THE DESIGN OF A CONSUMER INFORMATION SYSTEM IN THE SUPERMARKET ENVIRONMENT

by

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ABSTRACT

The purpose of this thesis is to explore the possibility of creating and maintaining a database in the public domain.

The concepts considered, relate to general computerized storage of consumer goods information, allowing dissemination of this information to the public. The focus however, is on a Consumer Information System (CIS) in the grocery industry, with emphasis on price data.

The major topics discussed include the advent of the Universal Product Code, the subsequent introduction of automated checkout and scanning systems in supermarkets, interest groups involved, one possible design of the CIS, and the feasibility of such a system. The system is designed to meet a minimum set of objectives of the interest groups.

Based on the analysis, the development of a CIS is feasible, subject to the mutual cooperation of the interest groups involved. Suggestions are made with regard to the practical implementation of the ideas generated. Future implications and possible research constitute the final sections of the thesis.

Thesis Supervisor

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CHAPTER I

THE NATURE OF THE PROBLEM

1.1 Introduction

This thesis examines the events leading up to the existence of scanning systems in retail stores, in particular grocery stores, and their impact on the retail environment. This technological advancement has not been without conflict, particularly between retailers and consumers in the area of automated checkout in supermarkets using scanning devices to replace key-entry. One area under current debate is the removal of item-pricing from goods. There is a threat of reduced price awareness among consumers, at a time when consumer advocates are striving for greater awareness through inceased availability of information. Opposition to item price removal caused many retailers to delay plans to install these systems.

Despite the present impasse, scanning systems seem likely to become a permanent feature of retail shopping. While the controversy continues, supermarket scanning systems are nevertheless slowly and quietly making their appearance. Some retailers are phasing in the new technology, yet many consumers are still unaware of the existence or significance of these systems. In the greater Vancouver area, three stores installed scanners in 1978 with a minimum of publicity. The

question is not whether retail goods will be checked out automatically, but rather whether or not this will be accompanied by the permanent removal of human readable item prices.

Retailers with scanning systems are proposing (or already implementing) the elimination of item prices, without offering an effective alternative for what is considered a vital source of consumer information. It is preferable that a substitute for the traditional method of disseminating price information be sought now, while the UPC systems are still in the early stages of development.

1.2 Motivation For The Study

To date, the grocery industry has invested some $50 million to develop the concept of the universal product code (Assembly Office of Research 1977). It has been suggested that "retail point-of-sale systems may become one of the most momentous marketing innovations, on consumers, on mass distributors, on small retailers, on manufacturers, and on marketing researchers" (Moyer and Seitz 1975). A food chain president asserted that "few, if any developments can anticipate the profound impact ... (of) this store-level point-of-sale equipment" (Steinberg 1972). Time and money have been invested by grocery retailers and manufacturers on the basis of optimistic studies (e.g. McKinsey & Co.) indicating acceptance of the system, and subsequent savings

for the grocery industry.

Despite all this zeal, and the apparent realization of economic benefits, the advancement of these systems has been slow. In the U.S.A. "... just 208 stores, considerably less than 1% of the country's 33,000 supermarkets, have so far been equipped with registers than can read the code" (Coyle 1978).

The fear of government imposed mandatory pricing of items has been a major concern to supermarket chains. Their feeling is that a large portion of hard savings due to the system [approximately 1% of sales (Moyer and Seitz 1975)] is from elimination of item pricing; in fact "... potential benefits of this system are reduced (about 25-35% of hard savings) if retailers are forced to maintain the itemized pricing of goods" (Assembly Office of Research 1977).

By 1975, legislation in "three states and 'numerous' U.S. cities", made item pricing mandatory for supermarkets under their jurisdiction (Armstrong 1975). Legislation was being considered at a federal level in both Canada and the U.S.A. Consumer associations with potential government backing have been a powerful contender in the debate over item price removal. "In the early wave of controversy over scanning, many labour and consumer activists charged ... that the grocers were conspiring to raise prices secretly by computer. Half a dozen states - California, Connecticut, Massachusetts, Michigan, New York, and Rhode Island - rushed to pass laws requiring that prices be stamped on every item sold" (Coyle 1978).

Is there a way to maintain or increase consumer price awareness in the absence of item-pricing? This is a much discussed topic today. In fact, the need for assimilation and dissemination of timely relevant data in all retail areas has long been recognized. In the supermarket environment, the question is particularly pertinent; The automated checkout system which threatened, in 1974, to revolutionize the industry has hardly justified even conservative predictions. Supermarket chains are loathe to install the system while the threat of legislation regarding price tags looms; consumer groups want to see price labeling continued in order to maintain consumer awareness and protection, and avoid a "possible abuse of consumer rights" (Armstrong 1975).

The removal of item prices is seen by consumer advocates as an "unnecessary and unjustified sacrifice of their right to basic price information" (Jones 1977). With consumers, themselves, reaction has been mixed, but studies have shown the response to be less than enthusiastic in general; "A $10,000 federally funded study, done in conjunction with CAC (Quebec), found that many customers still don't know how the system works and they do not want the price removed from containers" (Pappert 1978). "It is ironic that the food industry will not agree on any uniform dating codes, or uniform grade standards, or uniform packaging, any of which would help the consumer decide on the best quality for her money, but they can agree on a uniform labeling system, a

Universal Product Code that takes information away from the consumer" (Yaunatta 1975). The consumer pressure and threats of legislation in both Canada and the U.S.A. have temporarily slowed down the implementation of automated checkout using the UPC. Even in 1977, the indefinite postponement of the widespread use of scanners in supermarkets seemed inevitable - particularly in Canada. In 1978, it appeared that certain supermarkets were planning to go ahead with plans to implement scanners and remove item-prices despite consumer fears and objections. The objective of this thesis is the proposal of a consumer information system (CIS), based on the UPC, as a feasible method of breaking the stalemate and ensuring that all interest groups, particularly retailers and consumers, benefit from the technological developments on which the UPC systems are based. This objective encompasses:

a) taking advantage of available technology to improve society generally

b) assuring the continued protection of consumers' rights specifically.

There are two fundamental characteristics of the supermarket system which are important in the consideration of any ideas to improve the consumer information environment.

a) The inherent standardization of the code provides a basic key for product comparisons across stores, and for storing and updating the information. Without the UPC, the creation of an information system would require the prior

establishment of such a code. Not only would this be prohibitively expensive, but would require full cooperation of manufacturers and retailers in its establishment.

b) Every store using the computerized system will be maintaining a file of products and related price information. Thus, transferring this data to other systems for a variety of uses can be done at minimal cost and effort, if the cooperation of the supermarkets is secured.

These two factors, a standard comprehensive code structure, and the existence of individual store data in machine processable form provide additional motivation and lend feasibility to the consideration of a computerized Consumer Information System that can provide direct benefits to the consumer as well as the retailer.

The CIS considered herein will pertain largely to the grocery industry and will meet a minimum set of objectives of the interest groups. Possible extensions will be considered and suggestions will be made regarding aspects of possible conflict e.g. marketing the concept to the various interest groups; deciding who should bear the costs of the CIS.

1.3 Summary Of The Proposed Study

1.3.1 Literature Review

The idea presented in this thesis is original in that the concept was only recently proposed as a possible research topic (Dexter and Howson 1977; Barnett, Dexter, and Howson 1978). (The paper written by Dexter and Howson has been freely quoted in this thesis.) Relevant literature relates to the history of the UPC in Canada and the U.S.A.; the development of the supermarket system and its effect on the various interest groups; and the economics involved in such a system as regards retailers and consumers.

1.3.2 Consumer Information Systems

Generalized consumer information systems do exist, and operate on a limited basis in the private sector. Data is collected from surveys, e.g. "market-basket" prices, service ratings, etc.) and distributed to interested consumers in printed form on subscription basis. Information is also disseminated by means of private television channels. These systems are described further in Chapter III. The potential effectiveness of these systems on a national scale is considered. In the supermarket environment, a specific application area for a CIS is retail grocery price information. Not only is there a need, but the necessary data

already exists in an easily accessible form. The technical and political feasibility of setting up such a system is discussed.

1.3.3 Design Of A Specific CIS

In order to determine the economic feasibility of a CIS as envisaged in Chapter IV, the design of a specific system within the bounds of a given environment is examined. The objectives of the various interest groups as they relate to the supermarkets system are taken into account, and an effort is made to meet these objectives within the scope of the CIS.

The characteristics of a basic CIS are described in detail, bearing in mind possible future enhancements to the system. The costs vs. savings of the CIS are studied as the final step in the feasibility analysis. The assignment of costs for the system presents some difficulty and consideration is given to the potential savings and benefits of the interest groups involved.

1.3.4 Results Of Analysis

The analysis of Chapters IV and V is used as the basis for considering the feasibility of the CIS. Suggestions for the operation of the system from a practical point of view are made.

1.3.5 Discussion

The implications of such a system on the future of information publication are discussed, along with the possibilities for future research.

CHAPTER II

LITERATURE REVIEW

2.1 History Of UPC And Scanning

The introduction in 1973 of the Universal Product Code (UPC), as a standard method for unique specification of retail products, has led to much related research and made use of earlier technical achievements. Specifically, in the late 1960's and early 1970's, the implicit merits of automated checkout systems were becoming apparent throughout the various levels of the grocery industry. More specifically, in 1966 general scanning systems were developed and, in 1970, electronic cash registers were introduced by major hardware venders, including IBM, NCR, and Sweda. It was at that time that the Grocery Manufacturers' Association, other trade organizations and equipment manufacturers began to discuss the feasibility of coding products for scanning purposes - i.e. a method for "machine-reading" product information to eliminate manual keying of prices at the cash register.

Powerful "minicomputers" capable of performing as well as earlier large systems had also made their appearance. In 1970, the advantage of in-store minicomputers to control electronic cash registers was realized. These, in turn, could be connected to a large centralized processor which would

allow for pertinent information to be relayed to all in-store computers simultaneously. Prior to mid-1973, no grocery products carried any machine-readable markings, and scanners had yet to be developed for use at checkstands. The UPC was developed by a committee representing both retailers and manufacturers of the food industry, and within two years at least nine computer manufacturers were making this equipment. The companies included Data General Corporation, Data Terminal Systems, NCR, IBM, Bunker Ramo Corporation, National Semiconductor, Univac, and Singer Company.

By October 1975 it was estimated that, in Canada, 45% of all grocery items were UPC marked and, in the United States, the figure was put at 60%. Approximately 30 retail stores had UPC scanners, and this was felt as just the start of a popular trend.

2.1.1 Scanning In The U.S.A.

In the United States, Safeway Stores began testing Point-Of-Sale (POS) and UPC systems developed by Dymo Industries Inc., and Data General Corporation in 1973. They could not justify the operation with respect to savings, although they did justify the POS scanning system on the basis of faster checkout, less stock-outs, and better inventory control - i.e. benefits not easily quantifiable, ("soft" benefits). Finast Stores conducted several scanning tests in the 1973-1974 period. In Massachusetts they began testing the Univac

Accuscan scanning system. In other stores they ran scanning tests using Bunker Ramo's Electronic Store Information System, and the NCR 255 System. All systems tested, conclusively demonstrated 10-15% increased productivity at the checkout.

Kroger Stores Ltd. also tested the Univac Accuscan Scanning System in 1974. Their test procedures resulted in a 14% increase in productivity at the checkout counter. Late in 1975 they began testing IBM's 3660 Supermarket System. Marsh Supermarkets in Troy, Oregon were the first to use scanning in the supermarket environment in the United States over an extended period of time. Their test was conducted on an NCR 280 725 scanning system.

In 1977 the industry leader in scanning was Giant Food, with 25 scanning installations of a total of 173 at August month-end. Their planned purchase of a further 1,500 electronic scanner checkstand units will more than double the number of Giant stores having scanning installations.

Results of the test store operations in the U.S. were inconclusive. "... surveys in three U.S. stores testing the new system showed that the majority of shoppers were not bothered by the removal of the prices ...", yet "... a survey conducted by the University of Southern California's food marketing management program revealed that only 1.5% of housewives questioned were willing to do without price tags" (Armstrong Oct. 1975).

2.1.2 Scanning In Canada

Steinberg's Ltd., a large supermarket chain was the only supermarket in Canada to have implemented a UPC scanning system by the end of 1975. The store in Dorval, Quebec began test operations in July 1974. Item-pricing was discontinued and grease pencils were provided for customers who wished to write the prices on the goods themselves. IGA in Delhi, Ontario recently started using the scanning system while maintaining pricetags on the goods.

