

Business Intelligence and Natural Intelligence Applications in Consumer Communities

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Abstract- The recent proliferation of applications for Business Intelligence (BI) has created many opportunities for natural intelligence theory to be used in business applications. More and more companies today are using Natural Intelligence (NI) to exploit consumers' herd behavior, crowd wisdom and crowdsourcing in social network marketing.

The success and failure and resurrection of a large catalog and on line retailer in the U.S. present an opportunity for a unique case study for NI applications in retailing. This paper uses the experiences of three separate Fingerhut companies to validate the concepts with lessons learned and new insights.

Keywords- *Wisdom of Crowds; Natural Intelligence; Social Network Marketing; Business Intelligence*

I. INTRODUCTION

Natural Intelligence and swarm theory are interesting topics that can be applied to social network marketing. Natural Intelligence is the behaviors of species in response to change in the environment such as herd and swarm behaviors. Herd behavior theory describes how groups of individuals can act together with or without interactions among the herd. In observance of species such as bees and ants, it is evident that although each individual has its own agenda, the group appears incredibly organized [3]. For example, worker bees, queen bees, and drone bees all serve separate functions. Each of these functions is critical to the survival of the hive and without these specialized functions, the hive would likely fail.

Since birds, buffalos, and many other species flock together, businesses have also noted that consumers can hang together and shop together. Therefore, business organizations can utilize social network marketing to strengthen product brands, services and prices. For example, Hershey recently used crowdsourcing to add new colors to its M&M chocolate candies. For many businesses, the goal is to identify the best combination of product brand, price, availability and credit to meet current or expected needs. Organizational ecologists have argued that nature may provide a good model for organizations to follow. Utpal and Soltysinski [14] note that herd behavior can be observed in online auctions, while bee swarm behavior has been used for heuristic problem solving [13].

This paper attempts to answer the following questions:

1. How can enterprises use Business Intelligence technology, especially Natural Intelligence (NI) applications, such as herd behavior, swarm theory and wisdom of crowd for competitive advantage?
2. What are the success factors in using NI?
3. What are the lessons learned from the experiences at Fingerhut, Federated Direct, and Fingerhut Direct Marketing?

The paper discusses Natural Intelligence theory and applications, followed by a description of Fingerhut's long-term success and subsequent entry into e-business. It then provides analysis of the reasons for its failure and success, and concludes with findings and lessons learned.

II. CONCEPTS AND STRATEGIES

With the rapid advance in technology, many enterprises rely on innovations for competitive advantage. For some enterprises, the ability to personalize and customize the shopping experience is the most significant ways to achieve and maintain their value position. Using breakthrough technology, firms create new value for customer relationships, distinctive value chains, business intelligence, and new markets. Because breakthrough technology such as CRM and BI is critical for competitive advantage, continuous innovations management is a must for modern enterprises [1, 4].

A Customer Relationship Management (CRM) system is a repository of customer information which contains customer profiles. By differentiating products or services for each unique customer firms can customize and personalize needs of individual customers.

Business Intelligence (BI) refers to theories, methodologies, processes, architectures, and technologies that transform raw data into meaningful and useful information for business decision making. Technologies used for BI include data mining,

online analytical processing, querying and reporting. Study by Phan and Vogel [9] suggested that CRM and BI can be used with price discrimination and switching cost to improve success.

Recently, efforts have been made to increase the sophistication of intelligent agents (IA) for BI. In online retailing, a simple IA is a special purpose system that performs specific tasks for its users such as the proxy bidder or shopping bot. A more advanced IA can scan the environment track, and predict behavior patterns of buyers and competitors. They attempt to use agent-based modeling in order to mimic the natural intelligence of various species in nature such as birds, fishes, bees, and ants. They can accomplish this goal by communications that stimulate consumer's swarming to buy company's products and services.

