Leveraging Business Intelligence in e-business

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Introduction

e-business has taken root in corporate America and has forced firms to rethink their approach to key business intelligence (BI) and customer relationship management (CRM) strategic initiatives. The Internet and associated providers enable large firms to reduce costs and grow the market or their market share. Companies are finding new and innovative ways to capture and leverage data from multiple consumer channels to build a single view of the customer. *IBM offers e-Business Intelligence — a practice based upon knowledge and experience in issued-based consulting to deliver policies, procedures and methods which leverage customer-centric information in the developing Internet economy.*

While opening doors to new opportunities, e-business has also created new risks within the existing infrastructure. From an e-business intelligence perspective, a firm can be categorized in one or more of four ways.

1. ***e-business is an enabler and the Internet is a new channel among a set of channels***
   In this case, the firm has a significant investment in a traditional BI infrastructure including data warehousing, data mining, and online analytical processing (OLAP) reporting technologies. It would like to build upon these investments to find new and innovative ways to capture and use data from the all consumer channels to build a single customer-view consistent across multiple distribution channels.

2. ***the Internet is a new business model which the rest of the firm may adopt***

   In this category, a large firm has a brand and commerce presence on the web and would like to improve marketing effectiveness, customer service, and cross-selling on this channel. If this model proves successful within this strategic business unit, it is likely to be adopted across the firm.

3. ***e-business is <u>the</u> commerce channel***

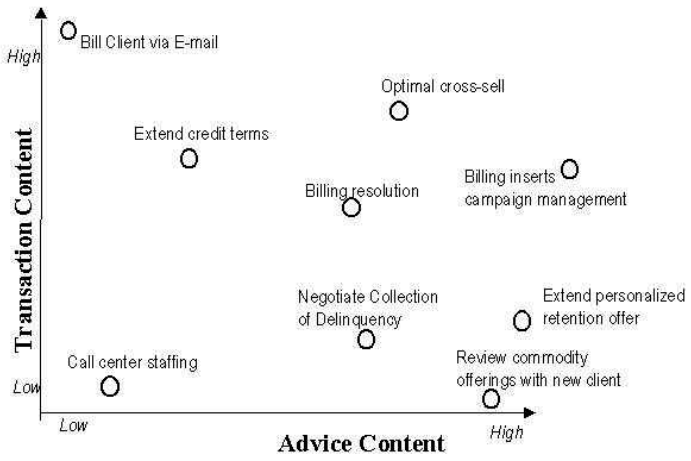
   A dot.com firm that has built an end-to-end BI system to capture and use data to enable a highly personalized cross-sell, up-sell, retention oriented relationship through the Internet. These are usually startup firms that already have a web presence or are firms that would like both the Online Transaction Processing (OLTP) and decision support environment.

4. ***e-business is the information delivery channel***
   Information service firms that create and distribute information-based products over the web. These firms provide data and analytics as their primary or sole service

The remaining sections of this paper will describe a series of evolutionary steps that firm s should undertake to realize the financial benefits of e-business intelligence. Each of the four types of firms may enter this evolution at different steps. This paper is intended to convey IBM s current thinking on e-Business Intelligence and the next steps necessary for progress in today s competitive environment.

Get the e-business strategy right and communicate it

As we discuss the e-business relationship that firms envision holding with their customers, we believe there are two basic, yet very distinct, dimensions that describe this experience. These two dimensions define a space and the firm s position in this space determines the customer s experience.



The *transaction activity* defines the first dimension. The transfer of money or information for products or services defines this activity. The creation of a service billing account or the display of the current month s invoice should be perfectly executed. Failure to perfectly execute inhibits long-term customer relationships.

The *advisory activity* defines the second dimension. This is the advice or service that is exchanged between the firm and the customer.

A classic example is the recommendation, to a unique customer, of the optimal service plan from the many plans available. The opportunity to match consumer needs with the available plans becomes the paramount issue. As the business, its customers, and the market mature, the transaction v. advice position will change through time. Ultimately, the firm s utility is at its maximum when the customer experiences are the optimal blend of perfect transactions and expert advice.