In August 1977 Miracle Mart, a subsidiary of Steinberg's Ltd. began operating a full scanning system at a Toronto store. They are relying on test data gathered by Steinberg's Dorval operation. Approximately 94% of the items carried are item priced. "The checkout people appear to be scanning most products. It is not faster up to this point; on the contrary efficiency is down approximately 25%" from the level prior to scanning (Pappert, 1978). Early in 1978, a limited item food store opened in Richmond, British Columbia with a full scanning system and no item-pricing. Prices, in general, appeared to be lower than in the larger supermarkets (Evans-Atkinson, Feb. 1978). This event was closely followed by the implementation of a scanning system in one of Canada Safeway's stores in Vancouver. A Super-Valu store in Vancouver, already equipped with electronic registers, subsequently installed scanners. Both planned to discontinue item-pricing (Evans-Atkinson, April 1978).

2.2 Interest Groups

Supermarket systems received the attention of many different groups - not all of the attention however being favourable. In regions where implementation of these systems had occurred, or appeared imminent, reaction was swift in coming.

2.2.1 The Consumers' View

In both Canada and the U.S., consumer advocates generally took a negative view toward the introduction of the UPC system. It was not the system itself to which they took exception, rather the effect of one of its natural consequences, - item-price removal. It was felt that this would constitute a threat to consumers' rights and protection. Price information is viewed as a basic right, not a privilege. For example, lack of item-pricing makes comparison shopping more difficult and, thus, less will be done (Maurizi 1972).

Consumer groups in both countries objected strongly to any decrease in visible consumer price information at the retail level. They felt that consumers would be less price conscious and therefore easy prey for unscrupulous supermarket owners. In the U.S., consumer unions were pressing for government intervention at all levels; and by 1975, legislation in "three states and 'numerous' U.S. cities ..." made pricing mandatory for supermarkets under their jurisdiction (Armstrong 1975). Legislation was being

considered at the federal level in the United States at that time.

Despite loud protest from the Consumer Association, the Canadian federal government was loathe to interfere in the matter. However, legislation was being considered here too and was a definite possibility should the need be felt. The Consumer Associaton is watching the progress of the new systems carefully. The Retail Council of Canada set up a Steering Committee to make policy recommendations on issues arising from the the implementation of scanning systems. There now exists a Publc Advisory Committee to the Steering Committee:

> "Our group, together with a Technical Advisory Committee from the equipment manufacturers and supermarket industry, conducts an ongoing dialogue in an effort to implement this system (if it is to be implemented) in a way that is beneficial to store and customer alike" (Pappert 1978). (Mary Pappert is CAC (Ontario) Chairman of the Committee dealing with the Computerized Supermarket Checkout System).

It should be mentioned that the automation itself was not criticized and a consumer advocate in Vancouver praised the advent of supermarket scanning with either price-marking or the provision of grease pencils (Wise 1976). In the U.S. however, the use of grease pencils for customers to mark products themselves is not considered a suitable substitute for price-marking in states were legislation has been passed.

How do consumers themselves react to the implementation of these systems? Several surveys have been made of consumer attitudes toward installed UPC systems both with and without unit prices marked on the grocery items. With the exception of item price removal consumer reaction has been favourable. In a typical U.S. study (Gylling 1976) of a sample of 150 customers of one store, 87% expressed favourable reactions to the system. The advantages mentioned were

- faster checkout time (42% of all respondents)
- descriptive sales slip (32% of all respndents)
- accuracy of the computer system (12% of all respondents)

However, consistently, the removal of item prices is identified as a dominant negative consideration in overall acceptance of UPC systems, providing support for the stand taken by consumer advocates. A Vancouver supermarket manager admitted concern about a decline in sales revenue since the implementation of scanners and the removal of item prices (A conversation with the local CAC board member - 1978).

Until recently, Steinberg's Ltd. was the only supermarket chain in Canada to have placed scanners at the checkstand. Consumer reaction, reportedly favourable, had been gleaned largely from informal surveys. However, as mentioned previously, a CAC study showed that many customers are still unaware of how the system works (Pappert 1978).

The studies mentioned above concentrate on the attitudes of shoppers as expressed on survey questionnaires. They are,

of course, subject to the drawbacks inherent in opinion surveys (subjectivity, bias, etc.). However, in 1976, a study was undertaken at Michigan State University (MSU) which went beyond the attitudes of shoppers to investigate shopping behavior. For this reason, it is felt to be the definitive work on the subject. The report from MSU criticized price removal, based on a study that led to four general conclusions:

a) Item price removal may reduce price awareness of shoppers who become less alert to price changes and price trends,

b) There is potential inconvenience as shoppers have to match products to shelf prices and make price comparisons at different points within the store,

c) There is a loss of price information in the home as items on the kitchen shelf no longer have marked prices,

d) There is a danger of inaccuracy if shelf prices are not kept current to reflect prices currently charged by the computer system (Harrell, Hutt, and Allen 1976).

The issue of item-price removal was specifically addressed, comparing behavior of shoppers in stores with and without conventional item-price data. In summary, it supports the following hypotheses:

- elimination of item prices reduces the short term

price awareness of shoppers (There was only weak support for a reduction of long term awareness.)

- shoppers in an environment without item prices make fewer price comparisons (although there was no difference in the percent of shopper using unit price information).

It would appear from this last statement that shoppers find it more inconvenient to compare prices if they have only the shelf price as an information source. Unit price information (when provided) has been printed on the shelves only which is why no difference was found in the percentage of customers using this information for comparison. In general, unit price is a little used comparison indicator.

General mistrust of supermarkets by consumers is also an issue. The automated system allows almost instantaneous price changes to be effected. Consumers are concerned that

a) the shelf prices may be deliberately different from the computer-stored price

b) old stock may be sold at new prices.

Comparison shopping across supermarkets is made more difficult because price information is no longer transported along with the product.

More recently, these fears have been manifest in B.C., Canada:

> Legally, "...all retailers, including those in the food industry, have the right to increase the price of old stock as higher-priced new stock comes in ... What's annoying consumers is the fact that the absence of price tags in scanner stores means no price break on the shelves where all unpriced items, old and new, increase with the twiddle of a computer dial. Under the system where goods are individually price-marked, the procedure of peeling away old tags and sticking on new, higher prices has often been deemed too time consuming and costly to bother with" (Parton, August 1978). In addition to this, executives of B.C. supermarkets expressed the view that consumers are not very price conscious anyway. They said price is seventh or eighth in consumer shopping priorities topped by "... the store's general appearance and cleanliness, the attitude of the staff, the proximity and availability of parking and other convenience criteria" (Parton, September 1978).

An Irish survey (Irish Business, Nov. 1975) showed that while "price is one of the major factors that influence the Dublin housewife when deciding where to shop for groceries, it would appear that a substantial number of Dublin housewives are simply not price perceptive". This conclusion came as a result of 30% of housewives perceiving large supermarkets as not being cheap places to shop. The result occurred despite the fact that "this particular type of grocery outlet emphasizes its inexpensive prices through frequent media advertising".

Of concern is the result of 1977 Los Angeles survey, which while not conclusive, bears taking into account:

> Interviewers there recently wandered through supermarkets asking customers what they looked for most when they were shopping. Nearly three-quarters of them said low prices and the remainder wanted short checkout counter line-ups.

> "The interviews were recorded on tape, however, and the tape was later played through a voice pitch analysis machine - a type of lie detector.
>
> "The result was that 56% were more concerned about checkout counter line-ups, and only 43% were really worried about food prices" (Evans-Atkinson, June 1977).

Are consumers perhaps not as concerned as they should be? Are they less perceptive than they would like to believe? Is their choice of supermarket based on information that is easy to obtain and retain? How easy is it to compare supermarkets on the basis of price; or does price comparison really only take place once the shopper is in the store? These considerations make the findings of the Michigan study (Harrell et al. 1977) of even greater importance, meriting the concern of consumers and government. It is the author's view that a trend toward even less price awareness could have serious impact on food prices and ultimately augment general inflation.

A survey was carried out by Steinberg's Ltd., directed at determining the sensitivity of factors that affect consumers' choice of supermarket. This formed part of a joint study by IBM and Steinberg's in 1972-1973 on the feasibility of automated checkout in the supermarket (Dexter and Barnett 1978a, Dexter and Barnett 1978b). See Exhibit 2.1.

EXHIBIT 2.1

CANADIAN SUPERMARKET SURVEY (PARTIAL RESULTS)

1. Factors in attracting people to shop at a particular supermarket.

Importance Rating	
8.6	Store Location
8.0	Pricing Policy
7.2	Store Personnel
7.0	Product Assortment
6.9	Parking
6.8	Speed Through Checkout
6.7	Reputation
6.5	Service Level
6.1	Car Order Pick-up
5.1	Institutional Advertising
5.0	Store Design and Decoration
4.1	Special Sale Advertising
4.1	Cheque-Cashing
3.4	Non-advertised Specials

2. Factors in persuading people to buy once they are in the supermarket.

8.0	Price
7.5	Service Level
7.3	Assortment
6.9	Brand Name Recognition
6.4	Store Services
6.3	Shelf Space Allocation
6.2	Location on Shelf
6.1	Store Layout
6.0	Display of Merchandise
5.4	Point of Sale Promotion
5.2	Special Sales
5.0	Substitution Offered

Note: The Canadian Supermarket results sited are based on a survey (by the supermarket and IBM), which rated the elements on a scale of 1 through 9. The survey questionnaire was answered by supermarket managers and specialists. Results were compared with those of a

EXHIBIT 2.1

(Cont'd)

U.S. study conducted by the National Association of Food Chains, A. C. Nielsen Company, and The Progressive Grocer Trade Magazine. Comparisons were favourable in most cases.

Source: Documentation on the study provided by Steinberg's Ltd., for use in the preparation of "Steinberg's Ltd." (Dexter and Barnett 1978B).

2.2.2 Labour's View

An early protagonist in the item-pricing controversy was the labour union movement which was trying to prevent the loss of jobs in supermarkets. "Stores adopting scanner systems may be able to cut jobs 10 to 15% if item-pricing is dropped, by somewhat less if it is retained" (Assembly Office of Research 1977).

In many of the U.S. states the Retail Clerks Union joined forces with consumer groups to lobby for item-pricing laws. In fact, "Thomas Zaucha, Public Affairs Director for the National Association of Food Chains in the U.S. called the consumer push for legislation , labor instigated". He also charged that "the labor movement was responsible for initiating price marking legislation in some 30 states" (Armstrong 1975). However, more recently, "the Retail Clerks Union has abandoned its efforts for item price legislation and no other clerks' union, other than the one in Philadelphia, had seen fit to push for such a measure (Supermarket News, October 1977).

"The Retail Clerks International Union, which had feared scanners would be bad for employment, has reconsidered the evidence on that point and retreated to a posture of neutrality." The Union "dropped its opposition to price removal when it came to realize that the new equipment wasn't costing its members any jobs" (Coyle 1978). There is no statistical data available to prove or disprove this viewpoint

but, lately in both the U.S. and Canada, labour unions have had little to say on the issue.

2.2.3 Supermarket Retailers' View

> "Whatever the immediate future may hold, there are several reasons for believing that scanning has now reached the tipping point where it will be increasingly difficult for stores to resist the payoff from this investment -- and increasingly dangerous to ignore the threat of an automated competitor" (Coyle 1978).

In 1978 it appears that, despite the uncertainty over pricing laws that caused a slowdown in the implementation of UPC systems between 1974 and 1977, retailers are going ahead and utilizing the available technology. The reasons Coyle gives for his belief stated above are

a) "... the grocery industry is already further into scanning than the number of automated stores would imply" (Coyle 1978). (In March, Forbes Magazine reported that only 208 U.S. supermarkets and five Canadian stores had installed scanners -- whereas McKinsey & Co. foresaw a possibility of between 5,000 and 10,000 such stores by 1975). Coyle suggests that a consideration of the chains, rather than the number of scanner stores, drastically changes the implication of the above facts. Namely 14 of the top 20 food chains in the U.S. have at least one automated store. These 14 chains account for about 30% of all U.S. food store sales (Coyle 1978).

b) A number of stores have automated checkout without scanners i.e. there exist 50,000 electronic checkout systems in U.S. supermarkets which are upgradeable to full scanning .

c) In both Canada and the U.S., a few of the chains have quantified the costs and savings involved in scanning and in some cases have made public this information. U.S. findings are presented in Exhibit 2.2, while the Canadian findings are shown in Exhibit 2.3.

Exhibit 2.2

(Source: Coyle 1978)

A. Giant Food Inc.

typical store volume $140,000 per week in sales

Savings areas:

Reduced cashier labour	625
Elimination of underrings	227
Others	530
Total	$1,382 per week

Elimination of price marking would save an additional $686 a week in labour costs per store

B. Ralph's Grocery Co.

Typical store volume $160,000 per week in sales

Savings areas:

Shrinkage control ($33,000 per year) $660 per week

No other dollar figures are available for Ralph's Grocery Co. although the "impact is being established in many of the soft benefit areas".

