# OptiRetailChain

## Price and Advertising Optimization Solution for Retail Industry

*" Optimization is a technology for calculating the best possible utilization of resources (people, time, processes, vehicles, equipment, raw materials, supplies, capacity, securities, etc.) needed to achieve a desired result, such as minimizing cost or process time or maximizing throughput, service levels, or profits".*
***e-Optimization.com***

- Makor Company has developed an **OptiRetailChain** Retail Optimization Solution. It is comprised of **OptiRetailChain** per-store price optimization solution and **OptiRetailChain** in-store advertising optimization solution.

- **OptiRetailChain** uses point-of-sale (POS) data for optimization of prices and promotion schedules for groups of interrelated products with the purpose of maximization of a preferred merchandising figure of merit like revenue, profit, etc. in a supermarket or in a chain of supermarkets.

- It enables the retailer to determine optimum prices and in-store promotion schedules for groups of related products based on predicted product demands.

- **OptiRetailChain** was developed by the group of Ph.D. mathematicians and statisticians and is based on the sophisticated mathematical and statistical models. Makor has applied to USPTO for 2 patents to protect **OptiRetailChain** technology and know-how, and we will continue to seek patent protection for future innovations and advances.

## Table of Contents

## OptiRetailChain System Overview.

The basis of the system is a statistical model that combines effects of prices, promotion schedules and other factors that could influence demands, and produces a flexible nonparametric predictive demand function that can be optimized simultaneously in prices and promotion schedules.

Demand predictions are produced by statistical prediction algorithms coupled with data mining procedures applied to historical database that contains sales data together with various sales conditions.

Determination of optimal prices is initiated by the user on the per request basis by execution of optimization scenarios, while optimal promotion schedules are generated continuously in real-time after initial options have been set-up.

**OptiRetailChain** combines a rich store of optimization and prediction scenarios with real time information processing in which most recent data are merged into historical data acquired previously via interface with the system database.

### User's Interface Module

For performing tasks like pricing optimization, or sales forecasting, the system has to receive from the user a number of option selections, parameter and variable values. For this purpose, the user is presented with a series of screens on which he is requested to tic menu options, make selections and enter input parameter values. The user can communicate with the system via User's Interface Module by selecting optimization scenarios from the library of optimization templates parameterized by input parameters and various options on the user's menu.

Varieties of customized reports are generated by **OptiRetailChain** in order to evaluate the system's performance. Detailed multidimensional reports of optimized prices, sales predictions, analytical and execution reports are generated and available both on and off-line.

### Implementation

Effectively all that is required from retail chain for **OptiRetailChain** implementation is a connection to the Internet.
**OptiRetailChain** will not slow down or interfere with the regular functions of supermarket databases and other in-store systems.
**OptiRetailChain** is ready to work in wide range of databases and computing environments. That means retail chain will not have to change its database and data mining system.

# OptiRetailChain Per-Store Price Optimization Solution

## Key Features and Objectives

- **OptiRetailChain** per-store price optimization solution is a decision-support system (two US patents pending) that enables retailers to make the most intelligent and profitable pricing choices.

- It provides per-store price recommendations in order to reach higher sales, to clear out inventory within a specific period and, as a result, to reach a maximal profitability.

- The system looks at past demand functions of products and product categories of each product, its cost and inventory stock, then makes a sell forecast for a particular period and recommends an optimal price.

- **OptiRetailChain**'s goal is determination of optimal prices and selected fogure of merit. It works to increase the per-store profits and by doing so the retail chain's cumulative profits.

## Why Price Optimization is Crucial in Retail?

Retailers are increasingly challenged by competition, variability and complexity across the retail chain, which impact their ability to increase sales while reducing the total costs to the shelf and the total inventory in the chain.

One of the biggest challenges the retailers are facing is managing prices to achieve their ultimate goal – maximal profitability.

Retailer's prices influence the quantities of various items that consumers will buy which in turn affects total revenue and profit. Hence, correct pricing decisions are a key to successful retail management.