These two activities specify the e-business intelligence foundation. For some activities, the focus should be upon perfect transactions with little advisory content. Other activities are defined solely by the content and quality of the proffered advice. Clearly, perfect execution along one dimension provides the greatest opportunity along the opposite dimension. The effectiveness of the advice should be based on the needs and knowledge of the customer.

To successfully approach any e-business intelligence engagement, it is essential to develop a deep understanding of the firm s current e-business strategy. In crafting a customer-centric strategy, we would offer the following insights:

> *All customers are not created equal*. Customer relationship management objectives must be established in order to take advantage of the incremental gains available through understanding customers unique wants and needs. This insight is gained through the products they purchase, the service they expect, the offers and content to which they respond, and their related demographic data.
>
> The treatment each customer receives should be related to their contribution to the firm s profitability. For instance, account delinquency has long been a tough social issue for electric and gas firms. Delinquency rates run as high as 35% of accounts in some areas of the country. The motivation to significantly reduce the carrying costs of delinquent accounts runs counter to a strong social obligation to maintain service.
>
> *Our knowledge about customer expectations continues to evolve*. In addition to focus groups, questionnaires and surveys, the Internet has added a very effective channel in gaining psychographic information. By combining this information with external data, we can gain competitive advantage by developing a more complete view of the customer. Knowing a single purchasing aspect of a customer is no longer good enough. The firms that create a holistic customer view are going to win.
>
> *Promotions need to match the customer preference with the offer and the content*. Determining current and future promotional offerings is increasingly difficult. Given a set of customer preferences, channels, products and contact opportunities, the goal should be to maximize the promotional effectiveness. IBM s multi-channel optimization processes offer a prescriptive means to allocate promotional offerings across all channels.

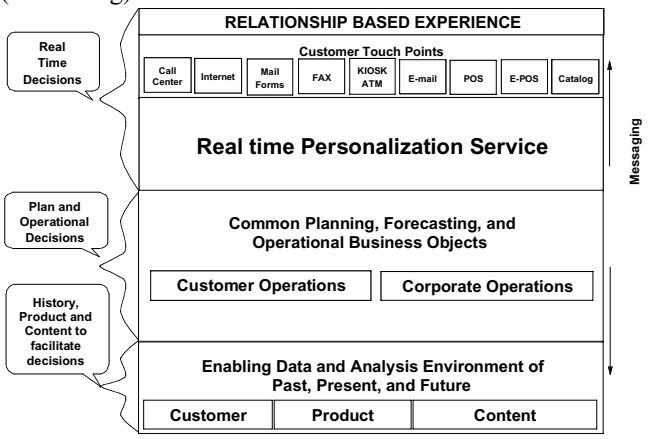
Knowledge of the customer, channel, and promotional offerings are critical to understanding and selecting the right methods to drive demand. Understanding customer traffic has been a staple in traditional business decision making. On the Internet, traffic comes in many forms and the volume, per unit of time, is many times higher than any brick and mortar store. If the firm looks at any combination of products, customer segments, promotional offers, economic factors, and

pricing strategy in an e-business environment, the number of decisions trade-offs range in the trillions. Exploiting these decision opportunities are key to leveraging customer demand against the firm s supply to maximize customer service.

Develop an e-BI Infrastructure and technical foundation

The Internet thrives on data in every form: images, chat dialog text, link text, video, behavior profile, traditional segment profiles, click streams, registrations, auction bids, and finally purchasing transactions. The challenge is to transform and classify the data into actionable information that will make significant positive impacts to the business. We can then organize, store, and exploit this data with advanced database marketing methods, pattern recognition, and mathematical transformation techniques to maximize the revenue potential of all channels. An e-BI infrastructure gives us the means to handle e-channel data and merge it with the firm s existing customer behavior and operations data.

In order to understand all of the data, we must first characterize the business issues — strategic (planning), or tactical (scheduling) — and the decisions that address these issues. In this virtual, multi-channel, multi-product world, an e-intelligence infrastructure facilitates the integration of strategy, data and decisions. It does this by creating a coherent view of many channels.



With the use of such a framework, firms can identify and position the data as a virtual set of business decisions and data objects supporting those decisions. Through the use of such frameworks firms can quickly identify duplication, gaps and opportunities in corporate information.

