

A HISTORICAL PERSPECTIVE

The retail industry has been around for many years. For example, Sears, a major player in the retail industry, has been around since the late 1800's, as have others. In order to discuss the retail industry and its relationship with information technology, it first helps to understand what the retail industry is. Retail can be defined as the sale of commodities or goods in small quantities to ultimate consumers. Therefore, the retail industry consists of selling a particular good or commodity to consumers. When this art of selling first began, it was much different than when we think of retail today.

When the retail industry began, three major players were involved: JCPenney, Sears, and Montgomery Ward. Now, in retail, there are hundreds of different retailers who make up this industry. So, throughout time, the retail industry has grown immensely.

One technology that has not always been a part of the retail industry is the scanner. The scanner did not come about until the early 1970's, but today it is seen as a necessity. Another technology that plays a big role in the retail industry today is electronic commerce. This technology can be compared to the catalog departments that used to support a lot of the retail stores.

The catalog department in retail stores used to be a major player. Many of the early retail stores had this department, which helped to boost sales tremendously. Today, some retail stores still provide a catalog department, but many are now replacing this service with the use of electronic commerce.

The retail industry is one that has shown tremendous achievements with the use of information technology over the years, and continues to do so today.

PREPACKAGED AND CUSTOMISED SYSTEMS FOR THE RETAIL INDUSTRY

Industries use software packages to assist them in their database management, the retail industry being no exception. More often than not, the software package comes from outside vendors rather than being developed in-house. Depending on their needs, the software package can be classified as prepackaged or customized.

Prepackaged software is based on the vendors' research and judgement of the needs of the retail industry. These needs could pertain to any particular functional area or the integration of various functional areas of the retail industry. Such a system may require the client to modify the existing style of database management to match the needs of the package.

Prices for these packages would be preset by the vendor and generally cheaper than the customized packages. Small-scale retail industries not offering sophisticated customer service would prefer to purchase these packages from the vendor to minimize their costs. Examples would be accounting packages or packages for payroll management or probably an integration of both of these areas.

Large retail firms, particularly huge retail chain stores, would prefer to have a software system customized to their way of database management. The different functional areas would use the software packages to assist them in their database management and then require integration across the various functional areas. These firms would like to specify their requirements to the vendor developing the software package and expect the vendor to come up with a complete package to suit their needs. Both the

vendor and the firm may have to make certain adjustments to come up with an overall system working to the clients' satisfaction.

The price of the software package would depend on the size of the job and may be enormous compared to that of prepackaged systems. Due to the price factor and amount of effort required on the clients' part to coordinate with the vendor, smaller retail firms would by and large stay away from this domain.

DATABASE MANAGEMENT IN THE RETAIL INDUSTRY

The Retail Information System (RIS) is a blueprint for the continual and periodic systematic developments that could or already have influenced the retailer's performance (Dunne et al, 1992).

Retail firms gather information from internal and external sources and store this in their database for future reference. The major source of internal information will be their sales record, credit reports, shipping records, purchasing invoices, inventory records, customer charge account records, employee personnel records, accounts payable and receivable, past merchandise budgets, and their operating or income statements. Sources of external information would be published statistics, information provided by standardized retailing information services, and publicly circulated research reports in trade and business journals.

The RIS is used by various departments of the retail unit. The accounting department uses the RIS for preparing financial statements. The marketing department uses the RIS to gather information about market trends, and to analyze the sales figures of the firm. RIS is used by the personnel department to maintain employee-related

information and by the inventory management and purchase department to store data on inventory and to make the appropriate reorders. Most large retail units operating as chain stores across the country maintain the database centrally and the various chains have access to the data through a network.

The retail units have been generally maintaining independent systems for various departments with linkages to share relevant information. The RIS has to take adequate precaution to maintain data security. While most departments/ users have access to the use of data, only a limited number of persons can have access to modify the data files. Retail units periodically offer discounts for their products or change the sales price of some products quite frequently (weekly/ biweekly). The price has to be entered into the system, which will be used at the POS when items are scanned out. Not everyone in the sales department can have access to change the sales price.

There is a current trend by large retail chain stores to move towards the enterprise resource planning (ERP) system in order to have an integrated database management system. Some retail stores have begun to install systems like SAP and PeopleSoft rather than use independent systems for various departments with limited link between them.

POINT OF SALES (POS)

Point of sales (POS) indicates that point where the customer actually checks out the items and pays for the purchase. Large departmental stores have their point of sales (or checkout) counters usually in the front end of the shop. This saves the customer a huge amount of time and effort as the customer can now place all the items in a shopping cart and pay for them at one go when the shopping is complete. The retail unit too saves time,

space and money, as it does not have to place checkout counters all over the store. The units however have checkout counters in selected sections of the store for the convenience of customers who wish to limit their purchase to one section.

