidden communities of stakeholders centered on MicroStrategy's advertisements, business alliances, cyber-university announcement, and strategic product development. Table 10 provides a summary of some shared issues and how they can be used for competitor profiling.

Table 10 - Interest and Competitor Profiling

Interest	Example	CI Analysis	Issue
Advertisement	Superbowl 2000 Ads (4 web sites)	Advertisement analysis (Britton); SWOT analysis (Fleisher & Bensoussan)	Key demographics of interest to competitors; real-time intelligence - perceptions of needs
Alliance	Integration Partner (183 partnership web sites)	Alliance networks analysis (deMan); SWOT analysis (Fleisher & Bensoussan)	Strengths and weaknesses of competitor's alliance networks
Media Announce-ment	Announcement of 'first free cyber-university' (9 web sites)	Futures-based analysis (Mogel); Media Analysis (Stott); SWOT analysis (Fleisher & Bensoussan)	Unusual announcement (may indicate changes in competitor's actions); implementation challenges

Interest	Example	CI Analysis	Issue
Strategy	Consumerism of databases (6 web sites)	Media analysis (Stott); SWOT analysis (Fleisher & Bensoussan)	Paradigm shift - real-time intelligence for all; Privacy

For example, the Superbowl television advertisements and stakeholders' comments can be used for analyzing MicroStrategy's marketing strategy. The tricky part in analyzing a competitor's advertisement ploy is finding current and usable data (Britton, 2002). Using Britton's approach for deconstructing a competitor's advertising, it can provide insight into following questions.

- Who are they aiming to influence? (target)
- What do they wish to communicate? (message)
- Why will this be believed? (support)
- How are segments of the target audience reacting? (response)

Since MicroStrategy's advertisements attempted to relate to the viewer's experiences, discovering the audience's responses can provide other perspectives in respect of the strengths or weaknesses of their brand.

Another example includes shared issue about MicroStrategy's strategic vision to make proactive database access as common as the telephone. MicroStrategy's vision can be understood by analyzing changes in society, technology, economics, environment, or politics (STEEP) so that its competitors can better predict the results of its action, and what it might do next. MicroStrategy seems to be capitalizing on changes in a global society that is becoming increasingly dependent on mobile technology in a deregulated, e-business-based environment. Therefore, real-time and hassle-free mobile access to the right information may become essential to businesses and eventually for individual personal usage.

In order to get increased market acceptance of its real-time business intelligence system, the stakeholders' comments indicate that MicroStrategy has to deal with the challenges of personal relevancy, affordability, ease-of-use, and privacy. The use of STEEP analysis may help competitors to see the industry the way MicroStrategy does, i.e. new opportunities, new threats, and new competitors such as Yahoo and AT&T.

Early Warning Signs

By identifying unusual events such as the announcements of real-time intelligence for all and free cyber-university, Hoyt's (2000) technique of detecting anomalies and unusual items can be applied. He suggested moving from a great deal of data to examining small and unique events as well as using an inductive process to generate inferences.

Consider for instance, the announcement of a free Ivy League cyber-university by MicroStrategy's CEO. From an inductive perspective, private university education is costly and since it was announced that tuition will not be charged, then the pronouncement is unusual. A competitor may ask why will it be provided for free - what (or where) is the catch?

By weaving information into a story, a possible scenario may emerge. For high-end business intelligence vendors, many major challenges, such as expanding the customer base, educating more mainstream people (including low-tech groups) on advantages of using the software, reducing concern about privacy, and increasing sales, etc., exist.

Over time, the free cyber-university may help allay privacy fears by creating a global community of cyber-students who 'ethically' use business intelligence software on a regular basis as part of the program requirements. The free cyber-university may provide the platform for expanding MicroStrategy's customer and human capital in the future. Table 11 summarizes the key early warning signs extracted from the analysis of the link-related texts, anomalies, and inferences.