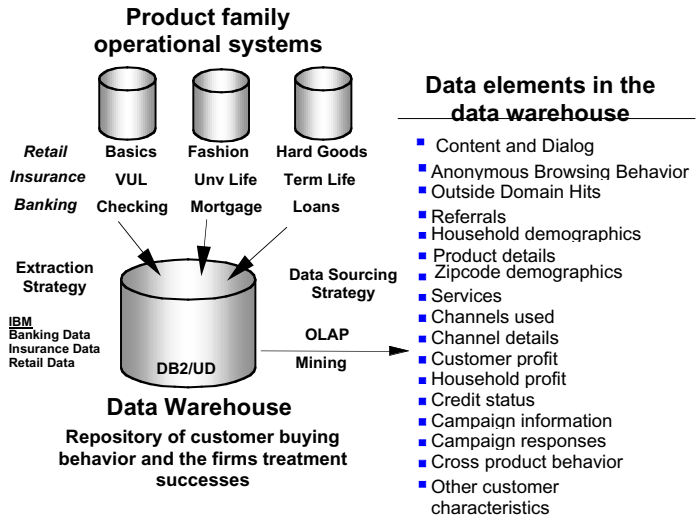
From an Internet perspective, getting a firm understanding on the data that describes traffic patterns on the website is similar to analyzing sell-through data against the store layout. As in a store, we must also understand how the customer gets to a specific page. Web traffic analysis tools can help in quickly understanding the traffic of the corporate website. Statistical and data mining techniques can further decompose the site traffic flows. These tools can be used to provide a better understanding of effective page presentations.

Website analyses provide insights to questions such as How do I

- quantify the return on investment for online advertising strategies by measuring the results they generated?
- learn which Internet Service Providers or Search Engines the profitable customers come from?
- measure the relative success of business web affiliations and partnerships?
- determine which Web sites provide the most referrals?
- identify new niche markets by user behavior using IBM data mining technology profiling?
- measure the success of Web marketing or content emphasis campaign?
- develop strategies to improve the Web site’s effectiveness?

Build the e-Data Warehouse or Operational Data Store

After collecting e-channel data and transforming it into insightful matter, we focus on the proper storage and retrieval to ensure it becomes a useful corporate asset, delivering relevant and meaningful results to both the customer and the firm.



Business data is a corporate asset but it can also become a corporate nightmare if not treated with the right amount of stewardship and structure. To the left are samples of data on which firms can focus to ensure that they enable accurate and sound corporate decision making.

Traditional retailers have been quite effective with warehouses organized by location, time, product, promotions, and price. With the introduction of the Internet, more dimensions are necessary such as traffic sources, on-line behavior segments, and content or image categories.

Data warehousing methods provide the foundation for building a historic record of both product performance and, more importantly, customer behavior. This record of behavior provides a vital piece of information for the generation of analytical models that can predict the propensity of a customer to respond to a web page or direct mail offering.

To make decisions and effect change, we almost always need historic data — a record of previous responses. This record forms the basis for future modeling processes and becomes the foundation for the corporate decision making environment. Importantly, this information baseline allows us to create a view of the customer before a significant event, such as a web page or kiosk screen presentation, or a direct mail offering. These events stimulate consumer behavior and provide important ingredients for prediction: the behavior of consumers before an event and the state of the consumer population after the event. With this evidence — a prior view and a response to a stimulus — sophisticated data mining algorithms can be used to generate models that predict the customer s next behavior. This prediction can then be applied to other customers.

After we establish the means to measure and predict behavior, we must then establish a framework for answering *the so what?* question. Therefore, for each customer, we establish a profit and loss (P&L) statement. The P&L also establishes a criterion for dividing customers into a loose groupings of similar, but not identical, individuals. The P&L calculation must be agreed upon at the executive level to maintain consistency with corporate objectives.

To achieve this P&L, we derive the set of revenue and cost elements using a variety of typical business methods as well as advanced mathematical techniques. Controlling cost growth is virtually impossible without building the P&L at the customer level. This gives us the means to create a common view or score card of the financial relationship between customers, products, and the firm. Again, most firms have finished or at least started to build databases, files, and small data marts with revenue and cost metrics. OLAP tools are replacing legacy reporting to increase the timeliness and usability of the information.

