

5-2008

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Recommended Citation

Amouzegar, Hamidreza; Tarokh, Mohammad Jafar; and Hidaji, Anahita Naghilouye, "A New Perception Model for Web Competitiveness" (2008). *CONF-IRM 2008 Proceedings*. 6.

<http://aisel.aisnet.org/confirm2008/6>

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6F. A New Perception Model for Web Competitiveness

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Abstract

Competitive intelligence is an effective tool for outmaneuvering, out-pricing and outsmarting the competition. It is important that you know what your competitors will do next in order to make smarter decisions. Many solutions are presented for competitor analyzing in old market point of view which come from strategic based till media scanning methods. This paper presents a new perception model for competitiveness in web environment and focuses on modeling and measuring the manner of competitors with software agent facilities. The purpose of this paper is to propose a new solution for e-firms to find their appropriate marketplace based on a formal methodology.

Keywords

Competitive Intelligence, CI, Web, Automata, Finite State Machine, FSM, Perception Model, Interactive Model

1. Introduction

No business is an island. For success, the business will need to deal with customers, suppliers, employees, and others. In almost all cases there will also be other organizations offering similar products to similar customers. These other organizations are competitors. And their objective is the same - to grow, make money and succeed. Effectively, the businesses are at war - fighting to gain the same resource and territory: the customer. And like in war, it is necessary to understand the enemy, how he thinks, what his strengths are, what his weaknesses are, where he is vulnerable, where he can be attacked, and where the risk of attack is too great.(SCIP.org)

And like in war, the competitor will have secrets that can be the difference between profit and loss, expansion or bankruptcy for the business. Identifying these secrets is thus crucial for business survival. But all this is not new; around the year 500 BC, the great Chinese military strategist, Sun Tzu wrote a treatise on the Art of War. From a 21st century perspective, many of Sun Tzu's approaches would be viewed as barbaric today.(Ian Gordon 1989) Nevertheless, his views on strategy are still relevant today - for both military commanders and business leaders looking at how to win against competitors.

Although elements of organizational intelligence collection have been a part of business for many years, the history of Competitive Intelligence began in the U.S. in the 1970s. In 1980 Michael Porter published the study competitive strategy: Techniques for Analyzing Industries and Competitors which is widely viewed as the foundation of modern competitive intelligence (Porter 1998).

After the Cold War ended, many U.S. (ex-) intelligence officers aimed at a career in the private industry. In 1986 the Society of Competitive Intelligence Professionals was founded in the U.S. and grew to 6000 worldwide, mainly in the U.S. but growing numbers especially in UK and Germany. In 1997 the Ecole de Guerre Economique (School of economic warfare)

was founded in Paris, France. It is the first European institution, which teaches the tactics of economic warfare within a globalizing world (Ian Gordon 1989). In Germany, Competitive Intelligence was unattended until the early 1990s. The term Competitive Intelligence first appeared in German literature in 1997. In 1995 a German SCIP chapter was founded, which is now second in terms of members in Europe. In summer 2004 the Institute for Competitive Intelligence was founded, which provides a post-graduate certification program for Competitive Intelligence Professionals (CI Tools web). Japan is currently the only country, which officially maintains an economic intelligence agency (JETRO). It was founded by the Ministry of International Trade and Industry (MITI) in 1958.

Business competitors are:

- Other organizations offering the same product or service now.
- Other organizations offering similar products or services now.
- Organizations that could offer the same or similar products or services in the future.
- Organizations that could remove the need for a product or service.

And in other words Industry or market research is the acquisition of corporate intelligence on a broad range of issues including:

- Microenvironment
 - economy
 - government
 - law
 - technology
 - ecological
- Market Analysis and Competitor Analysis
 - market definition
 - market size
 - market segmentation
 - industry structure and strategic groupings
 - Porter 5 forces analysis
 - supply chain
 - competition and market share
 - competitors' strengths and weaknesses
 - market trends
- Consumer Analysis or Marketing research
 - nature of the buying decision
 - participants
 - demographics
 - psychographics
 - buyer motivation
 - loyalty segments

After the web was born, the entire competitive analysis model turned to new direction which grows by search engines and measuring the competitor web sites traffic according to customer's behavior. The big problem is how to model the web sites and customers manner which present the business intelligence of competitors (Russell et al 2002).

This paper will try to introduce a new modeling approach to collecting competitor information in web environment.

The first section will describe three competitor analysis methods. The second section will explain the gap of behavior modeling in competitor analysis methodologies. The third section will propose a new model for behavior description of competitors with automata approach and the fourth section will present an agent solution for proposed model.