Table 11: Warning Signs

Subject	Anomaly	Inference (illustrative examples)
First free cyber-U (9 web sites)	"Good news, especially if cyber-U uses Linux".	How do they propose to fund this? How will this project align/support their current business strategies?
Distance Education for Senior Citizens (1 web site: Seniorwomen.com)	"Learning notes: MicroStrategy's CEO proposes funding of a free online university with Ivy League quality".	Retirees including the 'baby boom generation' with excess time and money are a rapidly growing group that has joined the cyber ranks. How can serving the demands of this niche market be of business value to MicroStrategy?
Consumerism of databases (6 web sites)	"MicroStrategy wants to be an angel whispering data in your ear"; "White House refuses auction of government databases".	Will personal intelligence system that provides proactive delivery of information become as popular and useful as the telephone? Have they invented a database killer application yet? How have they addressed the data-privacy concerns?
Superbowl Ad 2000 (4 web sites)	"What are they selling?"	How much marginal marketplace reach can truly be achieved by riding on the popularity of global sport events?; How does this work for firms like MicroStrategy?
Financial standing & earning report (13 web sites)	"MicroStrategy overstates earnings".	Is the company in the 'red'? Is this style of reporting sound? Ethical? Acceptable?
Interactive report card (11 web sites)	"E-government in action. Interactive report card for parents, educators, policymakers, media, & general public".	E-government application is a market that provides additional revenue streams as well as opportunities for educating mass population on business intelligence services. How can firms like MicroStrategy tap into this market?

Conclusion

This chapter discussed the feasibility of employing an analytical framework for detecting and analyzing relationships and activities of a company's implicit web communities of stakeholders. The framework builds on ideas from web link analysis, online communities, and competitive intelligence literature. From link analysis studies, implicit communities are defined as less visible hyperlinked communities that evolve as a consequence of the way in which web content creators link to one another in the context of topic of interest (Gibson, Kleinberg, & Raghavan, 1998).

In order to answer the research questions, the proposed framework was applied to MicroStrategy, Inc, a business intelligence vendor. The first question focuses on whether one can identify the relationships and interests of implicit web communities to a specific company. MicroStrategy's implicit communities were identified and categorized into internal and external stakeholder communities.

Their interests focused on tangible and intangible assets. An intangible asset drawing a lot of interest is its organizational resources, e.g. business intelligence systems, organizational brand, and strategy.

The second research question focuses on how the implicit communities are using the company's web resources. The stakeholders frequently used MicroStrategy's web site to organize directories, create and

disseminate news stories and press releases, and distributed information about conferences/exhibitions. Often times when the stakeholders create directories or news stories that are hyperlinked to MicroStrategy's web site, they also express their perceptions about the company. The systematic collection and analysis of such perceptions and comments -- previously untapped -- can be a very potent source of 'soft information'.

A key characteristic of the proposed framework is its use of hypertext link analysis technique to identify and mine unstructured link data. These links represent messages from less visible communities that are often not available anywhere else in cyberspace. They can be used to support competitor analysis such as analyzing the competitor's advertisements and media coverage. The framework can be developed into a technique for listening to the external environments to pick up on opportunities, threats, and detecting early warning signals. All of these enrich the CI capability and resources of a firm.