We have observed the following issues that can become obstacles to successful customer-centric data warehouse implementations.

Completeness of data: There may be issues with data completeness because of the range of possible sources of customer-related data. For example, for a customer loyalty system, the base data may have passed through a central data collection agency and the transaction data through the EPOS or teller system. The data warehouse may then be faced with the problem of transactions appearing before the related base customer data.

Quality of data: Errors may be discovered in data collected through the transaction systems because this data, though collected for some time, may never have been used for the customer-centric analyses and hence not proved 'clean'. We define error to mean incomplete, missing, or wrong data.

Data volumes/performance: In fast moving corporate environments, transaction level data volumes can be enormous. Performance of data load and inquiry functions must be considered in the design of the data warehouse and technical infrastructure. To address these, activities such as volume prototyping and performance guidelines for coding need to be built into the project plans. The batch window is almost the limiting factor in these environments.

Privacy Legislation: There is a growing imperative for data privacy legislation. New laws are proposed every day and customer data privacy is a topic that every company needs to be aware of. These issues range from the opt-in v. opt-out issue to consumer health insights derived from drug, vitamin and supplement purchases.

Business Rules: As rules for calculating business figures are determined during requirements gathering and design, we frequently find repetitive calculations — processes and data with similar names within one company, perhaps by different departments. These need to be understood and rationalized prior to solution implementation.

Data-driven personalization through advanced analytics

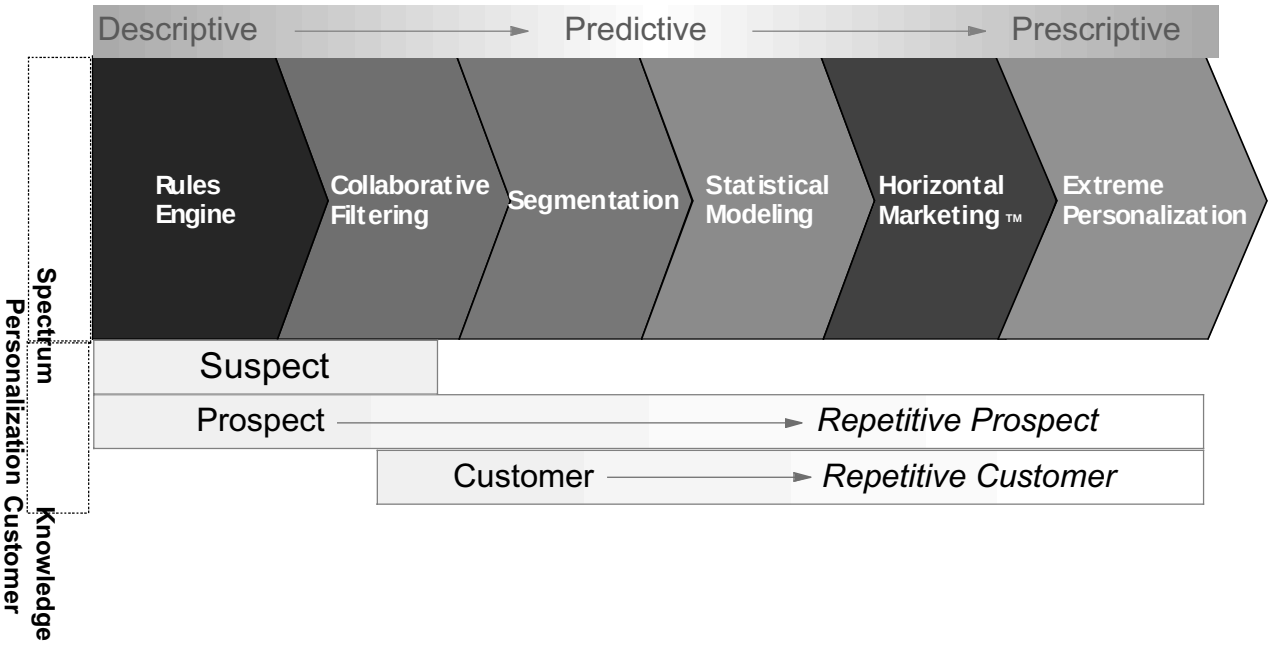
Advancements in data mining, collaborative filtering, statistical modeling, and decision trade-off algorithms are becoming common place. In order to create financial gains out of the vast amounts of information stored within corporate data stores, firms now find it necessary to utilize these technologies to enable new ways of identifying and treating prospects, maintaining core customers, and winning back former customers — critical elements in sustaining growth and profitability.