2. Competitor analysis methods

2.1. Competitor Array

One common and useful technique is constructing a competitor array. The steps include:

- Define your industry scope and nature of the industry.
- Determine who your competitors are.
- Determine who your customers are and what benefits they expect.
- Determine what the key success factors are in your industry
- Rank the key success factors by giving each one a weighting - The sum of all the weightings must add up to one.
- Rate each competitor on each of the key success factors - this can best be displayed on a two dimensional matrix - competitors along the top and key success factors down the side.
- Multiply each cell in the matrix by the factor weighting.
- Sum columns for a weighted assessment of the overall strength of each competitor relative to each other.

An example of a competitor array is shown in Table 1, based on material presented in "Beat the Competition: How to Use Competitive Intelligence to Develop Winning Business Strategies", Ian Gordon, Basil Blackwell Publishers, Oxford, UK, 1989. In this example competitor #1 is rated higher than competitor #2 on product innovation ability (7 out of 10, compared to 4 out of 10) and distribution networks (6 out of 10), but competitor #2 is rated higher on customer focus (5 out of 10). Overall, competitor #1 is rated slightly higher than competitor #2 (20 out of 40 compared to 18 out of 40). When the success factors are weighted according to their importance, competitor #1 gets a far better rating (4.9 compared to 3.7). Two additional columns can be added. In one column you can rate your own company on each of the key success factors (try to be objective and honest). In another column you can list benchmarks. They are the ideal standards of comparisons on each of the factors. They reflect the workings of a company using all the industry's best practices.

Key Industry Success Factors	Weighting	Competitor #1 rating	Competitor #1 weighted	Competitor #2 rating	Competitor #2 weighted
1 - Extensive distribution	0.4	6	2.4	3	1.2
2 - Customer focus	0.3	4	1.2	5	1.5
3 - Economies of scale	0.2	3	0.6	3	0.6
4 - Product innovation	0.1	7	0.7	4	0.4
Totals	1.0	20	4.9	15	3.7

Table 1: Competitor Array

2.2. Competitor profiling

Another common technique is to create detailed profiles on each of your major competitors. These profiles give an in-depth description of the competitor's background, finances, products, markets, facilities, personnel, and strategies (March et al 1994). This involves:

- Background

- Location of offices, plants, and online presences.
- History, key personalities, dates, events, and trends.
- Ownership, corporate governance, and organizational structure.
- Financials
 - P-E ratios, dividend policy, and profitability various financial ratios, liquidity.
 - Profit growth profile; method of growth (organic or acquisitive).
- Products
 - Products offered depth and breadth of product line, and product portfolio balance.
 - New products developed new product success rate, and R&D strengths.
 - Brands, strength of brand portfolio, brand loyalty and brand awareness.
 - Patents and licenses.
 - Quality control conformance.
 - Reverse engineering.
- Marketing
 - Segments served, market shares, customer base, growth rate, and customer loyalty.
 - Promotional mix, promotional budgets, advertising themes, ad agency used, sales force success rate, online promotional strategy.
 - Distribution channels used (direct & indirect), exclusivity agreements, alliances, and geographical coverage.
 - Pricing, discounts, and allowances.
- Facilities
 - Plant capacity, capacity utilization rate, age of plant, plant efficiency.
 - Location, shipping logistics, and product mix by plant.
- Personnel
 - Number of employees, key employees, and skill sets.
 - Strength of management, and management style.
 - Compensation, benefits, and employee morale & retention rates.
- Corporate and marketing strategies
 - objectives, mission statement, growth plans, acquisitions, and divestitures
 - marketing strategies

2.3. Media scanning

We can learn a lot about the competitive environment by scanning our competitors' ads. Changes in a competitor's advertising message can reveal new product offerings, new production processes, a new branding strategy, a new positioning strategy, a new segmentation strategy, line extensions and contractions, problems with previous positions, insights from recent marketing or product research, a new strategic direction, a new source of sustainable competitive advantage, or value migrations within the industry. It might also indicate a new pricing strategy such as penetration, price discrimination, price skimming, product bundling, joint product pricing, discounts, or loss leaders. It may also indicate a new promotion strategy such as push, pull, balanced, short term sales generation, long term image creation, informational, comparative, affective, reminder, new creative objectives, new unique selling proposition, new creative concepts, appeals, tone, and themes, or a new advertising agency. It might also indicate a new distribution strategy, new distribution partners, more extensive distribution, more intensive distribution, a change in geographical focus, or exclusive distribution. Little of this intelligence is definitive: additional information is needed before conclusions should be drawn (March et al 1994).