References

- Adamic, L. A., & Adar, E. (2001). *Friends and Neighbors on the Web*. Paper presented at the KDDI.
- Alampalli, S. (2002). Role of CI for Opportunity Assessment. *Competitive Intelligence Magazine*, 5(4), 21-24.
- Almind, T. C., & Ingwersen, P. (1998). Informetric Analyses on the World Wide Web: Methodological Approaches to Webometrics. *Journal of Documentation*, 53(4), 404-426.
- Beginner's Guide to Citation Analysis: Ten Frequently Asked Questions.[Web site]. Retrieved January, 2003, from the World Wide Web: <http://alexia.lis.uiuc.edu/~standrfr/beginner.html>
- Borgman, C. L., & Furner, J. (2002). Scholarly Communication and Bibliometrics. In B. Cronin (Ed.), *Annual Review of Information Science and Technology* (Vol. 36): Information Today, Inc.
- Boulton, R. E. S., Libert, B. D., & Samek, S. M. (2000). *Cracking the Value Code: How Successful Businesses Are Creating Wealth in the New Economy*: Harper Business.
- Britton, C. (2002). Deconstructing Advertising: What Your Competitor's Advertising Can Tell You About Their Strategy. *Competitive Intelligence Magazine*, 5(1), 15-19.
- Burwell, H. P. (1999). *Online Competitive Intelligence: Increase Your Profits Using Cyber-intelligence*. Tempe, Arizona: Facts on Demand Press.
- Chakrabarti, S., Dom, B. E., Gibson, D., Kleinberg, J., Kumar, R., Raghavan, P., Rajagopalan, S., & Tomkins, A. (1999, February). *Mining the Link Structure of the World Wide Web*.
- Cronin, B., Snyder, H. W., Rosenbaum, H., Martinson, A., & Callahan, E. (1998). Invoked on the Web. *Journal of the American Society for Information Science and Technology*, 49(14), 1319-1328.
- deMan, A.-P. (2002). How to Analyze Alliance Networks. *Competitive Intelligence Magazine*, 5(4), 14-16.
- Elias, A. A., & Cavana, R. Y. (2000, December). *Stakeholder Analysis for Systems Thinking and Modelling*. Paper presented at the ORSNZ 2000, New Zealand.
- Flake, W. G., Lawrence, S., Giles, C. L., & Coetzee, F. M. (2002). Self-Organization and Identification of Web Communities. *IEEE Computer*, 35(3), 66-71.
- Fleisher, C. S., & Bensoussan, B. E. (2000). Farout Way to Manage CI Analysis. *Competitive Intelligence Magazine*, 3(2), 37-40.
- Fleisher, C. S., & Bensoussan, B. E. (2003). *Strategic and Competitive Analysis: Methods and Techniques for Analyzing Business Competition*. Upper Saddle River, New Jersey: Prentice Hall.
- Garofalakis, M. N., Rastogi, R., Seshadri, S., & Shim, K. (1999). *Data Mining and the Web: Past, Present and Future*. Paper presented at the WIDM 99, Kanasa City, Missouri, USA.
- Gibson, D., Kleinberg, J., & Raghavan, P. (1998). *Inferring Web Communities from Link Topology*. Paper presented at the Hypertext 98: 9th ACM Conference on Hypertext and Hypermedia.
- Glitman, E. (2000). Comprehending 'Irrational' Competitor Actions through Futures-Based Analysis. *Competitive Intelligence Magazine*, 3(4), 29-32.
- Hagel, J., & Armstrong, A. G. (1997). *Net Gain: Expanding Markets Through Virtual Communities*: Harvard Business School Press.
- Hanson, W. (2000). *Principles of Internet Marketing*: South-Western College Publishing.
- Herring, J. P., Klein, R. D., Harris, M., & Bourey, A. T. (2002). Corporate Culture as a Tool for Anticipating the Competition. *Competitive Intelligence Magazine*, 5(4), 6-10.
- Holder, B. J. (2001). Scouting: a Process for Discovering, Creating, and Acting on Knowledge. *Competitive Intelligence Magazine*, 4, 17-21.
- Hoyt, B. (2002). Early Warning: the Art of Inference. *Competitive Intelligence Magazine*, 5(1), 10-14.