Setting optimal prices is especially difficult without scientific tools for understanding customer demand for every item at every location and predicting the right price to maximize sales and gross margins. Inventory levels, sales performance, seasonality, promotions, and various vendor-related issues are all factors to be considered when changing prices.

Retailers are often setting their prices relying on manual analysis, basic rules of thumb, and judgment to make these high-leverage pricing decisions.

Manually targeting price changes to particular regions or stores to account for differing inventory positions and demand is virtually impossible. Usually markdowns/markups are made across the retail chain, regardless of how individual stores were performing.

**OptiRetailChain** developed it Per-Store Price Optimization System with the aim of creating a consistent price optimization system that would make pricing decisions on a store-by-store basis.

## How it Works?

**OptiRetailChain** obtains data from the point-of-sale for each sale made in the store including quantity of sale, time of sale, if the product was on "Sale" promotion, etc.

It uses sales volumes at different price levels over time to forecast, per-store, how many units of the items would be expected to sell if no markdowns/markups were made.

Furthermore, it applies advanced mathematical algorithms and forecasting methods to sales and inventory data to provide precise per-store optimal pricing decisions.

It determines the optimal timing and magnitude of a price change per-store, so optimal pricing decisions are tailored to local sales and inventory situations and market conditions.

When optimal pricing strategies have been determined, **OptiRetailChain** sends optimal prices from central computer to the store manager for his price change confirmation. The new price could then be send to Electronic Shelf Labels (ESLs) as **OptiRetailChain is** easily connectible with ESL solutions.

## The Science behind the System

### Steps

**OptiRetailChain** mathematical algorithms are built as a six-step estimation-optimization model for calculating retail prices that will maximize predicted total of a chosen figure of merits for a given target time period.

At the first step, a data mining procedure operating on a historical database containing sales volumes and records of sales conditions is used for constructing a

regression model of demand. The data mining procedures use predefined patterns for constructing relevant factors to be included into regression model.

At step 2, regression model is specified and constructed when only relevant factors qualify for inclusion.

At step 3, the regression model is fitted, model parameters are estimated, and predicted demand function is computed.

At step 4, an appropriate objective function is selected based on particular circumstances and on user's preferences communicated to the system via user's interface.

At step 5, the product's predicted demand is expressed as a function of price alone, and after performing optimization, optimal values for the figure of merit and prices are obtained.

After an optimal figure of merit and optimal prices have been computed, error estimation and criticism of results are performed at step 6. Since all obtained results are based on historical data, they are uncertain. Therefore, they have to be tested for significance, to make sure that the proposed price adjustments are not resulting exclusively from noise in data.

**Problems to Be Solved**

- Decisions based on instinct rather than fact.
- Managing tens of thousands of items in hundreds of store locations.
- Uncertainty about demand and elasticity at various price levels.

**Challenges**

- Implementing scientific methodology for determining optimal prices.
- Setting flexible per-store prices to suit local and demographic characteristics.
- Eliminating unnecessary markdowns/quantity discounts. Investment analysts frequently cite excessive markdowns as a key factor contributing to surprise earnings shortfalls among retailers.
- Eliminate excess inventory – which results in last minute, deep discounts leading to lost margins.

**Objectives**

- To set the best prices for every item category, in every store, every week of the year.
- To understand consumer demand, price sensitivity, and fully-loaded product cost for every product in every store.
- To predict the impact and outcome of pricing strategies according to any number of "what-if" scenarios.
- Fast selling stores are taking smaller markdowns (if any). Slow selling stores are taking deeper markdowns.
- To execute the right pricing strategy for each store, category and market.
- To evaluate the results of implemented changes and refine future pricing strategies.

**Key Inputs**

- Historical regular/clearance prices and sales data.
- Minimal and maximal price range.
- Business rules.
- Concurrent external conditions that could influence sales volumes, such as seasonal characteristics, quantity discounts, package discounts, advertising activities measured on some scale, etc.
- Initial inventories for all product items (for clearance price optimization).