The POS normally is equipped with belt to assist movement of items purchased, scanners to scan items, computers to provide information on items purchased and prices, equipment to enable payment through credit /debit or other cards and equipment to generate receipt.

Retail outlets are trying to make the POS as customer friendly as possible by using the latest technology available to them. The POS is generally the most crowded section of the retail outlet with customers waiting to checkout the items purchased. The stores have for the convenience of the customers a large number of checkout counters. Many stores have introduced self-checkout systems for shoppers who have purchased a few items and are in a hurry to leave the store rather than wait a long time in checkout queues. (See Figure 1 for POS system.)

BARCODE AND SCANNERS

At the POS retailers gather and use information with equipment like the barcode and the scanner. Most products carry a uniform product code (UPC) symbol.

The first barcode was developed and patented in 1949 was the bull's eye code by Silver and Woodland. (Figure 2A) The bar coding system has developed continuously and the UPC is being currently used by more than 90% of all grocery products. The UPC is widely used at the point-of-sale by most supermarkets and retailers. (Figure 2B) But other types of barcodes exist too like the Interleaved 2 of 5 (Figure 2C) and Code 128.

(Figure 2D) The interleaved code is a condensed numeric code that can be printed easily on corrugated cartons. Code 128 is more advanced because it encodes both numeric and alphabetic characters. This code is gaining acceptance in non-grocery retail markets.

Many retailers work with the vendors through Electronic Data Interchange using the barcode. They are able to share information on inventory levels, status of deliveries and projected reorder points.

Information from the scanner data is also being used for computer plannograms. (Figure 3) The information gathered helps not only to store lucrative brands but also utilize shelf placement. Many retailers are given plannograms by manufacturers but retailers stocking products of the same category by various manufacturers prefer to produce their own plannograms.

As e-commerce is gaining acceptance and more consumers are shifting to shopping on the web, retail stores are increasingly concerned about the reduction in level of direct shoppers. Research indicates that the biggest objection that consumers are having is standing in line to pay for the merchandise purchased. Many large retail units have introduced the self-checkout system. The two systems being used are the self-checkout at the front end of the store and other is the portable scanning system. The former, called the USCAN allows customers purchasing 15 or fewer items to perform the self-checkout. A modification of this system is the PSC, where the items are put on the belt for automatic scanning. The customer then goes to the pay station to pay for the purchase. The portable scanning system allows the customer to scan the item right of the shelf as it is placed in their shopping cart. The scanning device is replaced in its rack as

the customer is done with the shopping. They are directed to a specific register where they pay for their purchase without having to scan the items again.

Developments in scanners are taking place on a continuous basis. Scanners are being ergonomically designed to prevent wrist fatigue, read 2D barcodes, read poorly printed barcodes and facilitate consumer self-checkout. Some scanners are designed to assist a consumer to use at home and order from the web site. Examples of scanners currently being used can be seen in the appendix. (Figure 3)

For the future, a system using a combination of scanners and camera technology to determine the size, color, shape, and texture of the item being scanned. The idea is to determine which type of grocery, particularly agricultural produce is being purchased and the customer is charged accordingly.

Retailers are working hard to tie the scanning system directly to the inventory management system. Though it is not possible to directly update the inventory levels when the product is scanned at the POS, it is not being widely used by the retail industry today. To make this system foolproof, the checkout system has to be very disciplined. Each and every item has to be scanned and shortcuts like the multiplier key or scanning one priced item a dozen times have to be avoided. (Work-centered analysis, Figure 4)

INVENTORY MANAGEMENT

There is an apparent need for computerized product controls in the retail industry in order to keep accurate accounting figures and to supply the company with timely reports relating to the flow of goods. The developments of Point of Sale software and advancements in top of the line hardware have been made due to the high level of

Investment Turnover that the industry experiences. That is, due to the fact that retail experiences the exchange of such fast-moving goods, there is a need for advanced technological controls. The most directly related system is Inventory, which is the management of product flows throughout a given entity in order to form an itemized list or database of on-hand goods (*Dunne*). The P.O.S. type system that retail industries employ electronically tallies all the movements that each particular good experiences for many various unspecific uses in the functional areas of the industry. For example, the main uses of inventory systems are to keep tabs on net sales and to subtract them from the total goods on-hand, all at the scan of a barcode. The constant computerized inventory is termed Perennial Inventory. Perennial inventory, as opposed to periodic inventory changes after every scan. When a pallet of cereal boxes comes off a truck in the back warehouse of a grocery store, the bar code that contains the pallet info is scanned into the computer, adding goods to the inventory. The thinking involved with these processes is simple yet the actual programming of the software that controls it is quite complex. The programs can vary as to what exactly is offered to inventory but the main elements are always present. They are even making their way towards offering a near paperless warehouse. (Figure 5) An initial investment is needed to acquire the technological equipment but it reduces costs as a whole. The advantage of this type of system is that it is almost absent of human error. Addition and subtraction errors are far fewer. However, computers and software have and always will be based on some element of human creation, which is never completely error free. There are limits to every system and the best product control systems that a retail company can hope for is

one that reduces costs and magnifies profit margins. (See Figure 6 for Future Handheld Scanner.)