The nature of the corporate decisions that need to be made has not changed. We still demand insights to:

- economic decisions such as price sensitive behavior, income shifts, or population shifts
- customer level decisions such as customer profitability, brand loyalty, abandonment risk, default, or attrition
- supply chain decisions of replenishment, customer service levels, shipping, or manufacturing

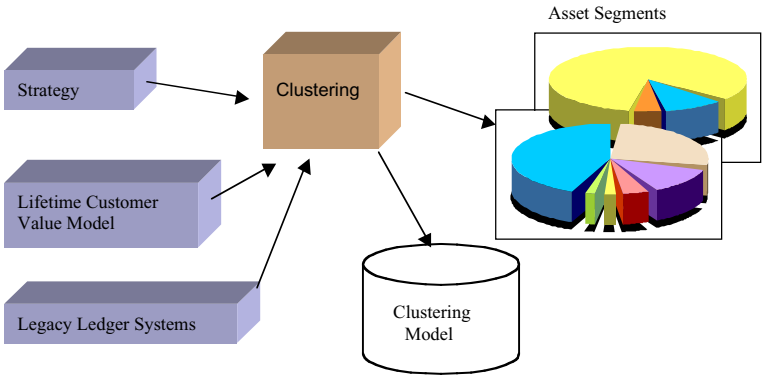
In order to establish a further return on investment, some tactical targeting may be done. For example, a customer demonstrating a propensity for purchasing premium (higher margin) products might form the basis of a campaign that encourages them to sample a related premium product at an introductory reduced rate.

As shown below, we believe that the continuum of descriptive → predictive → prescriptive modeling mirrors the movement of suspects → prospects → customer → repeat customers. IBM e-BI consulting provides the intellectual capital and tools necessary to build the firm s profitability at any point in the customer knowledge space. The more the firm knows about the customer, the more personalized the treatment can become.



Treat customers as an asset

In the same way a fund manager in a financial house would create a portfolio[1] of stocks and bonds, our approach is designed to treat the total customer base appear as a portfolio. Customer, channel and product metrics, corporate objectives, and the driving decision tradeoffs are organized in a scorecard to make effective decisions and track corporate progress. This scorecard becomes an integral part of managing the customer relationship at an aggregate level.



Viewing marketing as a negotiation between risk and reward, rather than focusing on the better performing segments alone, ensures a more efficient distribution of funds across the customer base.

We use data discovery tools, multidimensional query tools, and the P&L from the previous step, to segment customers into homogenous groups or *asset classes*. The term asset class is used rather than segment or cluster, because it is more industry neutral and is a more financially relevant name. It is meant to convey a sense of similar, but not identical, customers. This activity can, but will not necessarily, result in a large number of differing asset classes. The asset clustering process also creates a classification model. This model can be installed in a data warehouse / data mart / on-line data store, allowing continued assessment of the customer base.

As mentioned earlier, one-to-one marketing also raises previously unacknowledged data privacy issues. As privacy issues become more and more prevalent, the usage of certain technology will be very key. Training models with invasive tracking technologies may expose firms to privacy issues that could be detrimental to the organization. This makes it very important to establish privacy rules and noninvasive marketing approaches to customer interactions.

Create optimal promotional budget allocations

A cornerstone feature of our approach is the ability to look at the decision process across many different dimensions of the firm. Those dimensions would include both customer behaviors and multiple time periods. We intend to answer the question *am I doing the optimal set of activities that maximizes my firm s profit?* This question has the dimension of time associated with it because the lifetime value of a customer is not determined in a single period, but rather over time in a manner similar to an annuity, in which payoffs to the firm occur over many time periods.