Data based on 80% of all items being source marked.

Exhibit 2.3.

Steinberg's Ltd.

Typical store volume $105,000 per week in sales.

Savings areas due to use of automated checkout without scanning :

Labour	128
Underrings	12
Perishables	701
Total	$841 per week

Steinberg's also discovered other areas where savings could be achieved, but did not specifically quantify these savings.

Source: Steinberg's Ltd. (Dexter and Barnett 1978b).

Exhibit 2.4. Shows the breakdown of potential savings as depicted in the study by Assembly Office of Research, 1977.

Exhibit 2.4.

Savings Potential of the UPC system by Expense Category

Checkout and bagging	43%
Price marking	23%
Register balancing and Underrings	22%
Routine ordering	9%
Equipment replacement	3%
Total Savings	100%

Source: Assembly Office of Research, California Legislature, Study of Computerized Checkout Systems in Food Stores, 1977.

The non-quantifiable savings (which will be referred to as "soft" benefits) appeared to be fairly extensive according to the studies carried out by the retailers mentioned above. Ralph's Grocery Co. listed these as:

- proper product mix and shelf allocation;
- private-label-line-extension and evaluation;
- item introduction and evaluation, standard order development, improved labour scheduling techniques;
- front-end configuration, accurate comparisons of like stores, and inventory controls.

"A key area being addressed by a communicating network of stores is the store cash-accounting system which will provide an ability to control and audit store-level negotiable assets such as cash, coupons, and food stamps in a way that has never been available in a mechanical environment " (Supermarket News, October 17, 1977). Steinberg's study pinpointed benefits as follows:

Merchandising - e.g. better new item tracking, better analysis of advertising effectiveness.

Store control - this included the areas of direct delivery, coupons, bottle deposits, and department planning

Corporate funds control and reporting - potential savings for the company as a whole amounted to $94,600 per year and included supplies related to ordering ($28,600 per year) and the daily courier service to the EDP centre ($66,000 per year)

Service level - it was determined that with better inventory control, percentage stockouts could be reduced from the

existing 9% ideal level to a 5% level (Dexter and Barnett 1978b). While estimates of savings vary, the statistics quoted above and in Exhibits 2.2 through 2.4, in general, bear out the findings of other sources (Moyer and Seitz 1975, Assembly Office of Research 1977). The estimated 23% of savings being attributed to elimination of price-marking is widely accepted (Coyle 1978), and many chains feel scanning is "impractical without price removal (Supermarket News, August 1, 1977). Costs of systems vary with installation. Estimates place the conversion of a supermarket from manual registers to scanners at between $100,000 and $130,000, with some running as high as $300,000 (Forbes 1978, Mahoney 1974).

2.2.4 Manufacturers' View

The grocery product manufacturers have invested much time and money in the UPC and view automated scanning as a logical next step. In 1970, the funds for the initial U.S. study on a standard industry code were put up by the Grocery Manufacturers Association and the Super Market Institute -- $50,000 each (Mahoney 1974).

By 1977 the grocery industry had invested some $50 million to develop the concept of the Universal Product Code (Assembly Office of Research 1977). The manufacturers will benefit if the retail outlets employ scanning equipment on a large scale. One potential area for hard savings is in the policing of cents-off couponing. At present, consumers are

able to redeem coupons on goods not actually purchased. This may be done inadvertantly (e.g. during peak periods) or knowingly by the cashier. Blair Research recently presented data suggesting that "consumer misredemption alone accounts for a third of all coupons cashed in - far higher than earlier industry estimates. Misuse of this potent marketing weapon could be costing marketers well into the hundreds of millions of dollars" (Grey Matter 1977). As coupons could be UPC coded, the transaction can be validated by the computer system.

2.2.4.1 Marketing information System Potential

By being able to obtain detailed product movement information, hitherto available only on a broad basis, manufacturers should be able to refine their marketing strategies. For example, information could be obtained regarding:

- actual movement at the point of sale (item by item)
- consumer buying behavior, literally overnight, simply because the data is always current. The information may not, of course, be required on a daily basis.
- new product and other test market experiments (fast, accurate feedback)
- the effects of advertising and promotional

activity on sales

- perhaps even a dollar for dollar payout relationship of marketing investments to sales.

The scanning systems will make the necessary data available and it will be up to the manufacturers to make use of the information. Under present manual systems, promotion assessment e.g. through coupon control, is almost impossible, and item tracking difficult.

> "The speed and exceptional sensitivity of scanner-spawned data were recently documented by Tele-Research, Inc. ... findings presented to an American Marketing Association meeting in mid-June (1977) showed how the information (on a weekly or even daily basis) could be used to assess advertising and marketing effects previously lost because of long intervals (usually two months) between audits. Its TRIM division (Tele-Research Item Movement) is able to 'monitor the slightest tremors in sales and share, where others can only pick up the earthquakes', according to Tom Mindrum, vice president in charge of the New York office" (Grey Matter 1977).

2.2.5 Computer Manufacturers' View

Several computer manufacturers were involved in original development of the UPC by submitting proposals for its format. Among these companies were IBM, NCR, Singer, and RCA who all obviously saw the potential market for automated checkout equipment.

The advancement of these systems was far slower than anticipated and today "IBM with 57% of the U.S. market, and

NCR with 25% lead a field of five major manufacturers " (Coyle 1978). This small number of equipment manufacturers is representative of the Canadian market as well. The manufacturers must indeed be cheered by the renewed activity in the supermarket area. For example, Giant Food in the U.S. recently ordered 1,500 electronic scanner checkstand units from IBM. The manufacturers would like to see this trend continue, for although "last year food retailers spent about $200 million on checkout equipment, less than $10 million went for scanners" (Forbes 1978). This key-entry and other simpler point-of-sale equipment "costs only a fraction of the price of the scanner" (Forbes 1978).

2.2.6 Government's View

While not wanting to interfere unduly in the supermarkets' operations, governments on local and federal level, both in Canada and the U.S., have been pressured by consumer and labour unions to take action in the item-pricing controversy. This action, in the form of legislation to force item-pricing in scanning stores had taken place (as previously mentioned) in many U.S. cities and states by 1975.

Legislation at a federal level in both Canada and the U.S. was being considered in 1975 but, to date, there has been no federal stand on the issue. Governments have passed legislation to protect consumers where they felt that elimination of item prices would lead to unchecked,

indiscriminate price hikes by supermarket owners; or to protect labour where they felt that supermarket employees' jobs were threatened. However, lobbying by both these groups has diminished, if not the fears (Coyle 1978).

The Canadian government, in particular, would be concerned at a minimum by monitoring any price hikes in the industry. Government agencies have been formed to deal with this particular issue, i.e. the Anti-Inflation Board established in 1975 to control price and income. This body, or its "watchdog" replacement, Centre for the Study of Inflation and Productivity (CSIP), would certainly be concerned if it was felt that the changes taking place in the supermarkets could possibly lead to unchecked price increases. Both the AIB and the CSIP are presently active as borne out by recent newspaper articles (Mackie 1978, Teasdale 1978).

CHAPTER III

CONSUMER INFORMATION SYSTEMS

One possible alternative to conventional methods of price publication is to be considered. Presently, consumer information systems, paid for directly by consumers, do exist and these must be considered as a basis for further discussion of the specific CIS contemplated herein. Existing systems will be discussed along with new ideas in the area of telecommunications . This will lead to a description of a CIS in the supermarket environment, as well as giving ideas on the future potential of such a system.

3.1 Use Of Existing Information Services

The notion of a consumer information system in various forms is hardly new. Nationally, the U.S. Consumers Union and the Canadian Consumer Association endeavour to help consumers with their buying decisions by supplying yearly publications such as "Consumer Reports". Products are rated on overall quality and their attributes are discussed. On a local level, member-funded organizations exist offering local market information (products, services, venders, etc.) in the form of Consumer guides. Examples of the latter include "Checkbook", a periodical published quarterly by the Washington Center for the Study of Services; and "Vector", published monthly by a privately run concern in San Diego.

On a national scale, publications must of necessity deal with product data that will not date too quickly, thus rendering the information obsolete before consumers have had an opportunity to utilize it. For example, "suggested retail" prices are often listed, and the items being considered will be major purchase articles (e.g. household appliances). Locally, information systems can handle more volatile and area-dependent attributes (such as food prices) because printed information can be published more frequently and use can be made of local media.

For example, consumer groups will use the local newspapers to publish a "market-basket" of grocery item prices; in Montreal, food price comparisons appear periodically on a public access television channel; in some U.S. cities, consumers can have access, for a fee, to a private television channel offering a range of topics of local interest. Even these local information systems have drawbacks:

a) In many cases, the information systems are the product of voluntary associations (acquaintances who pool local information), or organizations utilizing volunteers to collect the necessary data (e.g. the Consumer Association of Canada). Both rely on the continuing energy and enthusiasm of these volunteers.

b) Even the professional, commercial organization possesses factors limiting the quantity of data collected and

published, i.e. financial resources; time required for collection and collation; restrictions that are a product of the publication media (e.g. physical space available, publication deadlines)

c) In any system, the information is only as accurate as the method of data collection which is prone to human error.

d) In most cases, the success of these systems has been questioned. The voluntary association tends to falter "as the dominant enthusiasts finally run out of energy and enthusiasm" (Maynes et al. 1977). The commercial organizations appeal to those peole who are willing to pay for the information they require in decision-making. However, whether such a system is utilized depends on the consumer's marginal net gain calculation. Here, the marginal cost is a function both of search time and any service fee. So, unless charges are minimal and access is simple, the system will have appeal to a limited range of people.

3.2 Potential On A National Scale

The drawbacks of existing nationwide publication of information have already been mentioned. However, developments in telecommunications offer alternative forms of information dissemination. Using television as a vehicle for publication of information on a local level is already in use (see above). Implementing this idea on a nationwide scale has begun to appear feasible. Canadian Television and Cablevision

executives recently took note of developments in Britain. Two systems have appeared there, and a description from a newspaper article is given below:

> "In its simplest terms, the BBC, IBA system is an information service that uses existing channels on a British television set to make a vast range of printed information available to the viewer. This currently includes news flashes, sports results, weather conditions, food prices, an entertainment guide, and transportation information ... To get at it, a television owner needs a converter fixed to his set and a hand-held digital keypack resembling a pocket calculator. With the keypack, the viewer can interrrupt his regular programs by punching up an index of information available over either networks (BBC, IBA), then request specific details. Within seconds, pages of printed information flash on the screen. A touch of the fingertips switches him back to his program" (Gray 1977).

Jointly, these systems are currently in use in over 6,000 British homes and offices. The author sees these telecommunication developments as the important link between existing limited-scope information publication systems and future easily accessible, potentially powerful Consumer Information Networks.

3.3 A CIS In The Supermarket Environment

The supermarket environment lends itself to consideration of the development of a CIS since the issue of item pricing is topical and the existence of the UPC eliminates many design problems.

3.3.1 Scope Of The System

Initially, the system is envisaged as a rather simple device for the storage, and subsequent publication, of grocery product price information. This data currently exists within the scanning computer systems of the supermarkets. Because most price changes are initiated from the chain's head office (except for instore specials), pertinent price information is stored in a central location. In the case where chains have stores with automated checkout, this centralized information system must be automated for communication purposes.

Thus, price information in the supermarket environment is available for use in other spheres. (The feasibility of the statement just made is discussed in more detail below.) If it is possible to store this information on a system in the public domain, then consumers potentially have access to price information on all products (not just a select set) and the accuracy and currency of the data is assured. Thus, the existing problem of data collection is eased; however, information dissemination is still a difficulty. It is suggested that publication of price information be through the following channels:

a) local newspapers (e.g. weekly market-basket price comparison)

b) printed lists of product prices and/or product price changes displayed publicly e.g. libraries, supermarkets

c) public television channels

d) Central Inquiry Centre, i.e. consumers will be able to telephone and enquire about specific prices.

At the start, only price information will be stored, but the potential of this system as a useful and powerful Consumer Information System is worth considering. Within the supermarket environment alone, there is a need for "better" information. This does not necessarily imply more information, but information in a form that assists the consumer in making rational decisions. For example:

a) unit pricing is generally available although it is not always consistent (e. g. millilitres vs. fluid ounces); and it is not used by a majority of shoppers.

b) nutritional information is listed on most food packages, but the number of items listed can become overwhelming and therefore useless, if more than two or three items are being compared. Additives are also listed, but these chemical compounds are meaningless to most people, and their potential harmfulness generally is not known.

An attempt is being made in the U.S.A. to make nutritional information simple to compare by setting up a single relative 'nutritional score'

- see Exhibit 3.1. Along with this, information on additives is being made more meaningful with warnings regarding the harmful effects of these substances - see Exhibit 3.2.

c) consumer ratings of the stores themselves is not handled in any formal manner at present. Ratings could be based on a subjective measure of cleanliness, service-levels (i.e. stockouts, ability to handle peak periods) helpfulness of employees, etc.