Clearly, community of consumers cannot spontaneously interact in exactly the same manner as do insects, fishes, or birds in close proximity to each other. Mimicking of interactions and communications in nature by businesses can be done using methods perfected by trial and error. The development of the Internet, combined with Customer Relationship Management (CRM) technologies such as email, twitter, "Like" and "Diggs" button, and Meta tagging, have created an opportunity to try the rapid interactions that could lead to swam behavior in social networks.

Some popular communities and/or social networks for firms to observe, start, and encourage group behavior are SlickDeals, RetailMeNot, Groupon, Facebook, LinkedIn, Google+, and Tweeter. Social network is created on the idea of digital social graphs. In the offline world, social networks are a collection of people who voluntarily communicate with one another over a period of time. In the online world, social networks are the digital communities where people communicate and interact. In general, people in digital social networks sign on to networks to share their profiles, what they like and their habits - along with a lot of other individual information. Customers can engage in collaborative shopping by sharing their shopping experiences and feedback on products and services. Social networks such as Facebook notify others through the "Like" button. Businesses can then make social recommendations based on what friends and other shops advise. For example, Amazon's recommender system uses Facebook's social profile to recommend products.

Surowiecki (2004) in his book titled, *The Wisdom of Crowds*, notes that when a large group of consumers are connected to each other, they become interdependent and can make better judgments than do individuals. In general, crowds are wiser when there are many decision makers who make judgments independent of one another and when they come from diverse backgrounds, as well as when there is a way to aggregate opinions to produce outcome or popular choice. It is a common knowledge that when people joined in a crowd, they are also vulnerable to manipulation, and this is what businesses want to exploit social network communities. However, group collective behaviors can be illogical and thus creating opportunities for businesses to exploit this vulnerability. For example, fans of celebrities in social networks are likely to buy products that celebrities, consumers are likely to buy items that other friends bought with or without validation of their values. A 2011 research at Harvard found that increasing a restaurant's review score by one star on Yelp.com boost leads to a 5 to 9 percent increase in sales [6]. With proper communications and stimuli, business can increase sales.

Another opportunity to improve interactions for consumers swarming is the use of crowd sourcing. It is the use of crowds to produce outcomes, as well as to improve products and services. For example M&M chocolate candies recently asked consumers to vote for the new color of candies then added the top two popular choices to new line of products. In the recent Boston bombing, FBI used crowd sourcing to gather videos and information that led to the identification and arrest of terrorist suspects. Some theoretical concepts in Natural Intelligence for BI applications are summarized in Table 1.

TABLE 1 SUMMARY OF CONCEPTS AND FRAMEWORK

Concepts	Sources
Wisdom of Crowds	Surowiecki [12]
Group behavior	Bonabeau, Dorigo, and Theraulaz [3]
Swarm theory	Tarasewich & McMullen [13]
Herd behavior in online auction	Utpal and Soltysinski [14]
CRM and BI model for retailers	Phan and Vogel [9]
Innovation Management	Affuah [1]; Clark and Fujimoto [4]

III. METHODOLOGY

According to Benbasat, Goldstein, and Mead [2] case studies in IS are suitable for theory building when existing theory is limited. Yin [15] argued that IS theory and model development can be based on a single case study. In this study, studies with three different corporate entities of Fingerhut Inc. were conducted to validate the existing theory. The three entities in Fingerhut's evolution were:

1. The original Fingerhut (1948-1999) was a public company focusing on the direct mail order business. At this point Fingerhut had fully evolved its business model for developing and supporting a customer community based on using BI to support its subprime closed-end credit programs, sales, and marketing.
2. The Federated Direct (1999-2002). In 1999 Fingerhut was acquired by Federated Department Stores and renamed it to

Federated Direct, a subsidiary. Federated operated Fingerhut operations from 1999 until it was liquidated in 2002.

3. The Fingerhut Direct Marketing, a privately owned company purchased from Federated Stores by FAC Acquisitions in 2002 (now Bluestem Brands).

Different data collection methods were employed, ranging from personal interviews, press conferences media coverage, and financial data. Due to the close proximity of Fingerhut's major operation centers and headquarters, the researchers were able to interview Fingerhut managers, workers, customers, and other stakeholders.