When the marketing activities of the firm are envisioned as a long term investment in a customer, the question becomes in which customers should we invest and how much? Today, the promotional behavior at most firms reflect the effectiveness of the regression models that score a customer's propensity to buy. One problem with this approach is that recency - the number of days since last purchase - tends to dominate the models, so that high-scoring customers end up receiving nearly every promotion. Some marketers are even getting requests from their better customer to promote them less often. While established marketers usually make promotional decisions that allow each promotion to meet its financial objectives, a different allocation of advertising resources would result if we shifted our focus from program profitability to customer profitability across time.

Investors use a technique called *asset allocation* to determine the investment level in each asset class. The technique is a rigorous inspection of alternatives that produces a set of holdings over time that objectively examines the risk and return tradeoffs. This concept is applied to the firm s customer base in an effort to produce a portfolio of optimal activities that maximizes return for the fewest advertising dollars while constraining the portfolio to meet certain corporate or promotional objectives[1]. A variety of factors can enter into these models ranging from the expected return on alternative uses of these funds, through the minimum amount of advertising needed to sustain the desired customer relationship. These factors represent the "marketing levers" the decision-maker can employ.

In our applications, the risk/return curves that describe diminishing returns are created for each asset class. The overall budget is spread across all asset classes and multiple planning periods using a linear program.

[1] Haydock, Michael P. and Bibelnieks, Eric, 1998, Horizontal Marketing: Optimized One-to-One Marketing

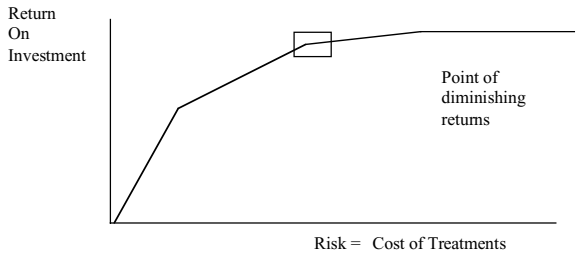


Figure 1. A risk/return curve as a piecewise linear concave curve.

We have described these curves as risk/return because they describe the relationship between the promotional cost — risk — of sending promotions with the return on investment attained by those mailings. The challenge is to treat the relationship up to the point of diminishing returns (Figure 1). Past the point of diminishing returns there is little to no financial gain attained under any level of continued spending.

Clearly, the very low cost of e-mail changes the scenario — direct mail promotion costs are closer to the expected revenue than e-mail costs. We believe that our efforts to incorporate this effect will yield substantial benefits to multi-channel firms.

Saturation — the relationships between promotions and channels

The interaction of promotions is an extremely important component of e-commerce. *Cannibalization*, or *saturation*, describes that portion of a promotion's sales that are consumed by a follow-on promotion - while the original promotion was still generating sales. Similarly, a portion of the follow-on promotion s sales is consumed, or cannibalized, by the previous promotion. After close investigation, we believe three forces move this cannibalization effect:

- a product component: *how similar are the promoted products?*
- a promotion type component: *how similar are these sequential promotions?*
- a time component: *how close together in time are these promotions?*

Sometimes the combined effects of the promotions create a positive effect on revenues while other combinations create a negative effect. The key to understanding the effect on an individual customer is to evaluate the total promotional strategy. The amount of cannibalization increases when similar promotions with similar merchandise are created fairly close together in time. The more time between the promotions, the less the cannibalization effect. Dissimilar promotions, with unlike merchandise, will have very small cannibalization effects. By evaluating the total strategy, an understanding of the incremental gains or losses due to multiple promotions can be developed. We use this information to seek out the optimal strategy for each customer or customer segment.

The impact of saturation in the Internet-only business applications remains an open issue. Though inexpensive, volumes of unwanted e-mail will create a noxious effect on customers. Also, such issues as opt-in v. opt-out and other privacy controls need to be considered in the firm s promotional strategies.

Direct mail firms that are now using the Internet as a new channel are seeing some positive interactions. Mailing of catalogs referencing the web site is driving site traffic and the resulting sales appear to be incremental. Analogously, web sites referencing the catalog are driving new productive prospects.

Assign meaningful offers

The firm initiates the promotion assignment process when all the information on customers, promotions, allocations, interactions, and constraints have been readied. Potentially, this information could include promotion overrides, which typically represent up-front business rules for establishing certain mandatory promote or no-promote actions, and customer-segment specific constraints, such as promote the best customer asset class at least twice per month .