**Our Per-Store Optimization System takes the inputs and**

- Considers all the possible combinations of consumer purchase scenarios or purchase behavior.
- Selects best combinations of merchandising decisions to meet desired financial and competitive goals.
- Utilizes probability decision theory and statistical models for making sales predictions and pricing decisions.
- Examines and incorporates business world retail constraints.

**Per-Store Outputs**

- Optimal prices for maximizing expected chosen figures of merit like revenues, profits, etc.
- Predicted maximal figure of merit.
- Predicted prices and demands.
- “What-if” scenarios are created.

## System Components

Our comprehensive Per-Store Price Optimization Solution consists of the following core elements:

- **Profit Maximization**
  An optimal set of prices is computed in order to maximize profitability while meeting unit sales and/or revenue targets and honoring business rules and management constraints.

- **Demand Forecasting Model**
  The demand forecasting technology capable of predicting consumer demand, by item category, per-store. Our demand model quantifies the changes in demand brought about by changes in price and by other factors. It delivers accurate forecasts of demands, revenues and profits

- **Business Rules Management**
  Exact pricing decisions need to combine accurate demand models with business rules, pricing policy or strategy and performance targets to properly reflect pricing strategies.

- **Predictive Analysis**
  Enables evaluation of prices and pricing policies by delivering accurate forecasts of the resulting impact on performance (sales, revenues and profits / margin). Enables retailers to conduct a suitable "what-if" analysis.

## Electronic Shelf Labels (ESLs)

Managing paper price labels is time consuming and error-prone.

Electronic Shelf Label (ESL) System is an in-store network that delivers shelf edge data for use in pricing and managing the retail environment.

Electronic Shelf Labels are small wireless LCD-display devices intended to replace conventional paper pricing systems used in most stores. The information displayed on the electronic LCD modules installed in the ESLs is controlled through the central server computer and RF communications.

### ESL Benefits

- It allows retailers to implement price changes from the store's central computer, resulting in significant labor savings and guaranteed pricing accuracy.

- Assurance of price integrity permits retailers to reduce or eliminate the time and expense of manual pricing audits and fines payable to governmental entities for pricing inaccuracies.

- It maximizes customer loyalty by insuring the price displayed at point-of-purchase is the same as at point-of-sale. Pricing accuracy results in fewer price checks and errors at checkouts.

**Linkage between Price Optimization and ESL**

Price optimization requires timely and accurate price changes. With price changes carried out by hand it is impossible to do all the changes that the price optimization system may suggest. With electronic labels the changes are made quickly and at the right time. Imagine making manually
1,000 items/store * 1,000 stores/chain = 1,000,000 changes.

Savings gained from not having to manually change individual prices are high enough to justify the cost of ESLs and bring high ROI (Return on Investment).

## OptiRetailChain Price Optimization Benefits

- **Increased Profitability**

**OptiRetailChain** Per-Store Price Optimization Solution helps the companies to identify optimal price policies and levels through analysis of historical performance, calculation of price elasticity, price testing, what-if scenarios simulations, and profit maximizing algorithms.

- **Per-Store Price Optimization**

Usually, retailers are taking pricing decisions across the chain regardless of individual stores performance. Using **OptiRetailChain**, retailer will be able to make optimal pricing decisions for individual stores instead of across the chain, eliminating costly and unnecessary markdowns/markups.

- **Clearance Sales**

**OptiRetailChain** provides faster clearance sales and better clearance sales / clearance markdown dollar forecasting. Faster clearance means reduced inventory and early fresh assortments.

- **Easy Access to Pricing Data**

It collects, organizes and centrally manages crucial pricing data that can be analyzed, downloaded or exported.

- **Pricing Data Security**

**OptiRetailChain** collects data on a secure central server which ensures the integrity and documentation of critical pricing policies.

## Price Optimization Efficiency

- According to AMR Research: “Some of the early users of applications employing modern-day optimization saw ROI levels of up to 300%."