IV. CASE STUDY: MANAGEMENT EXPERIMENTS AT THREE FINGERHUT ENTITIES

Before 1999, Fingerhut was not really an Internet retailer but was rather experimenting with online capability and an online community of customers. Its traditional Mail Order Telephone Order (MOTO) customers trusted Fingerhut and were very responsive to its promotions, shared their trust and experiences with friends and family, and helped Fingerhut to build and grow its customer community. MOTO customers can purchase a wide variety of products, including apparel, jewelry, electronics, toys, tools and more (see <http://www.fingerhut.com/> for a complete listing of products). Readers can find the history of Fingerhut in [9].

In 1999, Federated acquired Fingerhut for \$1.5 billion. Because Fingerhut had served as a pioneer in BI, Federated hoped to use the acquisition as a step into catalog retailing, as well as a platform of e-commerce.

Like many startup e-tailers at that time, Federated Direct suffered heavy losses and liquidated Fingerhut in the Spring of 2002. During the Summer of 2002, key technology elements of the original Fingerhut, including the database marketing were purchased by former Fingerhut CEO, Ted Deikel, and the Petters [Investment] Group. In November, Fingerhut Direct was resurrected. By 2005, it became a profitable and growing catalog and online presence, and by 2010 sales reached 521 million [11].

In the following sections, we discuss how the first Fingerhut exploited swarm behavior in consumer community for its success.

A. Successes at the Original Fingerhut Until 1999

As early as 1975, Fingerhut introduced a so-called "closed-end" credit coupon system in which customers make installment payments for their purchases. At its peak, it employed about 200 analysts and 40 statisticians to mine Fingerhut's database for insights that helped the company track and predict customers' buying behaviors [7].

In the early day of the legacy computing system, the data mining system at Fingerhut was accomplished on the IBM 370 mainframe running batch system. The system analyzed and extracted information about buying habits based on demographics in order to pinpoint products that might interest consumers. Fingerhut also used DM to control the customer experience and its closed-end credit account program. In this program, when a sub-prime customer wanted to buy more than his or her ability to pay, the credit agent would first advise delaying the purchase until an installment payment was made on outstanding purchases. After the payment was posted, the agent notified the customer that the new purchase was approved. Because of this BI based service, customers are more likely to pay their Fingerhut's bills than those of credit card companies.

BI was also used to identify buying patterns related to demographics and customer behaviors so that it could reach customers with the right recommendations at the right time. After the orders entered the system, a recommender system searched the buying behavior of other customers in the buyer community who had ordered the same products. The system would recommend additional products and suggest specialized catalogs to be delivered to specific customers. Through its Big Data Mining, Fingerhut discovered that customers were likely to triple their purchasing in the twelve weeks after moving to a new residence, with a peak in buying in the first four weeks. Their selections often followed a pattern, i.e., telecommunications equipment; new furniture and decorations were purchased at the exclusion of home electronics or jewelry. Fingerhut used this information to tailor a special attention program to "new movers".

In addition to DM, Fingerhut developed organizational systems to support everything its customers needed to flock on its promotions. Fingerhut found its niche at its captive sub-prime customers. Customers began to depend on Fingerhut's to provide the "closed-end" credit coupons, advice, and other support that all retail credit customers needed. Customers knew in advance what the minimum payments would be for each purchase and how much more they could afford to purchase.

Fingerhut had long known that direct promotions, such as sales calls on or after payday, could generate volume sales to its customers. If customers found the promotional items to be good buys and they wanted them, they would pass the information to people in their social community, online and offline. Fingerhut wanted to reproduce this process on the Internet because it could reach more customers. Customer's herd and swarm behaviors could be clearly seen at periodical warehouse clearance events of discontinued products, open-box, refurbished and returned items after the community was informed of the events. In these one or two-day warehouse close-out events, customers rushed to buy before inventory sold out. There are three major reasons for the success of Fingerhut's warehouse clearance promotions. First, it had a "captive" customer market of subprime customers who could not shop elsewhere. Second, Fingerhut Catalog retailing operated many years before the online retailing

businesses at the end of the 1990s and thus their low price offers without online competition gave them the competitive advantage in the market. Third, customers can rush to buy with confidence thanks to its no-restocking fee on return.