By considering all of a customer's risk / reward scores and the promotional interactions, IBM s methodology selects the future combination of promotions that best fits that customer's characteristics and the firm s budget constraints. The order of selection for these promotions is not dependent on what s available to promote on only the next promotion date. What matters is what s available to promote over firm s planning horizon - the next three weeks or six months or whatever. This is really the essence of assigning offers: the right promotion at the right time, minimizing the opportunity cost of sending promotions of poor fit.

In summary, the methodology uses math programming to find an initial set of candidate promotion combinations for each segment of customers. The initial sets are a small subset of the total number of potential promotion streams. Each candidate promotion stream incorporates the reward scores, cannibalization effects, and budget constraints to determine the optimal combination. We call this step stream generation.

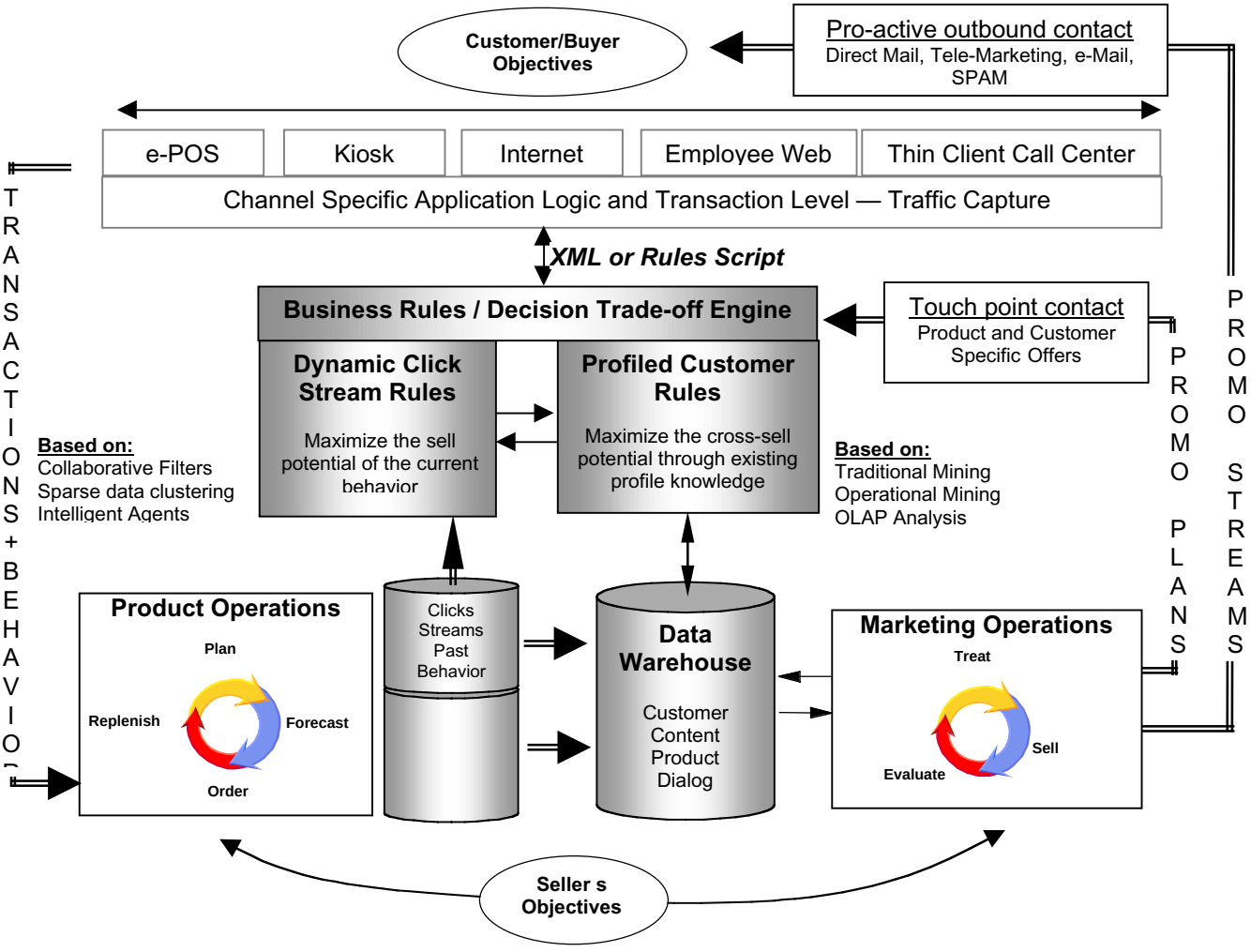
The second step of the methodology again applies mathematical optimization techniques across all segments to determine the optimal promotional streams for each customer segment using the set of candidate promotional streams associated with the customer's segment. We simultaneously consider the asset class budgets, the overall promotional depths, and any other user constraint that would be applied at the promotion or customer level.