ACCOUNTING

In the retail industry, technology has played a vital role in changing the way accounting tasks are performed. Mass amounts of financial records on paper have been eliminated due to the vast amount of information that can be stored electronically. More recently, a typical business either conducts accounting tasks on a computer or it outsources to a firm that performs accounting tasks. Either way, the instruments used to do accounting have changed greatly.

Information technology is getting closer to eliminating almost all of the human accounting errors. In recent years, retail accounting errors have fallen from five percent to two percent, while retail-pricing errors have fallen from four percent to three percent. Credit for such improvements lie in the influence of technology on accounting. The improvement has come about more directly from software. Whether it is prepackaged or customized, software has made drastic improvements. Reductions in errors have allowed technology to improve retail accounting in other ways as well. Costs drive managers' decisions. Thus, the accuracy of data has provided better cost estimates, which leads to improved budgeting. An improved budget gives companies' a more precise estimate of expected profit.

Accounting data has benefited from technology indirectly via the Point-of-Sale (POS) system. It has been a better predictor of popular products. The POS system has

allowed accounting to help in marketing products, keeping production costs down, and promoting products through e-commerce.

Numerous companies promote accounting software or services through the Internet. Companies such as Vigilant, Slowey Retail Systems, and Dynacom have specifically offered retail accounting such as “Point of Sale”, payroll packages, and “Accounting 2000”. Gemini features software modules (such as “Financial Management and Accounting System (FMASystem)”) to help accounting in the retail industry. Finally, FMS has been a service provider to the retail grocery industry for over twenty-five years. FMS has more specifically monitored financial operations.

The drawbacks and future of accounting in the retail industry rely heavily on the progress of computer technology. Computer technology must be upgraded almost periodically to compete in the retail industry. The drawbacks obviously involve the cost of hardware, software, and other components. Another drawback, system breakdowns, slows down the timeliness of processing accounting information. The future of accounting will be determined by whatever technology is in place.

MARKETING

The Marketing function of a retail business uses a number of information technology systems. The sheer quantity available is vast and unlimited in their capabilities. They can be proprietary to a specific retail business or they can be pre-packaged, off-the-shelf versatile software. The Point-of-Sale System (POS) is typically the primary source of data gathering that which drives most other marketing systems.

The POS system has many functions in the retail industry. One of these functions is that they are the perfect means of data gathering, and thus are invaluable to the marketer for data mining. Once the data has been stored in the central database, it is available for all functional areas of the organization – especially marketing. With this data, data mining is explored like never before – as the data has never been this accurate.

Data mining is defined as the use of software to find hidden patterns in a group of data. Marketers have been data mining for years, but prior to the POS system, the data has been questionable in its reliability and integrity. With the POS system, the data comes directly from the purchase itself, or the customers themselves.

When items are purchased they are scanned at the check-out – the data is stored in a central database. It is not only the single item that is stored in the database, but also the items that are purchased along side the item, when the items are purchased, and where the items were purchased (store location). By this means of collecting data, marketers are able to not only determine demand for a certain product, but also are able to determine when to promote certain items (seasonality), where to place items in a store (next to which items, product placement), and at which store location (product placement).

Another means of data mining which goes one step further is that of loyalty/frequent shopper programs. When a loyalty/frequent shopper program is being used, the POS system also records who purchased the items. A customer fills out an application with their personal profile and they are issued a “smart card.” This card identifies the customer, along with their name address, and any other information the marketer wishes to know. When a loyalty customer purchases an item, their card is scanned – to provide them with discounts, points, free groceries, etc., and to provide the

marketing staff with valuable, reliable demographic information on the types of people who shop at their store, and the types of people who buy certain items.

Once the data has been gathered and stored, a Decision Support System is used to manipulate the data. Without this, or similar software, the POS database is just a conglomerate of useless data, as far as marketing is concerned. The Decision Support System helps the marketer by sorting, formatting and analyzing the data. Reports that are generated take on forms such as:

- Sales Analysis: measures sales effectiveness by product.
- Merchandising Analysis: measures the effectiveness of in-store activities designed to create demand.
- Marketing Analysis: Measures the effectiveness of promotions, events, campaigns, and advertising.

In the retail industry, the Scanner/POS System is integrated together with a software package, which acts as a Decision Support System for all functions of the business, including Finance, Marketing, Human Resources, and Inventory. One type of system designed specifically for Marketing is the Promotional Planning System.