- According to Andersen Consulting: "On average, a 1% increase in price, without a corresponding drop in volume, can lead to operating profit improvements of 11% or greater."

- McKinsey & Company concluded that: "Getting pricing right has emerged as one of the ultimate keys to the success of e-businesses, but few companies have even begun to explore the opportunities."

- Price optimization is a key element of a Retail Revenue Management. It is critical to increasing profits in all segments of retail.

- Retail Revenue Management is widely expanding aiming to reach a $500M market size by 2005.

## OptiRetailChain: Optimization of In-store Advertising Space and Time

### Key Features and Objectives

- **OptiRetailChain** optimal advertising solution is a remotely controlled In-store Advertising Optimization system (US patent pending) for maximizing a preferred figure of merit by targeted in-store advertising of selected number of store items.

- The **OptiRetailChain** system works by administering, managing and publishing rich media advertising information to in-store point-of-purchase shoppers through high-resolution interactive plasma/LCD smart displays.

- In so doing, the **OptiRetailChain** system effectively brings together the shopper, advertiser, and retailer permitting time-sensitive information and product incentives to influence the shopper at their moment of purchase decision.

- Effectiveness evaluation of promotional campaigns and profiles will be performed to evaluate sales and profit growth as a result of individual screen promotion for a given period.

### How it Works?

**OptiRetailChain** installs in-store smart displays in retail chain branches.

Smart displays are connected through Internet/Intranet connection and have access to supermarket databases.

**OptiRetailChain** obtains from the supermarket computer detailed real-time point-of-sale data for each sale made in the store including the quantity of sale, the time of sale, if the product is 'on-sale' promotion, etc.

**OptiRetailChain** receives from the supermarket database detailed revenue and cost information on every product on the store.

From our server, **OptiRetailChain** obtains real-time information regarding time and length of advertising message for each product in the store.
**Real-time optimization is done according to sales data and supplier-defined advertising profile.**

By appropriately combining all the statistical information available, **OptiRetailChain***'s proprietary Promotion Optimization algorithms calculate the*

*best time and place of advertising clip promotion messages on a per-screen basis based on the most updated information, hence closing more sales and increasing returns.*

*Optimal video clip's per-screen schedule and playlist are created.*

*Rich media advertising content is sent automatically from a central server to in-stores displays according to the optimal playlist.*

*Utilizing the machine-learning capabilities, actual video-clip play list is dynamically updated for every individual store display and responds dynamically to daily sale fluctuations for that store-display-location and for hundreds of other store-locations simultaneously.*

## Complete Turnkey Solution

1. **OptiRetailChain**'s unique Promotion Optimization software.

2. A complete hardware and software solution including displays. In order to implement the project, Makor will bring the most suitable hardware and software solution to be installed in all branches.

3. Ready to work in wide range of computing environments and functional domains. That means retail chain will not have to change its database and data mining system.

4. Advertising effectiveness evaluation is performed for all interested parties: retailer, advertiser, and supplier.

5. Multilingual advertising is available to suit local neighborhood demographic characteristics.

6. It provides floor plan recommendations and design services for optimum location of **OptiRetailChain**'s smart displays.

7. Continual testing and quality assurance process will be performed to ensure that applications will work flawlessly.

8. It comes with full installation, on-site full-care maintenance.

## System Components

1. **Main Optimization Server** – where Promotion Optimization is performed.

2. **Clip Distribution Manager** – administering and updating per-screen advertising schedule according to Promotion Optimization results. Clip Distribution Manager generates an advanced optimal schedules for individual screens in each store and is capable of updating the schedule in real-time.

3. **Central Push Server** is uploading new clips to local server IP-locations in off-peek hours according to Clip Distribution Manager results.

4. **Internet Distribution System** – **OptiRetailChain** is sending video clips using WAN & LAN 24hours /7days a week network connection while meeting standardized Bandwidth and Provider Requirements by using off-peak time slots.

5. **Security -** central and local-net Firewall security control.