Information in the future could be obtained by simply selecting a television channel. With the advent of micro-computers in the home, the consumer of the future should be able to key in a shopping list and get a display of supermarkets in the area and a comparison of total costs for the items selected. He/she may also have the option of automatically placing an order with the most convenient store.

Exhibit 3.1

Nutrition Scoreboard[1]

The foods are given "Relative Nutritional Values". There is no perfect score, but higher scores indicate greater nutritional value than lower scores. Ratings can be added, e.g. two plums have a rating of 18. The chart advises: "A diet must be balanced as well as generous".

Examples:

			Nutritional Score
Protein Foods:	beef liver	2 oz	172
	chicken liver	2 oz	158
Vegetables:	broccoli (frozen)	3.3 oz	116
	brussel sprouts (frozen)	3.3 oz	73
Dairy:	skim milk	8 oz	39
	whole milk	8 oz	39
Fruits:	strawberries	1.5 cup	50
	plum	1	9
Snacks:	oatmeal cookie	1	-4
	milk chocolate	1 oz	-27
	Chuckles candy	1 package	-74

---

[1] From the book Nutrition Scoreboard by Dr. Michael Jacobson. Posters produced by Centre for Science in the Public Interest (CSPI) Washington D.C., 1978

Exhibit 3.2

Chemical Cuisine[1]

This chart lists many of the common food additives, in an attempt to inform consumers as to what the chemicals do, which ones are safe and which are poorly tested or dangerous. Three colours are used on the poster: Green - safe, yellow - caution, and blue - avoid.

Examples:

Ascorbic Acid (green), nutrient - oily foods, cereals, soft drinks, cured meats.

Caffeine (blue), stimulant - coffee, tea, cocoa, soft drinks

Calcium Propionate (green), preservative - bread, rolls, pies, cakes

Quinine (blue) flavoring - tonic water, quinine water, bitter lemon

Along with the above a short narrative is provided, listing characteristics of the chemical and any known or potential hazards in its use.

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[1] A poster produced by Center for Science in the Public Interest, Washington, D.C., 1978 Source: Michael Jacobson's Eater's Digest, Anchor Paperback.

3.3.2 General Feasibility Of The System

The economic feasibility is discussed in Chapter V. However, there are technological and political considerations which must be taken into account.

3.3.2.1 Technology

Computer hardware and software requirements for setting up the initial CIS are available at present. The fact that the grocery industry has developed the UPC makes computerized storage and retrieval of information straightforward. Using the UPC as a record key, consistency of product identification within manufacturers and/or across grocery chains is assured. Data collection is facilitated by the use of scanners; data publication can make use of existing telecommunication methods, with a view to more sophisticated techniques (described above; Gray 1977) in the future.

3.3.2.2 Political Aspects

Much has been said about the ease with which a price information system could be constructed because the necessary data is stored by the supermarkets in a readily usable form, Section 3.3.1 above. However, cooperation must be obtained from the grocers in order for this data to be obtained.

Why should the retailers agree to provide price information on a regular basis for use in the central

database? We must consider two important points:

a) There is a possibility that pressure will be brought to bear on retailers to retain item pricing, either informally from consumers, or more formally from government legislation.

b) Retail grocers, as competitors, pay for the collection of other stores' price information. They can however, simply be considered in the role of consumers needing price information.

It follows from the above that it is highly probable for retailers to view the CIS as advantageous and a viable alternative to item pricing:

a) Retailers have the opportunity to realize full potential benefits from the scanning system, i.e. the savings due to item-price elimination.

b) Retailers, as consumers, will have easy access to competitors' price information.

c) Publication of price information can be seen as a form of advertising by the retailers.

Within the scope of this thesis, only the supermarket environment is being discussed as playing a part in the formation of a CIS. However, other retailers (department stores, automobile sales, etc.) have installed, or have the potential to install automated checkout systems. Removal of item prices has not become an issue as yet (with bulk items e.g. refrigerators and stoves, it probably never will), but

these retailers must be considered for the future. Valuable information is stored on their systems, and expansion of the CIS into areas beyond the supermarket should take this into account. It is left to future research to consider the complex policy aspects involved in this endeavour. Herein the scope of these issues will be confined to the grocery industry.

The timing of the CIS development is a very important political consideration. In Vancouver, the two major chains, operating two scanner stores apiece, view these stores as test systems. Consumer reaction, particularly to price removal, is being put to the test as much as any other feature. At present, formal complaints have been few, but consumer advocates have suggested consumers could express their disapproval by shopping elsehwhere. This lack of written objection, wrongly or rightly, could be taken by grocers as a signal to go ahead with all stores and interpreted by government as a signal not to interfere via legislation .

Once the majority of stores have been converted, the expression of objection by boycott of scanner stores may be impossible and voiced objection may be too late. With scanners firmly entrenched and no item prices on goods, supermarkets will be less likely to cooperate in the formation of a CIS. Government will be loathe to interfere this late if it is felt consumers passed up their opportunity for action.

CHAPTER IV

CONSIDERATIONS IN THE DESIGN OF A CIS

In a changing environment, people's attitudes and information processing methods may also be required to change to meet new challenges. Chapter IV looks at the feasibility of offering consumers an alternative method of food price information-gathering. As a consequence of the situation presented in Chapters I and II, it appears that a stalemate over item pricing still exists. Although the tension appears to have lessened recently, consumer fears are still prevalent, and may well be justified. The findings of the study by Harrel, Hutt, and Allen (1976) cannot be ignored even though consumer groups' objections may have "quieted down - perhaps because the consumers they presume to speak for have fallen in love with scanners" (Coyle 1978). In Vancouver, Canada, where two major chains each have two scanner equipped stores, objections to item price removal are once again being voiced (Parton 1978a, Parton 1978b).

Offering an alternative to existing methods of pricing retail goods (in particular supermarket products), and maintaining or heightening consumer awareness is thus a major thrust behind the establishment of a CIS. There are also studies which support the expectation that widened publication of price information would reduce both average price and price dispersion, and also price discrepancy between stores of the

same chain. A study on drug prices (Cady 1976) showed that in areas where advertising of prescription drug prices was unrestricted, both prices and price dispersion were significantly lower.

Studies by Devine (1976,1978) in the Ottawa-Hull area supported the hypotheses that public dissemination of market information

a) reduced the dispersion of prices across stores;

b) decreased price variations within stores;

c) lowered the average price level in the market.

From the above we are left with the distinct impression that price publication offers significant advantages to consumers over and above existing methods of item-pricing. The need for a database of consumer price information in the supermarket environment - a CIS, appears warranted.

4.1 Design Issues

The objectives of this CIS should be made clear at the outset. Bettman provokes thoughts on the issue, and comments on the objectives of "designing Consumer Information Environments" (Bettman 1975).

> "A system is said to be 'processing' normative if it is intended only that consumers should be aided in perceiving and processing the appropriate information, but there is no commitment to how or even if consumers use such information. Usage is a subjective individual consumer decision, and the system does not try to direct that decision other than by providing information in a fashion facilitating processing. A system is 'policy' normative if the intent, based upon

> some notions of rational behavior, is that information be used in a particular manner, if there is a policy or goal of 'educating' the consumer to make 'better' purchase decisions".

The author agrees with Howson and Dexter (1977) that "In this context the objective of a consumer information database is processing normative (however) specific analyses and methods of distributing information extracted, could have either processing or policy normative objectives."

This is not to say that responsibility for the consumer is being shrugged off. Rather, the point is made that consumer needs can be satisfied whether or not consumers specifically use the information in the way it was intended. It is the intention of the author that the proposed publication methods be 'policy' normative in nature. Thus, the question becomes whether or not the "specific outcome or set of outcomes" desired (Bettman 1977) will, in fact, satisfy consumer objectives (or those of consumer advocates purporting to be one and the same). Section 4.2. discusses these objectives further.

The design issues as they relate to the CIS in the supermarket environment will be considered. These include

a) Scope of the system; who the prospective users and interest groups are, and their objectives with regard to price information and the UPC (Section 4.2.).

b) Content and accessibility of the system; initially only price information will be stored; direct access by consumers and retailers while desirable, is not feasible in

the early stages of operation (Section 4.4.).

c) Economics; an attempt is made to assess costs and savings of such a system and ascertain where responsibility for maintaining the system should lie.

4.2 Objectives Of The Interest Groups

The proposal outlines the features and requirements of a basic Consumer Information System, i.e. one which meets at least a minimum objective set of the various interest groups. In order to formulate this objective set, the objectives of the interest groups (Exhibit 4.1.) are considered.

EXHIBIT 4.1

Interest Groups and Their Representation in Canada

A	Grocery Manufacturers	- Grocery Products Manufacturers of Canada
B	Retailers	- Represented by individual supermarket chains, and by the Retail Council of Canada
C	Equipment Manufacturers	- 5 major manufacturers led by IBM (57% of U.S. market) and NCR (25%) (Coyle, 1978)
D	Government Organizations	- Statistics Canada - Department of Consumer and Corporate Affairs
E	Labour Unions	- Represented by the Retail Clerks' International Union
F	Consumers	- Represented by consumers in general, and by the Consumer Association of Canada in particular

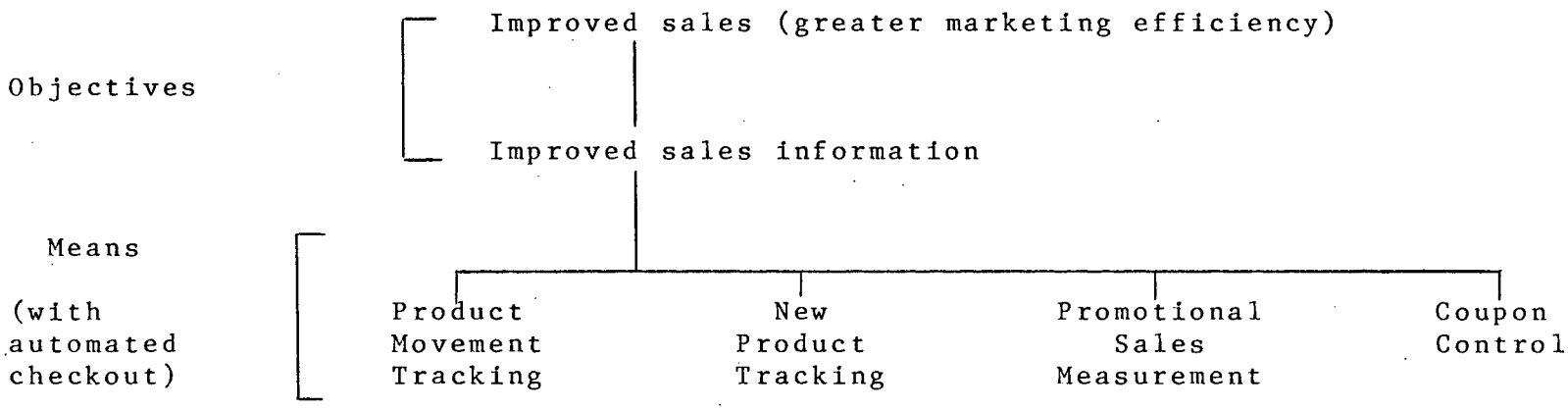
4.2.1 Grocery Manufacturers

The grocery product manufacturers present the most straightforward analysis. They do not stand to benefit directly, as do the retailers. However, they have invested considerable money and effort in the introduction of the UPC (and the standardization of information labelling), so they view scanning as the next logical advance. The hierarchy of manufacturers objectives is presented in Exhibit 4.2.

EXHIBIT 4.2

HIERARCHY OF OBJECTIVES

Grocery Manufacturers



The supermarket systems allow the manufacturers greater efficiency in the distribution of their products as has been mentioned in section 2.1.3. But this is only possible if, in fact, scanning is adopted by a large percentage of the supermarkets.