- Hypersearching the Web. (1999). *Scientific American*.
- ISI. (1999). *Introduction to Citation Indexing and Citation Searching*. Institute of Scientific Information.
Retrieved, from the World Wide Web: <http://osulibrary.orst.edu/instruction/classes/engr/Mod6/impact.htm>
- Joureston, J. (2000). Using Intelligent Search Agents for CI. *Competitive Intelligence Magazine*, 3(1), 32-36.
- Kahaner, L. (1998). *Competitive Intelligence: How to Gather, Analyze and Use Information to Move Your Business to the Top*: Touchstone.
- Kassler, H. (1998). Competitive Intelligence. *Econtent*, 16-24.
- Kassler, H. (2000). Competitive Intelligence and the Internet: Going for the Gold. *Information Outlook*, 4(2), 37-42.
- Kleinberg, J. (1998). *Authoritative Sources in a Hyperlinked Environment*. Paper presented at the Proceedings of the 9th ACM-SIAM Symposium on Discrete Algorithm (SODA).
- Kumar, R., Raghavan, P., Rajagopalan, S., & Tomkins, A. (1999). *Trawling the Web for Emerging Cyber-Communities*. Paper presented at the Proceedings of the 8th International World Wide Web Conference.
- Lazar, J., & Preece, J. (1998). *Classification Scheme for Online Communities*. Paper presented at the Proceedings of the 1998 Association for Information Systems, American Conference.
- Microstrategy Ranked as One of the 10 Most Influential Business Intelligence Companies in 2000 DM Review 100* (2000). Retrieved, 2002, from the World Wide Web:
http://www.microstrategy.com/News/PR_System/Press_Release.asp?ID=621
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative Data Analysis: an Expanded Sourcebook* (2nd ed.): Sage.
- Mogel, R. (2002). Futuristic Thinking. *Competitive Intelligence Magazine*, 5(3), 12-14.
- Naylor, E. (2002). *X-Ray Your Competition: Profiling, Media Analysis and CI* [electronic newsletter]. SCIP.
Retrieved, from the World Wide Web: <http://www.scip.org>
- Patchett, V. (2002). May the Force Be With You: Michael Porter and the Five-Force Theory of Industry Analysis. *Competitive Intelligence Magazine*, 5(4), 28-30.
- Preece, J. (2000). *Online Communities: Designing Usability, Supporting Sociability*: Wiley.
- Rayport, J. F., & Sviokla, J. J. (1995). Exploiting the Virtual Value Chain. *Harvard Business Review*, 75-85.
- Rouach, D., & Santi, P. (2001). Competitive Intelligence Adds Value: Five Intelligence Attitudes. *European Management Journal*, 19(5), 552-559.
- SCIP. (2002). *What is CI?* Society of Competitive Intelligence Professionals. Retrieved, 2002, from the World Wide Web: <http://www.scip.org/ci>
- Shaker, S. M., & Gembicki, M. P. (1999). *WarRoom Guide to Competitive Intelligence*: McGraw-Hill.
- Simpson, G. R. (2000, January 3). Microstrategy Looks to Mine Untouched Government Data. *Wall Street Journal*.
- Smith, A. (1999, January 19-21). *ANZAC Webometrics: Exploring Australasian Web Structures*. Paper presented at the Information Online & On Disc 1999.
- Stanoevaka-Slabeva, K., & Schmid, B. F. (2000). *A Typology of Online Communities and Community Supporting Platforms*. Paper presented at the Proceedings of the 34th International Conference on Systems Sciences (HICSS '01), Hawaii.
- Stewart, T. A. (2001). *Wealth of Knowledge: Intellectual Capital and the Twenty-First Century Organization*. New York: Currency Book.
- Stott, M. D. (1993). You Can't Trust What You Read: Making Sense of the Business Press. In J. E. Prescott & P. T. Gibbons (Eds.), *Global Perspectives on Competitive Intelligence* (pp. 309-321). Alexandria: Society of Competitive Intelligence Professionals (SCIP).
- Thelwall, M. (2001). Extracting Macroscopic Information from Web Links. *Journal of the American Society for Information Science and Technology*, 52(13), 1157-1168.
- Wallin, J. (2000). *Operationizing Competences*. Paper presented at the Annual International Conference on Competence-Based Management, 5th, Helsinki University of Technology, Finland.
- Whitehead, C. (2002). Five Building Blocks for Organizational Renewal. *Competitive Intelligence Magazine*, 5(4), 25-27.
- Yang, C. (1999, 21 December). Microstrategy Wants to be an Angel Whispering Data in Your Ear. *Business Week Online*.
- Yang, K. (2002). *How Do We Find Information on the Web?* Unpublished dissertation, University of North Carolina, Chapel Hill.
- Zaiane, O. R. (1999). *Web Usage Mining*. Retrieved, from the World Wide Web: <http://www.cs.ualberta.ca/~zaiane>
- Zanasi, A. (1998). Competitive Intelligence through Data Mining Public Sources. *Competitive Intelligence Review*, 9(1), 44-54.