A competitor's media strategy reveals budget allocation, segmentation and targeting strategy, and selectivity and focus. From a tactical perspective, it can also be used to help a manager implement his/her own media plan. By knowing the competitor's media buy, media selection, frequency, reach, continuity, schedules, and flights, the manager can arrange his/her own media plan so that they do not coincide (Kahneman et al. 2003).

Other sources of corporate intelligence include trade shows, patent filings, mutual customers, annual reports, and trade associations.

3. What is involved?

There are four stages in monitoring competitors - the four 'C's:

- Collecting the information (with a first stage - deciding what to collect)
- Converting information into intelligence (with three steps: CIA collate and catalogue it, Integrate it with other pieces of information and analysis and interpret it)
- Communicating the intelligence.
- Countering any adverse competitor actions like using the intelligence.

4. What is the Gap?

All the described methods are inherited from strategic point of view which tries to explain the competitors based on PEST analyses and needs a physical concentration for the manner detection. The main gap is in modeling the competitor behaviors in web environment which is positioned in a virtual location. Modeling the strategic actions in web requires a finite and formal detailed view, because of the complication of data gathering in this environment. We need a new model to present the manners formally which has the possibility to be generated by agents automatically. Gathered data need to be grown to information and then be converted to intelligence. Next section will propose a new model for those two transitions based on automata.

5. Interactive Modeling

5.1. Automata

An automaton (plural: automata) is a self-operating machine. The word is sometimes used to describe a robot; more specifically, an autonomous robot (A.Shalyto 1991).

5.2. Automata-Based Programming

Its defining characteristic is the use of finite state machines to describe program behavior. The transition graphs of state machines are used in all stages of software development (specification, implementation, debugging and documentation). In recent years great attention has been paid to the development of the technology of programming for embedded systems and real-time systems. These systems have special requirements for the quality of software.(N.Tukkel et al. 2001) State diagrams are used to graphically represent finite state machines as shown in Fig.1.

To represent a service with a finite state machine:

- 1- Service should describe himself as main and sub scenarios of the use case.
- 2- Scenarios should be modeled by state machine from start to end.

The machine waits for input on any state which is the interaction point of client and server, and then it continues the way by performing state actions and selecting the appropriate outgoing transition for next step.

5.3. The Basis of Model

One of the features of such approach to programming for the reactive systems is that the centralization of program logic is achieved by liquidation of logic in the event handlers and forming of system of interacting automata, which are called from these handlers. Automata in such system can interact by nesting, by ability to call each other and with the help of state numbers interchange. So if services are designed with this interactive approach, use cases can be mapped to FSMs by these rules:

- 1- Absolutely the main scenario of each business service could be modeled by finite state machine as their use cases describe. The reason is that the set of states is finite and a normal use case will cover limit responsibility.
- 2- All the exceptions will be handled by finite state machine transitions.
- 3- Every finite state machine has a start state and a final state representing entrance door and exit door.

Runtime environment (executer) has a fully enveloped finite state machine and controls it as a manager.

6. The Proposed Model

Modeling the competitor's behaviors and tricks by automata helps us to:

- 1- Find his scenario completely.
- 2- Increase the possibility of weighting for detailed behavior.
- 3- Increase the possibility of using agents automatically.
- 4- Discover the competitors provided services while measuring the customer's reactions.
- 5- Find the strength and weakness of any competitor actions.

This solution can be provided by agents or human researcher. Figure 1 shows how you can model a competitor service and his manner in relation with customer. This model helps us to simulate consumer for competitor's web site and negotiate with its services to weigh the transitions for finding the SW (strength and weakness) of competitor.

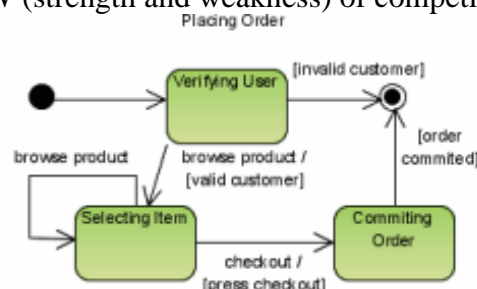


Figure 1: State diagrams are used to graphically represent finite state machines

According to Figure 2, we can compute the strength of this competitor in a provided service (use-case) for two goals. This figure describes that 0.8 of web site services need the personal information form; 0.4 of next service facilities push the user to behave in an employee manner; 0.3 of next service facilities for employees help them to find a car and 0.2 of next service facilities direct car finders to buy the car. In other words it means approximately

two($0.8 * 0.4 * 0.3 * 0.2$) percents of this web-site's services aims for selling cars and one percent aims to sell films to visitors.