It took Fingerhut decades to learn to recruit and to profitably serve a sub-prime social network community. It required a high level of knowledge of the subprime consumer social network. Fingerhut's systems depended upon highly specialized employees who constantly updated information and carefully controlled over credit and sales.

Fingerhut evolved to experiment, support, and encourage swarm-like behaviors in its subprime customer community. The operations became very complex when Fingerhut was constantly experimenting and learning from workers and customers. The findings were then disseminated in effort to ensure that the whole organization acted in near perfect synchronization like a flock of birds. The knowledge of flock behavior was gathered and stored in Fingerhut's early knowledge management system.

B. The Federated Direct of 1999

In 1999, Federated acquired Fingerhut for \$1.7 billion and launched Federated Direct, including Fingerhut Catalog and Fingerhut Net and the new Federated online businesses. William Lansing, hired from General Electric, was put in charge of Federated Direct. He ramped up hiring and investments in risky e-commerce startups. By 1999, Fingerhut received order fulfillment contracts of 22 companies including eToys and Walmart.com. Instead of continuing the database marketing to the subprime market, Federated decided to eliminate this closed-end subprime credit coupon system and issued credit cards to its sub-prime customers.

As a result, Federated Direct abandoned Fingerhut core competency which relied on BI and natural intelligence to generate sales and manage customer credit in the sub-prime market. After Fingerhut's customers received credits to shop freely elsewhere, most no longer shopped at Fingerhut and they were not able to pay for their new bills. Worse still, Fingerhut's order fulfillment systems encountered massive failure during the Christmas shopping season of 1999. After suffering large losses from unpaid credit and operations, Federated closed and liquidated Fingerhut in the spring of 2002 [9, 10].

C. The Fingerhut Direct Marketing of 2002

When Fingerhut closed its doors in 2002, it left a niche in the sub-prime retail market that required sophisticated BI and NI capabilities that no company was capable of serving it. Realizing the opportunities to recapture the niche, Former Fingerhut CEO, Ted Deikel, convinced FAC Acquisitions Inc. to join him to purchase the core competency of Fingerhut from Federated in 2002, and launched Fingerhut Direct Marketing as a privately held company. In December 2002, Fingerhut's new online retail web site was launched to take orders for the Christmas shopping season.

TABLE 2 REVENUES AND GROWTH FOR FINGERHUT 2006-2012 [5, 10]

	Fingerhut Direct Marketing				Bluestem*		
	2006	2007	2008	2009	2010	2011	2012
Total revenues (millions)*	310	449	423	438	521	615	700
Revenues growth rate	50%	45%	-6%	3%	19%	18%	13%
Online Revenues (millions)	82	144	159	186	N/A	N/A	N/A
Online sales growth rate	57%	76%	10%	17%	N/A	N/A	N/A
Online retailing industry annual growth rate	34%	12%	11%	34%	12%	16%	15%

*Data from company history Website (<http://www.bluestembrands.com/our-company/our-history/>)

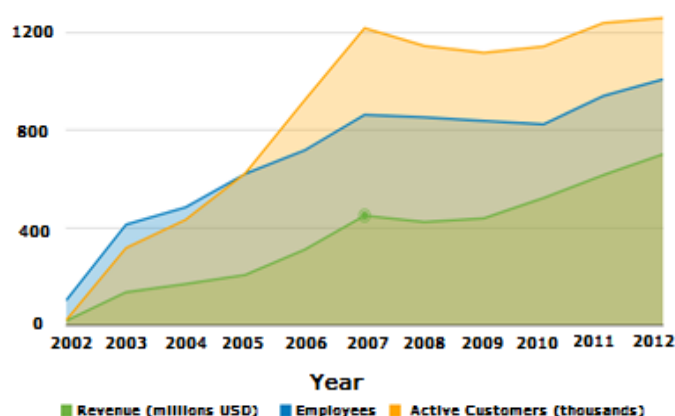


Fig. 1 Fingerhut Direct Marketing Growth after Resurrection (Adopted from: <http://www.bluestembrands.com/our-company/our-history/>)