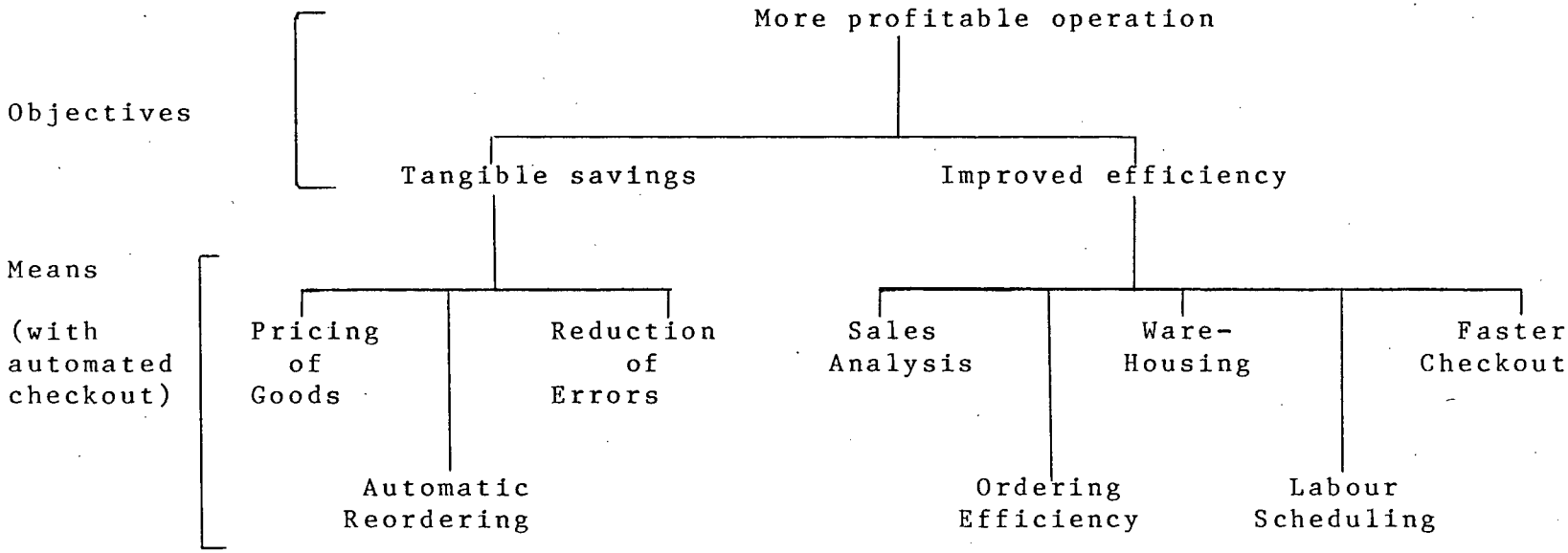
4.2.2 Retailers

Retailers will benefit directly from the use of automated checkout, with full potential being realized once item pricing is no longer required. The hierarchy of retailers' objectives is presented in Exhibit 4.3.

EXHIBIT 4.3

HIERARCHY OF OBJECTIVES

Grocery Retailers



4.2.3 Equipment Manufacturers

The objective of the equipment manufacturers is to sell the automated checkout systems in quantities that reflect the market potential. Both hardware and software are readily available and represent large investments by these suppliers over the past few years.

Reaction to the supermarket system may be an indication of the future success or failure of other important concepts, e.g. Electronic Funds Transfer.

4.2.4 Government

The government would like to stimulate the economy but, at the same time, avoid excessive inflation. They would like to be sure that competition is not reduced as a result of any change in the environment, e.g. introduction of scanning equipment and the elimination of itemized pricing. What is required is a way of monitoring operations without undue interference. The AIB Control Program expired at the end of 1978. It has been replaced by a "watchdog" agency, the Centre for the Study of Inflation and Productivity (CSIP) whose function is to monitor post-controls. "CSIP has a double barrelled function to analyze price and cost developments that appear to threaten the country's economic objectives and to study ways of improving productivity" (Teasdale 1978).

4.2.5 Retail Unions

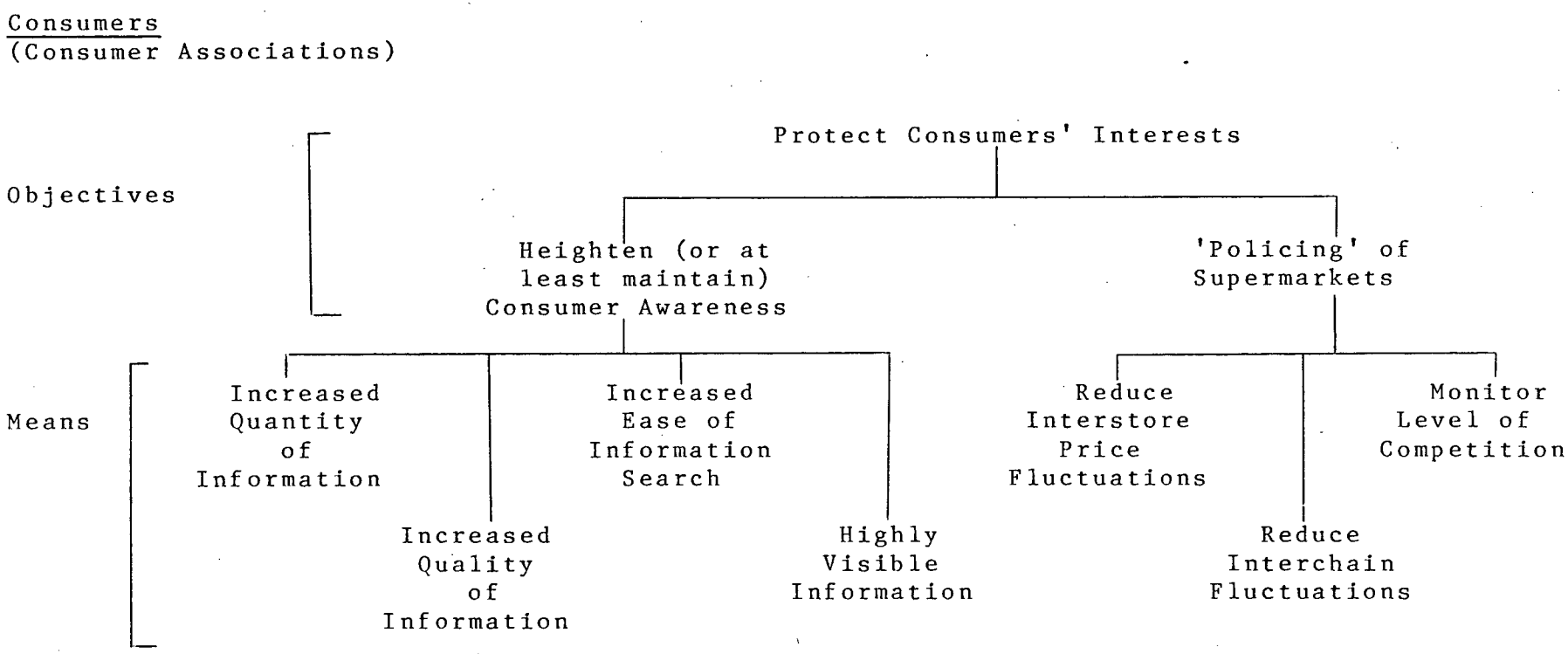
The Retail Clerks International Union in the United States has stated their opposition to the scanning equipment. Their objective is to avoid loss of employment for members due to change in the industry. (However, as mentioned earlier, the objections are no longer voiced in many of the states).

4.2.6 Consumers

The consumers are discussed last because they form a very significant and interesting, yet complex, group. Both in Canada and the United States, consumers' needs generally are represented by associations. Locally, therefore, the objectives of the Consumer Association of Canada need to be considered. (See Exhibit 4.4.). The suitability of an alternative to itemized pricing will be judged by this agency.

EXHIBIT 4.4

HIERARCHY OF OBJECTIVES



4.3 Meeting The Objectives

This thesis proposes that the simultaneous implementation of a CIS with the supermarket scanning systems will reasonably meet the objectives of the previously mentioned interest groups. If the CIS is indeed a feasible substitute for item pricing, then, in the short run, we will see an end to the present impasse on this issue, without either side feeling the imposition of an unfair compromise. In the long run, the CIS makes possible the collection and availability of even more information to consumers and other groups; For example, marketing boards will be assisted in their collection of information on volumes produced and sold, consumers will have the potential to get nutritional information on food products, and grocery manufacturers and retailers have the potential to get accurate market-share information.

4.3.1 The Grocery Industry's Objectives

It is obvious from the preceding discussion (Sections 4.2.1. and 4.2.2.) that the grocery manufacturers and retailers' goals are achieved through the use of supermarket scanning systems to obtain their information. While this is not directly attributable to the Consumer Information System, the indirect influence is as follows: Reports on productivity at the front end, movement of products, and buyer profiles are of use to both retailers and manufacturers, and were not previously (or easily) attainable using manual systems. With

automated checkout for all goods being sold, this information is easily obtained. Machine-reading the UPC is the most effective form of data collection. The retailers fear much of their marketing information will be incomplete and possibly incorrect if checkers can key in the price rather than using the scanner for all encoded products. The attaining of their goals therefore, is dependent on the satisfying of consumer objectives in a way other than the maintainence of item pricing.

4.3.2 The Equipment Manufacturers' Objectives

If the retailers purchase supermarket systems, the hardware suppliers increase their volume of sales. If scanning equipment is part of the purchase, there is a further increase in both hardware and software sales. Prices quoted in Forbes (1978) puts NCR's lowest priced scanner at double the cost of their key-entry electronic checkout system.

4.3.3 Government Objectives

There are various governmental agencies who realize the potential wealth of information gathered and stored by these supermarket systems. With access to the data generated by the stores, agencies such as Statistics Canada could produce the "Market Basket" information more efficiently; watchdog agencies too could save money on their monitoring process of the retail grocery industry. Present manual systems are time

consuming and therefore limited. For example, Canada's Food Prices Board's "weekly price survey, set up to give speedier information than that offered monthly by Statistics Canada's consumer price index" was limited to between 5 and 8 stores in 8 cities (Armstrong 1975). The survey covered 68 foods and 26 'non-foods'.

With the CIS, the various government agencies concerned have the opportunity to monitor prices with a minimum of effort, and without undue interference. There is potential for the government to monitor costs vs. prices in their effort to impede inflation (e.g. the CSIP, See 4.2.4). This, of course, opens up the area of government/supermarket cooperation, with the attendant issues of information privacy, and control over data accuracy. The detail of these topics is beyond the scope of this study. However, the related issue of supermarkets' access to the data will be discussed in Chapter V, Section 5.1.

Consumers are directly affected by a CIS. Ideally, to assess how well their objectives are satisfied, a 'measure' of consumer awareness should be used (Harrell et al., 1976). This measure wll not be attempted within the scope of this paper. Realistically, it is not possible to predict accurately how much (if at all) consumers will use the information provided by the CIS; And, as mentioned, it is the groups representing the consumer interest who will decide on the effectiveness of any alternative to item pricing. To this end, it is useful to consider studies already carried out in

the field.

There have not been studies dealing directly with what, if anything, can replace item-pricing and maintain awareness levels. However, there have been studies concerned with individuals' methods of processing comparative information for decision-making purposes. The ultimate benefit of changes in the information available to consumers depends on the individual's ability to utilize the information. This is attributable in part to the limits of an individual to attend to, recall, and process unlimited amounts of data. Haines has postulated a principle of information processing parsimony which maintains that "consumers seek to process as little data as is necessary in order to make rational decisions" (Haines 1972). Research has shown that rational decisions are facilitated if, for example, unit price information for different brands and sizes is listed (and centrally displayed) for an entire product class (Russo et al., 1975). Bettman too, stated that "both on theoretical and empirical grounds, it can be argued that facilitation of processsing by attributes can help to simplify choice processes" (Bettman 1975). It would appear then that consumers should be able to make improved decisions of choice if the presentation of the data is improved over the current item-pricing method. With proper design the CIS will be able to offer this alternative.

It is suggested that supermarkets list item prices and price changes at a convenient location in the store; that price lists be published in local newspapers, public buildings

(e.g. libraries), and that these lists be made available to groups such as the CAC and the consumer advocates.

However, if we assume that consumers' uses of the information will be no more or less than at present with item-pricing, then we must consider whether objectives (of consumers and consumer groups) will still be met. There is theoretical (Stigler 1961) and empirical (Devine 1976,1978) support for the expectation that improved price information publication from the CIS would reduce average prices and price dispersion. Stigler argued that the cost of search for price information by both sellers and buyers is a significant source of price dispersion. More specifically, with lower search costs for individual products, consumers will engage in more searches and buying will shift to the lower-priced and, ultimately, more efficient seller. Studies by Devine suggest that exactly the same effects experienced in the prices of drugs (Cady 1976) can be anticipated from improved price information of food products. To reiterate, the results showed that public dissemination of market information;

a) reduced the dispersion of prices across stores;

b) decreased price variations within stores;

c) lowered the average price level in the market (Devine 1976).

Results of Devine's experiments were mentioned in the introduction to Chapter IV above. Devine points out that store comparisons are difficult for consumers to make. "For

the most part, consumers must rely on their personal experiences and observations from shopping at alternative stores in making their store selection decisions. Commercial or government reports which provide store comparison information are generally not available".