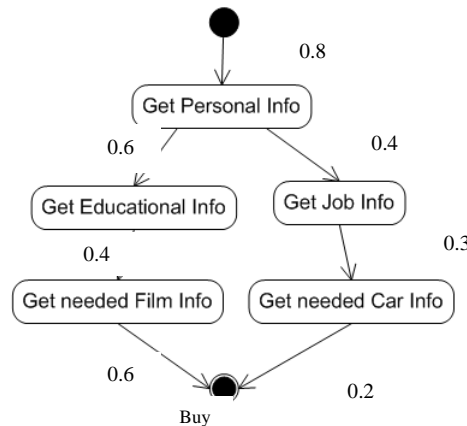


Figure 2: Automata Model of one competitor's provided service

This also describes 0.32 ($0.8 * 0.4$) of services in this web site focus on employee segment of customers and 0.48 of them focus on student segment. There are many other findings from this diagram which comes from automata modeling of web site services by an agent automatically.

7. What is Software Agent?

In computer science, a software agent is a piece of software that acts for a user or other program in a relationship of agency. Such "action on behalf of" implies the authority to decide when (and if) action is appropriate. The idea is that agents are not strictly invoked for a task, but activate themselves. Related and derived concepts include intelligent agents (in particular exhibiting some aspect of Artificial Intelligence, such as learning and reasoning), autonomous agents (capable of modifying the way in which they achieve their objectives), distributed agents (being executed on physically distinct machines), multi-agent systems (distributed agents that do not have the capabilities to achieve an objective alone and thus must communicate), and mobile agents (agents that can relocate their execution onto different processors).

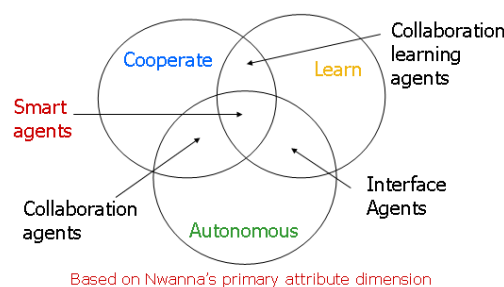


Figure 3: Nwana's Category of Software Agent

Various authors have proposed different definitions of agents; these commonly include concepts such as:

- Persistence (code is not executed on demand but runs continuously and decides for itself when it should perform some activity).
- Autonomy (agents have capabilities of task selection, prioritization, goal-directed behavior, decision making without human intervention).

- Social ability (agents are able to engage other components through some sort of communication and coordination; they may collaborate on a task).
- Reactivity (agents perceive the context in which they operate and react to it appropriately).

The agent concept is most useful as a tool to analyze systems, not as a prescription. The concepts mentioned above often relate well to the way we naturally think about complex tasks and thus agents can be useful to model such tasks.

8. Software Agent and Proposed Model

A software agent should simulate a human behavior in web interaction; it goes to competitor's web site and tries to find all the possible next states from this page or form. It traverses the possible ways till the end and weights the transitions according to web facilities.

To find the competitor's web sites, agent would use these steps:

- 1- Link Intelligence
- 2- Search Term Intelligence
- 3- Search Engine Intelligence
- 4- PPC Campaign Intelligence
- 5- Referrer Intelligence
- 6- Popularity Index Report
- 7- Ranking Report
- 8- Meta Keywords

Agent will use the smart propagator methodology to influence in selected competitor's web site; and parallel completion of automata models will be handled by agent in a single or multi-agent manner. In this model the agent will check all the local reference links and buttons to find the paths and to complete the models incrementally.

9. Conclusion

In this paper, we propose a new perceptive model for increasing Competitive Intelligence in web environment with software agent approach called Interactive Web Perception for CI (IWP CI) model. Its main elements are: finite state machine (FSM), interactive state-full service, and software agent. The aim of IWP CI is to enable fully flexible, scalable, and perceptible agent based awareness about competitor's manners. We achieve this goal with an architecture that is based on three complementary principles:

- All the use cases of competitor's behavior could be modeled by a finite state machine.
- Services could be provided state-full and interactive.
- Software agents could automatically track the provided services on web.

In the paper we define a formal measurement of competitor's manner by weighting the transitions of FSM model additionally. It helps users to find the better perception about competitors and finding a good strategy in market decision making.

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