Fingerhut's key and core proposition in 2002 remained marketing and providing credit to the subprime retail market using BI and Natural intelligence. Then it discovered the new shopping pattern of its Web shoppers. They often waited until just

before Christmas to do their final shopping. “The normal five or six week holiday shopping season was compacted down to about two weeks,” says Mark Redetzke, Vice president of e-commerce and digital marketing at Fingerhut [5]. Thus, Fingerhut set the timing to generate consumer flocking using bundle pricing with mix and match strategy: “When we did offer discounts, we mixed and matched to create a sense of urgency that attracted buyers,” says Redetzke. Fingerhut also noted consumer behavior typically changing around mid-November and thus it tried various sales incentives.

As a result of its new strategies, Fingerhut has continued to experience high growth in sales, revenues, employment, and number of active customers (Table 2 and Figure 1). By 2009 Fingerhut was renamed Bluestem Brands but still kept its Fingerhut name in the Website.

V. DISCUSSION

Swarm theory is a novel concept in the retail industry. There are some important lessons to be learned from the Fingerhut story.

First, Federated's choice to abandon the core competency of Fingerhut might be partially to blame for the ultimate failure of Fingerhut. There were many reasons to expect that Federated would also succeed with Fingerhut if Federated stockholders and top management gave them a few years to improve its business model.

Second, the mass collapse of dotcoms in 1999-2000 proves that the losses are not only at Federated Direct. Among startup online retailers who suffered heavy losses in 1999, some kept improving their business model for several years. Unfortunately the stockholders and top management at Federated were not patient enough to wait for Federated Direct to improve its business model. They pressured Federated to liquidate Fingerhut in 2002.

Third, after the core competency in BI and NI was resurrected and the new company was able to generate profit, the company survives. What may be unique is the fact that the company was successfully resurrected after a colossal failure while there are many others that failed never got resurrected.

Finally, Fingerhut's BI capabilities and knowledge management systems are a significant competitive advantage in community and social network. Because it takes more intensive processes and systems to manage the “subprime” credit market than the prime market, Fingerhut incurred large expenses when they developed and evolved their systems over the years. Although other retailers once used similar credit systems such as layaway, the authors were not able to uncover any other companies that invested in developing BI and NI capabilities for subprime community. Hence, Fingerhut dominated this niche and did such a good job of developing and supporting a community and social network that even after Federated essentially failed, the social network and community were still running underground, so the resurrected company was able to survive. From Table 3, we can see that Innovation, BI, DM, and NI for communities play key roles in the success of modern retailers.

TABLE 3 SUMMARY OF IT STRATEGIES

IT Strategies	Fingerhut Catalog	Federated Direct	Fingerhut Dir Mktg
Innovation Management	Yes	No	Yes
Business Intelligence	Yes	Yes	Yes
Data Mining	Yes	No	Yes
Community Natural Intelligence	Yes	No	Yes

VI. CONTRIBUTIONS OF THIS STUDY.

This is a unique case study that is based on experiments of NI and BI concepts on three separated firms. We have seen the experimental applications of NI strategies for BI for the successes of Fingerhut Inc. (prior 1999) and Fingerhut Direct Marketing (after 2002) and the abandonment of NI and BI strategies that are part of the failure of Federated Direct (1999-2001). While there are numerous articles written about BI, they rarely cited experimental strategies applied on real companies. This is the key contribution of this paper.

VII. LIMITATION OF THIS STUDY AND SUGGESTION FOR FUTURE RESEARCH

Fingerhut was (and is) one of the few retailers focusing on the sub-prime population, enjoying a “captive” customer base. Because some BI and NI applications were new technological breakthrough with some potential social, ethical, and legal ramifications, we may never know the details of customer behaviors (herd or swarm, especially those involving sensitive demographics, such as gender, race and age). Finally, the competitive environment has changed so much, and so has technology, that no simple, straightforward predictions are warranted for contemporary businesses.