6. **User Interface** provides an accurate real-time reporting of sales increase and inventory status**.**

## Technology

- Enhanced network capabilities for different content channels to enable different advertising content to be displayed on different screens at the same time.

- Full network control and real-time updating from one or more server locations to unlimited number of display-points.

- Central push server uploading new clip-playlists to local server IP-locations.

- On-line, real-time reporting and Client-Supplier Interface keeps our system up to date with all of the activities that every station and display is currently processing.

- Advertising Optimization module differs from the Pricing Optimization module in that it constitutes an autonomous block within the system that

functions continuously, in general without user's intervention, and changes promotion schedules according to predefined time frames.

- The module works autonomously unless and until the user decides to introduce modifications into promotion schedules in the form, say, of restricting demonstration times of certain clips on certain monitors. In such a case, he will be presented with a number of options for modifying promotion scheduling or customizing reports as the case may be.

## In-store Buying Process

- Impulse Buying - the majority of shoppers are impulse buyers. Every year fewer shoppers stay at home and read newspaper ads to plan their grocery shopping. The increase of two-household earners means considerably less time for planning. Consequently, more and more people do their grocery shopping without a list and are more susceptible to in-store advertising.

- In 1995 POPAI and Meyers Research Center conducted the POPAI Consumer Buying Habits Study, based on information from super- and hypermarkets. The principal findings of the study were that in supermarkets more than 70% of buying decisions based on brand take place in-store, while in hypermarkets this figure increases to over 74%. The second finding was that the brand lift index, which represents the increase in in-store buying decisions after the introduction of POP materials, rose as high as 48% in certain categories, such as camera film.

- According to a study by American marketing professors Russell Winer and Jeffrey J. Inman, shopping lists drawn up before visiting a store have negligible influence on the number of unplanned purchases. In fact, consumers with shopping lists make the same number of unplanned purchases as those without them. The study by the two professors provides a key to interpreting the decision-making process. It also leads one to conclude that the shopping list doesn't play a major role in this process. The critical variable is the degree of exposure to in-store advertising. Armed with this information, retailers should be better equipped to focus their resources on POP and maximize investments.

## In-Store Advertising Efficiency

- US retailers and brands spent $17 billion on in-store advertising in 2000 and $15.5 billion in 2001. The study conducted by POPAI (Point-of-Purchase-Advertising-Institute) on 220 supermarkets in 22 US cities showed sales increased, ranging from 2% to 65% due to POP advertising.

- According to research reported in Marketing Magazine, gross sales are 12% higher in stores with advertisements on product shelves than in stores without shelf advertisements.

## Benefits

### For Retailers

1. Maximizing in-store net profits by optimizing in-store advertising space and time.

2. **OptiRetailChain** will generate an additional revenue stream to retail chain and to Makor by selling advertising time on the in-store based smart displays.

3. In-store advertising is difficult to control in large retail chains environment. For 500-store chain we arrive to the following numbers: 500 stores X 10 per-store displays X 240 commercials per-hour = 1,200,000 commercials per-hour. **OptiRetailChain** automates the in-store advertising process by controlling it from down to one central server locations.

4. Sometimes advertising message is displayed, the shopper wants to buy a product he just saw advertised… but the product is out-of-stock. This situation will not occur with us. **OptiRetailChain**'s real-time linkage between store databases and advertising clips databases will not allow void advertising as commercial is shown only for products that are in-stock.

5. **OptiRetailChain** helps retailers draw shoppers in, direct them to a specific product or a time-sensitive promotion and fine-tune promotional strategies in real-time.

### For Advertisers

1. Efficient use of advertisement campaign budgets as **OptiRetailChain** offers the best value-for-money solution by achieving the highest return for an advertising dollar.

2. Detailed reports are available to evaluate the advertising performance.

**For Shoppers**

1. Shoppers will enjoy budget savings by receiving up-to-date deals information and buying recommendations.

2. Rich media advertising content is provided to enhance the buying experience.