Earlier experiments in the Edmonton market revealed that "one particular firm was a dominant price leader setting the competitive price for all regions in the city". Price publication caused a substantial change in the market. The dominant firm announced it would charge identical prices in its stores throughout the city, various competitors were able to underprice this firm, and there was a general decline in prices for the entire city. Most importantly, "The University of Alberta began publishing comparative weighted price level indices each week. There was a positive response from both sellers and buyers to the increased information. Consumers used the price indices to select stores, and sellers used the indices as a benchmark for performance evaluation". Devine concludes "If we assume that a defined minimum of market information is necessary for 'workable' competition under most contemporary market structures and that a minimum is not supplied because of the lack of market incentive, the characteristics of the product would suggest that retail price information may be a public good". Thus, widely advertised price comparisons will serve, at a minimum, to 'police' the supermarkets, thereby protecting the consumer interest. For example, supermarkets may be deterred from raising prices

indiscriminately if they run the risk of protest; this risk is higher if there is wide publication of information, and is obviously lower if consumers are not aware that it was taking place.

The question exists as to what constitutes 'widely advertised' price data. Some possible means of dissemination: 'Market basket' price lists altered on a daily, or even a weekly basis, could be published in newspapers; consumer advocates with newspaper columns (e.g. Nicole Parton, Vancouver Sun) could publish their own choice of selected items. The considerations discussed in this chapter are mentioned again in Chapter V to the extent that they affect a specific design - a CIS in the Vancouver area.

CHAPTER V

DESIGN OF A SPECIFIC CIS

Taking into account the relevant studies and the design considerations of Chapter IV, a specific design is contemplated for the area of Vancouver. Section 5.1 looks at the physical location and suggested global system design as well as the database design. Section 5.2 considers the economics of such a data centre, leading to a cost/benefit analysis in Section 5.3. The design aspects of the system are discussed at a relatively high technical level.

5.1 Proposal For A Vancouver Data Centre

In order to demonstrate the economic viability of the CIS proposal, the feasibility of such a system is studied. The study examines one potential system. This specific CIS environment will be defined, and characteristics with regard to hardware and software components will be discussed.

The initial system is a basic consumer database with the objective of supplying price information to consumers on a timely and convenient basis, i.e. a replacement for itemized pricings in order to maintain consumer awareness and/or to control perceived or potential advantage-taking by supermarkets. At a minimum, this requires a highly visible method of data publication.

5.1.1 Physical Location

The area chosen is Vancouver, with a view to designing a practical CIS for this environment. There are aproximately 6 grocery chains in the Vancouver region (North and West Vancouver have been included). A 'grocery chain' is defined as having a minimum of 4 member retail stores in the area; the stores are of the self-serve, multiple checkout variety and, thus, the 24-hour convenience stores are excluded. The assumption that 6 chains are representative of the market in Vancouver is based on the fact that "in western Canada the four largest firms account for over 90 percent of all grocery store sales (Mallen 1974). Within this definition approximately 60 stores are included in the proposed system.

Design and economic calculations will be based on 'average store' statistics. These statistics were derived from:

a) interviews with local grocery retailers;

b) what Safeway terms an 'efficient store', (Business Week, March 1977);

c) Steinberg's Model Store (Dexter and Barnett 1978b).

Pertinent information of the typical store is given in Exhibit 5.1.

EXHIBIT 5.1

'AVERAGE STORE' STATISTICS

Store size	22,000 - 27,000 square feet
Number of checkout lanes	8 - 10
Weekly sales	$100,000 - $140,000 per week
Gross margin	20%
Number of grocery items in store	6,000 - 10,000

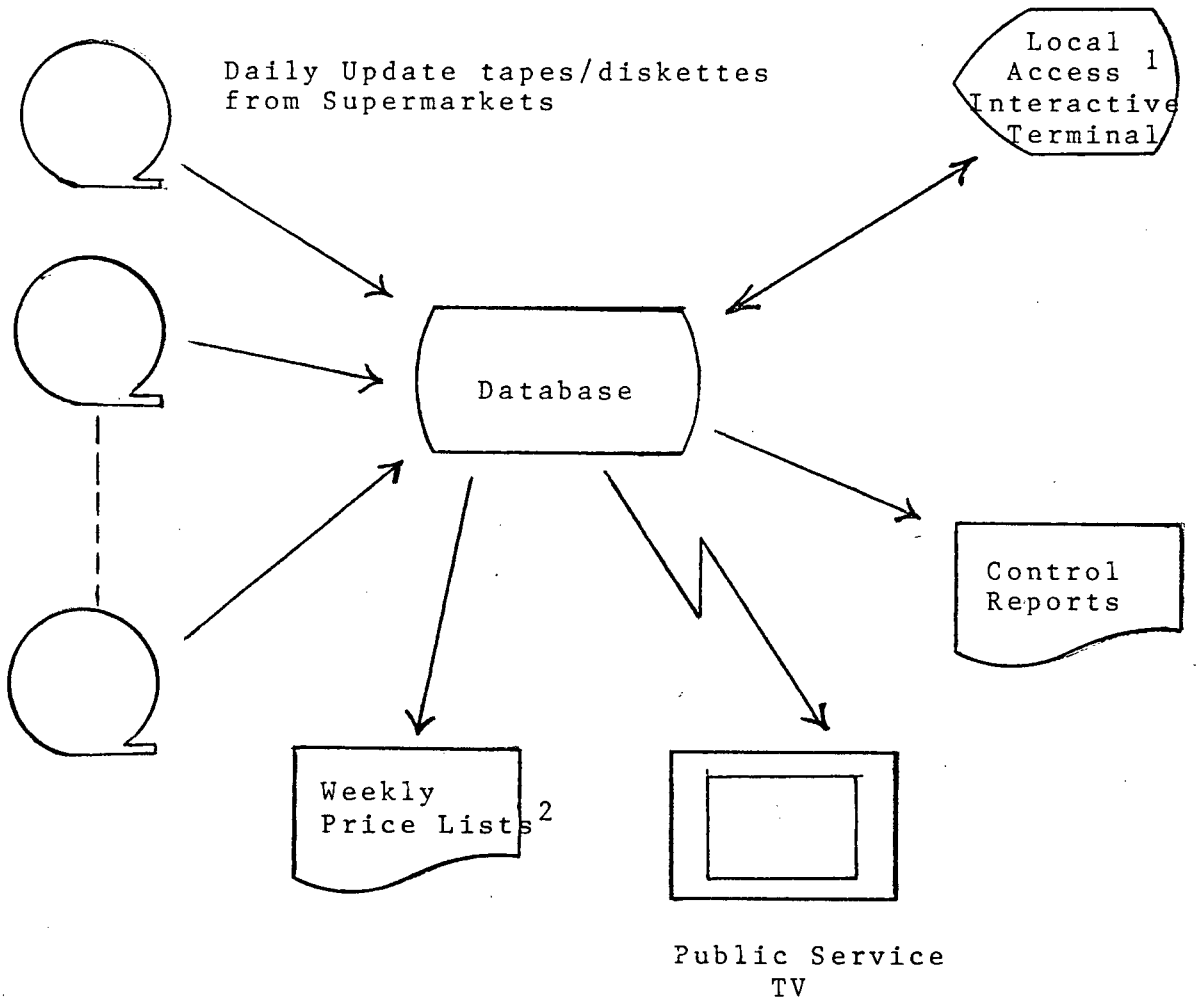
The above estimates were reached based on statistics from the following sources:

Cady, 1978; Dexter & Barnett, 1978b; Conversations with the local head offices of Safeway, Super-Valu, and IGA.

5.1.2 Global Systems Design

The overall system flow is conceptually very simple, consisting of input data to update the database, periodic reporting to supermarkets and the datacentre controlling group, and data publication for consumers. (See system flow chart, Exhibit 5.2.).

EXHIBIT 5.2



2 Available in:
(i) Public Libraries
(ii) Consumer Bureaus
(iii) Weekend Newspapers
(iv) Local Supermarkets

Lists are by product within type, for supermarket chains
e.g. Dairy
item 1 P1 P2 ....
item 2 P1 P2 ....

Produce
item 1 P1 P2 ....

1 Allows for
(i) Input of
(a) Data Changes
(b) "Specials" Information
(ii) Queries on the Database.

Based on information gleaned from 3 local grocery chains, the volume of price changes varies from 20-40 per day per chain. Chain-wide price changes are handled on either a daily or a weekly basis, implying 100-200 changes per week per chain. The large spread that can occur in this figure is due to:

a) changes in meat and produce prices which are especially volatile,

b) across the board price changes by a grocery manufacturer.

The frequency with which the CIS is updated depends upon the media used to communicate the information from the grocers to the CIS datacentre. Initially, magnetic tape or diskette will be the easiest and most economical form of data entry. Price changes, originating at a central site, or communicated to the central site by the stores can be written to magnetic tape or diskette and sent to the CIS datacentre. This is possible on a daily basis, with diskette being the simplest means of data transferral. On-line communication is a natural future consideration which could result in instantaneous information updating. This will be discussed in Chapter VI.

5.1.3 Database Design

'Database' rather than 'file' design is used here to indicate that it is the author's belief that traditional file structures will not be practical in the long run. Maintenance

and control of the system envisaged will become increasingly difficult as the size and complexity of the system grows. Also, the present design only considers 60 supermarkets in a single city - the possibility of a country-wide network cannot be ignored. Thus, any design must meet present needs, allow for the contingencies mentioned above, and must also take into account future innovations in Database Management Systems (DBMS) and distributed processing.

Whatever file design is chosen, provision should be made for:

a) increase in the number of stores and products;

b) changes in, and additions to, price information stored;

c) implementation of security control measures (for sensitive data stored);

d) access to information on a variety of fields (keys).

Thus, the 'basic' system should be along the lines of a formal database - even if access is via conventional methods at the start. The data will be described according to the relationships that exist among the data items because:

a) these relationships form the basis in the design of a database system utilizing one of the standard models e.g. network, hierarchical or relational. (Database systems have been described as belonging to one of the three categories mentioned, according to the design of

the schema (model). For a more detailed explanation see Date 1977).

b) the relations shown can be regarded as 'records' in a 'file' for conventional access methods; specifically this design lends itself to the use of secondary indexing.

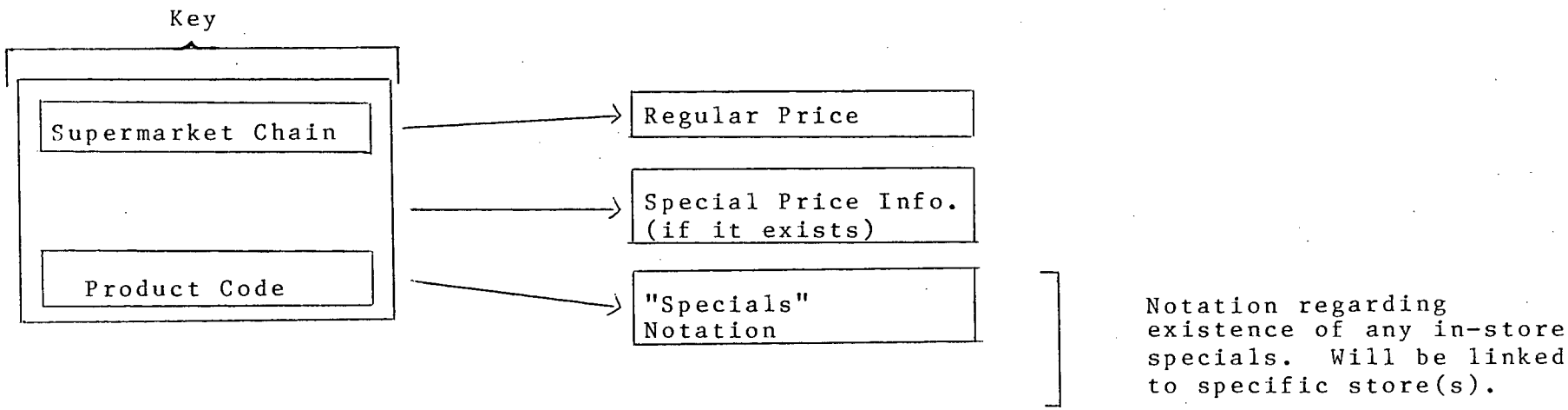
EXHIBIT 5.3

LOGICAL STRUCTURE OF THE SUPERMARKET

CONSUMER INFORMATION SYSTEM DATABASE

(Relationships between elements are depicted,
as well as keys that are needed
for information look up)