We have seen that BI applications in communities and social networks require technological breakthrough. In some instances, firms must be willing to take risks to launch experimental technology. Companies which are willing to try NI for communities and social networks must have a high organization capability and a high level of BI maturity. Because BI capability and maturity levels are beyond the scope of this paper, these topics are suggested for future research.

VIII. CONCLUSIONS

This study of three separate entities of Fingerhut provides proofs that retailers can exploit the efficiency and effectiveness of BI and NI in communities and social networks. Simple flocking behavior observed in the animal community can help researchers understand social network behavior in human. Wisdom of crowds can improve the individual's ability to find favorable buying opportunities. The buyers may have all of the information available to every member of the collective community. In order to exploit herd behavior of buyer community, it requires the development of trust in communications.

This study helps confirm the efficiency and effectiveness of natural intelligence theories on consumer communities and social networks. It also demonstrates that managers may not be motivated to exploit the kinds of complex, new forms of social and business organizations. The stampede during Black Friday each year proves that BI and NI capability can generate great success in retail business. With modern IT resources, retailers can efficiently exploit herd and swarm behaviors in community and social networks.

REFERENCES

- [1] Affuah, Allan, *Strategic Innovation: New Game Strategies for Competitive Advantage*, New York: Routledge, 2009.
- [2] Benbasat, I., Goldstein, D. and Mead, M., The case research strategy in studies of information systems, *MIS Quarterly*, vol. 11, iss. 3, pp. 369-386, 1987.
- [3] Bonabeau, Eric, Dorigo, Marco and Theraulaz, Guy, *From Natural to Artificial Swarm Intelligence*, Oxford University Press, 1999 ISBN: 0195131584.
- [4] Clark, K.B. and Fujimoto T., *Product Development Performance: Strategy, Organization, and Management in the World Auto Industry*, Boston: Harvard Business School Press, 1991.
- [5] Internet Retailer, Fingerhut gets its hands on a 2.9% hike in Q4 web sales, January 21, 2009, <http://www.internetretailer.com/dailyNews.asp?id=29140> (accessed November 4, 2013).
- [6] Luca, Michael, Reviews, Reputation, and Revenue: The Case of Yelp.com, *Working Paper 12-016*, Harvard Business School, Sept. 16, 2011, 1-40.
- [7] Pearson, David, Marketing for Survival, *CIO magazine*, April 15, 2003.
- [8] Phan, Dien, Chen, Jim and Ahmad, Sohel, Lessons learned from the failure of a major retailer, *Information Systems Management*, Spring 2005.
- [9] Phan, Dien and Vogel, Douglas, A model of customer relationship management and business intelligence systems for catalogue and online retailers, *Information & Management*, vol. 47, iss. 2, pp. 69-77, 2010.
- [10] Phan, Dien D.; Schmidt, Mark B.; and Roth, Larry, Natural Intelligence Applications for Business Intelligence in Online and Catalog Retailing Firms: A Case study, *International Jour. of Information Systems and Change Management*, vol. 6, iss. 1, pp. 68-83, 2012.
- [11] Sommerhauser, Mark, Bluestem files to have public stock offering. *St. Cloud Times*, Apr. 23, 2011.
- [12] Surowiecki, James, *The Wisdom of Crowds*, New York, NY: Random House, 2004.
- [13] Tarasewich, Peterand, Patrick R., McMullen, Swarm Intelligence: Power in Numbers, *Communications of the ACM*, vol. 45, iss. 8, pp. 63-67, August 2002.
- [14] Utpal, D. and Soltysinski, K., Coveted or overlooked? The psychology of bidding for comparable listings in digital auctions. *Marketing Letters*, vol. 12, iss. 3, pp. 223-235, 2001.
- [15] Yin, R., *Case Study Research: Design and Methods*, 3rd ed., Sage Publications, Thousand Oaks, CA., 2001.



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