The promotional planning system works in conjunction with the POS system. The data gathered by the POS system is uploaded to this system. Once this sales data is captured, the system sorts the data, and analyses are preformed, such as those described previously. Based on these analyses, promotions can be mapped out ahead of time, including where to target a promotion, where in the store to place the promotional products and accessories, and the ability to control the shipping of the merchandise to coincide with advertised events.

Although the POS system is the most vital to the retail marketer, there are other IT systems available for the Marketing function of the organization which offer great benefits. One of these is called advertising technology. As its name clearly describes, it is a technology to help marketing professionals manage their advertising.

Advertising technology software uses a centralized database (usually separate from the POS system), where everyone involved in the advertising process can exchange ideas, information and coordinate tasks. This includes, merchandising managers, copywriters, graphic artists, etc. (Bernstein, 1). This system's database stores a vast array of data, including numerous product and price versioning, product usage histories, price/cost histories, copy, images, markets, and product grouping. The resulting output includes signs, kiosks, printed media, web pages, and CD-ROMs (Bernstein, 2).

A third type of Information Technology used in retail marketing is a promotional planning system. This type of technology was designed to help manage product promotions, product placement and product distribution.

The future is bright, so to speak, for the retail industry. Information Technology continues to improve the way of doing things, decreasing costs and increasing profits. In marketing, there are two major future trends that have been identified: CPFR and Smart Cards.

CPFR (Collaborative planning, forecasting and replenishment) is the concept of sharing data and processes across the supply chain. It's collaboration between the retailer and their suppliers; it's the sharing of promotion schedules, POS data, and inventory data. In the January 1999 issue of *Retail Info Systems News*, an article entitled, "CPFR Pace

Picks Up” states, “a surprisingly large proportion of retailers and consumer goods firms say they plan to implement CPFR over the next 36 months.” This requires a look at:

- Data: content and format of the data that will be shared/communicated
- Communication: vehicle that will support the sharing of the data
- Security: measures that will ensure that the data shared/communicated is secure

The primary benefit of CPFR is in inventory management. “Today, each trading partner can see and analyze only its own internal data assets, supplemented by reports from others in the supply chain. Secondhand data, much of it based on other secondhand data, is prone to error, resulting in costly "inventory stuffing" tactics to ensure product availability...” (Frook, 2, 1998).

Another future trend appears to be “Smart Cards.” These are not the same cards we use today, such as those as Food Town and Sam’s Club, but much more advanced. The Smart Cards of the future will contain a microprocessor, which will be able to hold a vast amount of data, much greater than that of the common credit card magnetic strip used today. The card will replace virtually everything a person carries in their wallet.

ELECTRONIC COMMERCE

Electronic commerce (e-commerce) is a rapidly growing aspect of the retail industry. Revolutionizing the way customers can shop is just a small aspect of the capabilities of e-commerce. E-commerce technology can adapt web sites to provide personalized shopping experiences, enable companies to reach segments of the market that were

geographically unreachable previously, and provide prompt, accurate delivery to customers all over the world.

Companies are utilizing the Internet to integrate technology with everyday work applications. For instance, Kroger sells groceries every day to customers that come in the store and shop. Because Kroger now has an interactive web site, customers have the option of ordering their groceries and having them delivered, or ordering their groceries and picking them up at a specified time. This way is of tremendous value to the customer because they save time and money by not shopping themselves.

Other companies that utilize the Internet to reach customers do not have a physical store and exist solely in cyberspace. Amazon.com for instance does not have a storefront, where you can physically go to browse for books, videos, and CDs. It does, however, have a large inventory of books to look at, read descriptions of, and read reviews for. You can also personalize the site by registering, and then, on subsequent visits, Amazon.com will tell you of books that may be of interest, CDs that are being released that you may like, and other personal services that make shopping at your computer a pleasant and intimate experience.

The most important issue for companies branching out onto the Internet is security. While companies must have an up-and-running, easy-to-use, fun, web site in order to be competitive, if they are to succeed, they must reassure customers that their site is secure. In order to purchase items online, consumers must furnish their credit card numbers. This information must be given in a secure environment in order to ensure that it will not fall into the hands of criminals or hackers. Some web sites, like Amazon.com, will ask for billing information when a customer signs up for a membership with them,

and will not ask for it again. Asking only once limits the access to that information, because it is only supplied on the web once, as opposed to every time a customer makes an order.

PROJECTIONS FOR THE FUTURE

As in any industry, retail corporations must continue to focus on where the industry is headed as far as technology is concerned. Among the most widely used technologies will be Local Area Networks (LANs), scanners, client/server, and Windows NT. The hottest technologies within the next couple of years include web-based EDI, consumer-specific databases, videoconferencing, and smart cards. All innovations are devoted to making things as convenient as possible for consumers. The retail industry, however, is conservative and often implements technology only after the technology has been proven to work. There may come a day when annual routines, such as “beating the Christmas rush,” become outdated.