Supermarket-Price Relation



Branch-Price Relation

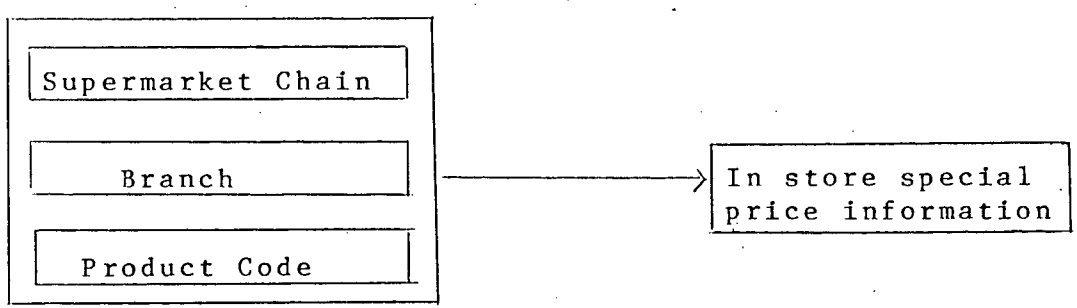
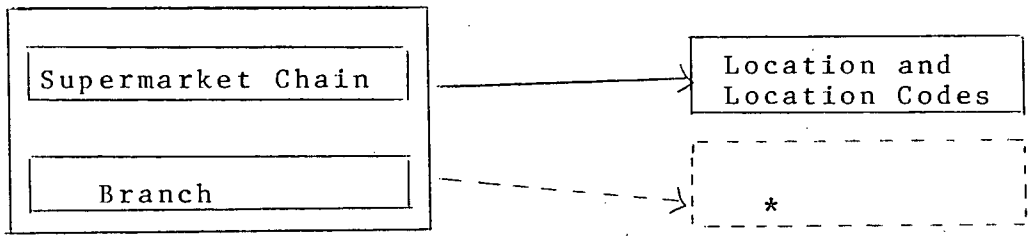


EXHIBIT 5.3

(cont'd)

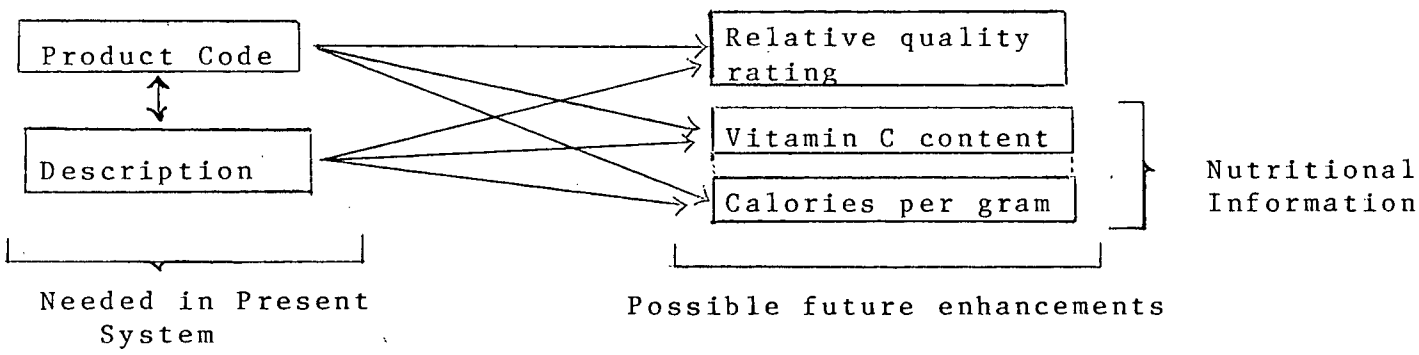
Supermarket-Branch Relation



* Possible future fields
e.g. (a) Consumer Rating of store
(b) Existence of other services (in store bakery)

It should be noted that the database containing the information is in no way considered complete or static. For example other consumer information relating to products could be stored, as shown below:

Product Relation



The logical structure of the database is shown in Exhibit 5.3. The apparent redundancy in this design exists diagrammatically, but not necessarily in the stored record form where linking of records is possible. Points to note regarding access of the database:

a) For daily price updating, access of the database will be by supermarket chain (and branch when required);

b) For price lists, access will be by product code (or description);

c) Specific queries on the database will be random, and access will be by supermarket or product code description.

Some efficient form of indexing can be used to access the data initially. Indices will be required on fields other than just the 'primary' attribute -- which is the UPC in this case. Exhibit 5.3 gives the logical structure of the 'records', simply showing the attributes we may wish to use as keys to access the database. Information obtained from the database may be in the form of lists requiring access to a number of records (e.g. by product class, by supermarket, etc.) or else a single line, requiring access to a specific record (e.g. price of a particular item). The following examples of attributes used as index keys demonstrate potential accessing requirements:

a) Index by product code will give direct access to information on the item, (product relation)

b) Index by product description e.g. 'beans' will allow access to all makes of beans, giving the user the choices by which to specify further.

c) Index by product within manufacturer e.g. 'Campbell's soup, tomato' allows access as in a) above, where UPC is not known,

d) Index by location e.g. 'Area 6' (Representing Broadway: MacDonald to Alma) will produce a list of supermarkets in that area.

It will also be useful to link the 'files' on certain attributes, e.g.

a) product and supermarket-price files could be linked on 'product code'. This amounts to having pointers to all supermarkets (supermarket-price relation) that carry a particular product (product relation). This type of linking saves search time on product queries.

b) branch-price and supermarket-branch files can be linked on 'branch' (in supermarket-branch relation). This will link all branches of a particular supermarket chain.

c) supermarket-price and branch-price files can be linked on 'product-code'. This will facilitate finding prices of a particular product in the various branches. Note that in the Product Relation, 'description' is also a key. The

description is unique when the full title is used, e.g. Libby's beans, 16 oz. can (or some unique shortened version e.g. Lib bns 16 oz.) However, in order to make specific query possible, there is a need to have an index that allows 'beans' or 'bns' to be entered and immediately produces a list of bean products stored. A particular product can be chosen, or the list printed as given. (Users of this information might be the CAC, in order to determine all types of beans available; i.e., as the first step for a price comparison). The user could also specify a subset by qualifying the description e.g. 'string beans'.

This requires two refinements to the method of indexing:

a) allowing for phonetic searching i.e. 'bns' = 'beans', etc.

b) the attribute values i.e. descriptive qualifications associated with a product (such as outlined above) will need to be stored in such a way as to be retrieved without having to access the actual records, i.e. it may be possible to store this information along with the index. For example, when looking in the index for a particular product, the possible qualifying attributes (type, size, etc.) will be

simultaneously obtained.

Making use of the logical design in Exhibit 5.3 the system file statistics were developed (Exhibit 5.4). In order tc produce a viable hardware configuration, the storage statistics were used to establish direct access storage requirements. Using the average store statistics, the daily transaction and printing volumes were calculated. Direction in producing Exhibit 5.5 was obtained from Phil Lamb, a local independent systems analyst. This information, Exhibit 5.5 was given tc a few hardware vendors and, based on their responses, a hardware configuration was established, along with its cost estimates.

EXHIBIT 5.4

STORAGE STATISTICS

ESTIMATES OF BASIC SYSTEM REQUIREMENTS

Product Information

Product Code	Max 13 char
Description	Max 30 char

Allow 50 char/record X 15,000 products* = 750,000 char

Supermarket-Branch Information

**Chain Name	20 char
Branch Address Data	40 char

Allow 60 char/record X 60 branches = 3,600 char

Supermarket-Price Information

Chain Name	5 char
Product Price Data	20 char
Keys to Branches	25 char

Allow 50 char/record X 15,000 products X 5 chains = 3,750,000 char

EXHIBIT 5.4

(cont'd)

Branch-Price Information

Branch Name	5 char
Product Price Data	20 char

Allow 25 char/record X 8,000 products* X 60 branches = 12,000,000 char

Direct access storage requirements for the data stored, approximately 16,500,000 char.

Indexs:

If access is available on all pertinent fields as indicated in Exhibit 5 then the index storage requirements are approximately 5,000,000 char.

(While the amount of data stored in a record may increase dramatically in the future, the number of records stored will not, so the index requirements will not change significantly.)

Storage requirements for the application	21,500,000 char
Contingency factor 16%	3,500,000
	25,000,000 char

* Number of products carried by an average store is 8,000 but the retail chain can offer a variety of 15,000 products, this being the selection carried by a large store (Cady, 1978)

** It is feasible for the chain name to be stored once (in one relation) and an abbreviation used in other relations; similarly for branch name.

EXHIBIT 5.5

SYSTEM SPECIFICATIONS

A Storage

(i) From Exhibit 5.4; Direct access storage requirement: 21.5 million bytes

(ii) Allow an extra 15% for wastage due to; e.g. device characteristics, space fragmentation, etc.: 3.0 million bytes

Total: 24.5 million bytes

Approx. 25^{1} million bytes

B Volumes

(i) Batch processing:

Input: Daily updating of files; approximately 200 transactions

Output: Daily printing of price lists;

Price changes $200 \times 100^{2} =$ 20,000 lines per day

Weekly; Market basket $100 \times 50^{3} =$ 5,000 lines

Product group (e.g. Dairy)

$100 \times 50 \times 10$ groups = 50,000 lines

55,000 lines per week

- Lists will be printed during an 8-hour shift.

Periodic reports will be printed on request and can be handled at times other than the peak periods above.

EXHIBIT 5.5

(cont'd)

(ii) On-line Processing:

Input:	Specific queries on the database as described in 4.4.3	750* per day
	Average length of transaction	30 char
Output:	Price on a specific item	1 line max
	List of all makes of beans	30 lines max
	List of stores carrying an item	60 lines max

The requests listed above could result in any one of these output lists being produced.

As the volume of transactions is small this volume of printing is not expected to cause a bottleneck.

A simple query language (or some form of prompting program) will be required to handle these on-line transactions.

* This is the maximum number of requests expected to be handled from the single interactive CRT terminal.

1 These storage requirements are a revised estimate, (February 12), and proposed configurations had already been obtained from some vendors on assumption that 45 million bytes would be required.

EXHIBIT 5.5

(cont'd)

2 Lists printed for 60 supermarkets and 40 other locations e.g. libraries, etc.

3 Assumes this type of list will be sent to 50 strategic locations e.g. News Media

5.2 Economics Of The Datacentre

In order to assess the economic feasibility of the CIS, the costs and potential savings must be considered. This is complicated by the fact that the users of the present system are not necessarily the direct economic contributors, i.e. the consumers. Any attempt to do a cost-benefit analysis will therefore have limitations. The issue of who should pay for the CIS is discussed in Chapter VI, but there is no pretence made at offering the solution, only suggestions. Thus, while the analysis can outline the costs and show to whom the savings (and benefits) accrue, it would be presumptuous to directly offset the one against the other. However, the analysis is extremely pertinent if the present cost of item pricing is to be compared with the cost of some alternative, e.g. a CIS.

5.2.1 Development Costs

The CIS as outlined above requires the use of a small range computer system with a fairly substantial amount of direct-access storage available. On a test basis, either time-sharing or the use of an existing system (e.g. a government run EDP operation) are viable alternatives. However, with an eye to the future, this thesis considers a data centre set up specifically for the Consumer Information System. Following discussions with local hardware suppliers, the hardware configuration envisaged is as follows:

CPU

DASD - Magnetic disk

Printer

Diskette drives

Interactive terminals or other input/output devices

- for system control
- for development and maintenance

CRT terminal

- for query purposes
- additional CRTS to be added as need arises.

Details of hardware characteristics as supplied by vendors are given in Appendix I. Configurations suggested by the different vendors are similar in design. The hardware required allowing output to be displayed via television screens is also a future consideration.

Hardware costs have been estimated using representative industry figures on lease basis and shown under the operational costs. (These costs could alternatvely be considered on a purchase basis). Quotations received are given in detail in Appendix I.

Software needed is divided into two groups: system and application software. The system software which includes

- operating system/compilers,
- database management system (or file handling software),
- telecommunications software, will also be accounted for under operating costs. (As with hardware, purchase is an alternative to leasing). The specific application, although

unique in itself, is really a file-update information - retrieval system complicated only by the chaining required between records. For this reason, it was suggested that a Database Management System be obtained from the vendor or developed (see system software above) to interface with the application software. The development costs then, are based on the estimated time required for the design and programming of the application software. (Estimates were obtained through discussions with systems analysts currently involved in systems development in industry).

Major applications:

a) update the database with data from the tapes/diskettes
b) print daily price lists
c) file access for specific on-line queries
d) print 'market-basket' and other specialized lists
e) management reports, e.g. statistics of price changes
f) file management

Major phases:

System design
Program design, coding, and testing
System testing and data conversion

(A single time estimate is given because some functions of the different phases may be carried out concurrently).
Man-days required: 400, i.e. four people working 20 days per month each will take about five months to set up the CIS.

Approximate costs: (These figures take average 1978 salaries without attempting a breakdown of systems analyst/programmer time.) 5 months at $1,500 per month x 4 = $30,000

Estimated Total Development Costs: $30,000

5.2.2 Operating Costs

Operational costs are calculated for one year and based on 1978 figures.