Deliver a relevant experience via campaign management

The Internet is moving business into a new generation. Spending to gain brand market share (up to 40% of some dot.com firms operating budgets), building e-business infrastructures with large capital expenditures, and developing secure e-commerce is center stage at this point. We can now deliver targeted messages that maximize the potential sales from the promotion presented at the customer touch point to meet both the customer s expectations and the firm s objectives. By utilizing operational data mining techniques, a knowledge base can be created to serve the customer the right content at the right time.

One thing to note is the loss of channel focus and the sole orientation of a one-to-one customer relationship with the firm. The e-business and especially the Internet are playing a tremendous role in redefining this corporate positioning of a one-to-one customer relationship.

Based on a worldwide collaboration of IBM patented technologies and field consulting, we address the issue of visitors



with a powerful business rules / decision trade-off engine. This engine utilizes up-to-the-minute information to continually learn about visitors to a site. The algorithms devise strategies for delivering pages and links to meet the site objectives. This engine plays an important role in reducing the cost of converting a site browser to a purchaser.

The business rules and decision trade-off engine utilizes information derived from the web traffic analysis tools. Information is established in the page content to allow effective tracking to be undertaken that raises the on-line analysis process above the simple web log parsing. This smart approach, coupled with powerful machine learning techniques, produces an engine capable of learning about visitors in real time. The basis of this technology is similar to IBM's Deep Blue chess playing engine. Instead of deriving the next chess move to make, it is calculating the most effective page to build and present. The objective is to enable identification of the visitor so she may be viewed as more than a suspect to the presentation engine. We then deliver product features relevant to the customer to engage in the initial sell, up-sell, or cross-sell proposition. Through out the entire process, results are tracked and reported back to the decision-makers through the balance scorecard to validate and ensure financial returns.

Conclusion

e-Business Intelligence systems will improve decisions based on customer relationship management, product, content, and, of course, improve return on investment. What the customer needs, in the way they want to see it, all just a click away.

e-Business is changing relationship strategies - marketers are increasingly looking for more focused ways to engage customers. IBM e-Business Intelligence provides the knowledge foundation to produce motivating experiences for prospective customers, compelling relationships with new customers, and better relationships with old customers can be forged along this developing channel.

Creating the optimal customer experience is a major business challenge. The objective is to raise the relationship with the customer to a level where the firm becomes the consistent first choice.

- To sustain a solid relationship and meet the aspirations of the customer, the firm must provide the customer with the optimal blend of transaction and advice.
- The firm must collect, organize and utilize its data to find new ways of delivering optimal marketing materials and relationship messages at the right time for each customer.
- Advanced analytics help the firm understand promotion and channel interactions; treat customers a part of a portfolio so that the firm invests in a relationship; and creates an optimal stream of promotions over time to build a consistently compelling message.
- Extreme personalization can help to distinguish one firm from another in the eyes of the customer by demonstrating that we know you, therefore we understand your wants and needs".

By partnering with IBM and utilizing IBM s e-business expertise, industry leading technology in hardware and software, intellectual capital, and world class services in implementation and integration of e-Business Intelligence solutions, firms can build a diversified portfolio of customers aligned to their financial goals. The IBM Business Intelligence methodology provides clients with the solutions that meet both short-term and long-term corporate decision making goals. The resulting business intelligence solution enables the corporate marketer to make financial and strategic decisions for justifying promotions, new products, new channels, and new services that maximizes their overall revenue from marketing expenditures.