System hardware and software;

Lease costs	$2,500 p.m.	$28,000 p.a.
Supplies (paper, tapes, etc):	$1,000 p.m.	$12,000 p.a.
Maintenance:	$580 p.m.	$7,000 p.a.
Data centre staff:		
1 operator programmer		$13,000 p.a.
1 clerk (queries, library, etc.)		$11,000 p.a.
Managerial supervision (This is not a fulltime requirement and could be under the auspices of the CAC)		$ 6,000 p.a.
Total Staff Costs:		$30,000 p.a.
Estimated operating costs:		$77,000 p.a.

Note: It has been assumed that cost of publishing data will be minimal or free;

e.g. Newspapers - published in Consumer Advocate's columns such as that of Nicole Parton, Vancouver Sun

- "Hamilton Spectator" prints prices on approximately 70 items weekly, along with commentaries on "good buys" etc.

Television - some channels, e.g. Channel 10 in Vancouver display public service messages during certain hours

- public service channels in Ontario display food item prices to fulfill the CRTC requirements for their licences (Conversation with Tom Rogers, Saskatchewan Consumer Affairs, Jan, 1979).

5.2.3 Potential Savings - By Interest Groups

For this analyis, "savings" is defined as a cost reduction that is a result of the introduction of the CIS and its potential applications. Within the scope of this definition, the CIS is seen as an alternative to item pricing.

Grocery Manufacturers: With fully automated checkout, the grocery manufacturers can be confident that data capture is an accurate reflection of reality. However, any derived savings are unquantifiable and highly variable.

Grocery Retailers: Savings due to item-price removal varies depending on the source. A minimal saving is considered to the salary of one person for an average size supermarket , i.e. $16,000 p.a. (Conservative estimate based on data from different sources e.g. Coyle 1977, Dexter and Barnett 1978b).

Therefore, yearly savings for the test area:

60 x $16,000 $960,000 p.a.

Note :

a) One local chain stated that savings due to item price elimination would be $70,000 per store per year (Brown 1978). While it is unlikely that the 60 stores in the area could save $4,200,000 per year in total, the indication is that finding an alternative to item-pricing is a worthwhile endeavour.

b) An important implication to the retailers is the cost of any price reduction. Devine (1976, 1978) attempted to quantify the cost to the supermarkets when comparative price information is published. While results are felt to be inconclusive, one study showed a reduction of 7% in retail price index over the five week test period (Ottawa-Hull experiment); and in a second study the test area showed an average 1.8% greater price reduction than the control area, (prices were generally declining during the six month Saskatchewan Project.)

In his subsequent analysis Devine used a price reduction of 5%, a food demand elasticity of -0.2 (based on work by Kulshreshtha and Holub 1973) which results in a sales revenue decrease of approximately 4%. The average gross margin on groceries is 20% (Business Week, 1977). If correct, this loss of revenue would represent a significant reduction in profits for supermarkets. However, it is not clear whether Devine takes into consideration

i) the breakdown of food dollars between supermarkets and restaurants. The "food service" industry's share of the American food dollar is about 42% (Business Week, 1977). There is no indication that any change in this ratio, due to price reductions, is taken into account in the use of the price elasticity of food in the analysis.

ii) the possibility of a change in consumers' buying habits in the long run. In the analysis a drop of 5% in prices leads to a 1% increase in demand (quantity), and thus an overall 4% decrease in revenue (elasticity of demand is -0.20). The possibility that consumer demand may increase over the long term is not considered, (i.e. consumer spending returns to the initial

level in terms of dollar value.) This implies the eventual return to the original level of the revenue. Obviously, this has thus far ignored the important variable, gross profit. (Devine's analysis deals only with revenue, but an opinion of the effect on gross profit follows in order to complete the cost/benefit analysis.)

Based on i) and ii) above, an average of 2% reduction in sales revenue is used and Devine's analysis repeated. Sales revenue decrease for average supermarket:

$8,000 per month

This represents a gross profit decrease of $1,600 p.m. (based on gross margin of 20%, Exhibit 5.1). For 60 supermarkets gross profit decrease:

$96,000 p.m.

approx 0.4% of present sales.

Without the benefit of supportive evidence it is hypothesized that the revenue loss dissipates, and that the gross profit loss is reduced to a monthly amount of $30,000 on average, approx 0.1% of present sales

which is $360,000 p.a.

Equipment Manufacturers: While this group may benefit from the sale of scanners rather than the less expensive key-entry

checkout devices, there is no savings as defined above. However, as a cost comparison, it should be noted that NCR's electronic checkout system without scanning "costs only $4,500 vs. $9,600 for NCR's lowest priced scanner - even after NCR's recent 20% cut in scanner prices" (Forbes 1978).

Government and Consumer Agencies: Both these bodies are involved in the collection of data which could easily be obtained from the CIS. It is estimated that surveys and other means of data collection presently cost approximately $20,000 per year (Rogers 1979).

Therefore,

potential savings per agency	$20,000 p.a.
for 3 agencies	$60,000 p.a.

Note :

a) Cost for the Saskatchewan experiment was $57,275 for five months. Of this a large portion was for consultant fees and publication of data. On the proposed system data must still be published so any savings to be realized will be in the area of data collection. Based on conversations with Tom Rogers (Saskatchewan Consumer Affairs) this amount is estimated to be $20,000 for any agency desiring to collect the data at present.

b) Assume three agencies carrying out surveys in the Vancouver area in any one year

i.e. - Statistics Canada
- some monitoring body
- government sponsored study by the B.C. chapter of the CAC.

The Consumers: An "American economist Donald Snyder showed that each shopper would have to pay only $2.27 a year to have all groceries marked with the prices" (Pappert 1978). However, the variability of this cost is tied up in the supermarkets' pricing policy and consumers will not necessarily save this amount if supermarkets remove prices. (The supermarkets have made no offer to maintain item-pricing at this cost to consumers).

Potential savings to consumers will be a portion of the savings that accrue to the supermarkets. If increased competition and lower prices result from the formation of the CIS, then savings will in fact be realized by the consumers.

The general benefits of a CIS have been described in depth throughout Chapters III and IV, (e.g. policing of supermarkets' price increases) and justification for the idea itself. Most are intangible but assist in meeting the objectives of the various interest groups.

5.3 Analysis Of The Costs/Benefits Of The CIS

Development Costs	Yearly Costs	Yearly Savings	
(All costs based on 1978 figures)			
30,000	77,000		
	360,000	960,000	to retailers
		60,000	to government
$30,000	$437,000	$1,020,000	

With just 60 supermarkets involved in the system, the savings clearly outweigh the costs. Of course, this analysis is limited because the savings do not accrue to a single user; nor is a single user bearing the costs of the system. Furthermore, it is not at all obvious that the retailers would approve the offset of their savings against the costs. This issue is elucidated in Chapter VI; and no solution is offered. However, recommendations are made with regard to coping with this complex situation.

Adding other supermarkets in the greater Vancouver area will add little to the cost of the operation of the system as much of the cost is incurred in setting up the system initially. Yet, each supermarket that "joins" the system as an alternative to item pricing adds an additional $16,000 per year to the "collective" savings. Expansion beyond a certain limit will mean that a second system must be set up. However, the details of such an occurrence and the possibility of development of a network must be left for consideration at a

future date.

Within this analysis, other less quantifiable costs and benefits must be considered.

Publications of product and price information is certainly a source of advertising for the retailers with scanners. Not only could this be used to replace a portion of their advertising budget, but it would give these supermarkets a competitive advantage over chains without scanning equipment. With some creative planning, supermarkets will have the opportunity to match their "specials" with the daily "market-basket". These are benefits attributable to the implementation of a CIS, but only have speculative value at this time. In the long run, if scanner prices follow the downward trend of other computer hardware, even small independent grocers will have the opportunity to operate with scanning equipment and, thus, reduce the large chains' competitive advantage.

It has been noted (Devine 1976) that a 'marginal' store (one which has difficulty making a profit and relies on variables other than price to attract customers) may be forced out of business when price competition becomes fierce. The pros and cons of such situations are beyond the scope of this thesis, though it cannot be ignored in more in-depth studies.

Of foremost concern in this study is the consumer, and how, if at all, the CIS will be advantageous. Lower food prices are indeed an advantage! While studies discussed herein were carried out in differing time frames, and long-

term effects are inconclusive, the empirical data suggests the trend will be toward lower prices.

CHAPTER VI

RESULTS OF THE ANALYSIS AND GENERAL DISCUSSION

The purpose of this chapter is to review the economic and technical analyses and results presented in the previous chapters; and to discuss some of the issues to be resolved if the CIS is to become a reality. From detail presented in Chapters IV and V, it appears that the CIS is feasible from an overall economic pcint of view especially if the retailers view it as

- an alternative to maintaining item-pricing and/or
- providing "free advertising" and/or
- a natural consequence of the age of electronic technology.

For the consumer, the CIS may provide (in its narrowest definition), a viable alternative to item pricing, which is steadily disappearing despite protest; and (if it's potential is realized) the CIS will enable the consumer to shop conveniently from home. The creators of the phrase "let your fingers do the walking" could have had no idea of the possible extensions tc its meaning!

Topics discussed herein include division of costs of the CIS, and the problems in the practical application of the system. Future extensions to the basic Vancouver Data Centre are suggested.

6.1 Feasibility Of The CIS

Technical and political feasibility of a CIS have already been discussed in 3.3.2. A major unresolved issue is the cooperation of the different groups, particularly that of the supermarkets releasing price information. Most large supermarket chains have scanners installed in some of their stores. They are gauging consumer reaction to the removal of item prices. In Vancouver, vocal objection has taken place through consumer advocates (e.g. Parton 1978a, 1978b). The B.C. government reaction has been to state that consumers have the option to shop elsewhere, and that no official intervention is planned (Evans-Atkinson 1978). The important aspects to bear in mind in this regard are that

a) if cooperation of the supermarkets is to be sought it should be contemplated in these early days of automation. The reason is that both sides are still actively involved in finding a suitable solution, and this will assist in reaching a compromise.

b) At present, consumers do have the option of alternative stores in which to shop; though it should be noted that location convenience is a high priority when choosing a supermarket. As more stores install scanners and remove item-prices this great freedom of choice will no longer exist, and boycott will no longer be a

> viable means of expressing opposition. What then, will be the value of Rafe Mair's suggestion "you simply do not have to shop at a supermarket that uses scanners and doesn't price-tag its items if you don't want to ... in other words, if the public wants price tags it should boycott the stores that don't have them" (Evans-Atkinson 1978)?

It is clear from the analysis in section 5.3 that the CIS is economically feasible, if it be regarded as an alternative to item pricing, and the costs and savings be compared directly. Savings and benefits outweigh the costs to the interest groups taken as a whole. Unfortunately, these are not the only issues in this complex situation and as mentioned, other aspects must be considered.

6.2 Suggestions For Division Of Costs

Which groups should be included in this division of costs, and in what proportion should they be borne? These groups will benefit directly as a result of the development of a CIS - namely the grocery retailers, government agencies and consumers (see Section 5.2).

- Consumers: The cost to this group to have all groceries marked with prices is estimated to be $2.27 per shopper per year (Pappert 1978). However,

consumers probably pay more as the charge is made indirectly through the supermarkets' pricing policies. Despite item-price removal it appears unlikely that consumers will reap the benefits in the form of price reductions. This is a reason why consumers should not be expected to contribute directly to the CIS. Related to this is the unlikelihood that retailers will pass all savings from item-price removal onto consumers. If consumers are forced to pay a portion of the CIS costs, then the CIS will not be viewed by consumer advocates as a viable alterative to item-price information. If consumers pay on a usage basis, then many will be less inclined to use the services of the CIS. This could also cause further disenchantment with the scanning systems.

- Grocery retailers: Retailers are in a position to benefit directly from the implementation of a CIS, and to decide how best to manipulate these savings (Section 5.3). Savings will be realized even if they contribute to the operating costs of the CIS.
- Government agencies: Use can be made of the CIS by agencies e.g. in the role of a price monitoring board (with regard to inflation on consumer affairs). It would appear that while this information is important, its collection costs have always been prohibitive (see Section 5.2.3).

Statistics Canada's data collection is restricted by costs and the time factor. The CIS will give them the opportunity to collect price data at a relatively lower cost and on a more timely basis than before, so government agencies can be expected to contribute to the costs of the system.

6.3 Suggestions For Practical Application

The practical considerations of the system will be mentioned in order to complete the analysis, but the detailed discussion does not fall within the scope of the thesis.

Maintaining the integrity and security of the data in the CIS are two of the most important practical considerations. It is suggested that the system be operated under the control of the CAC. This group has a vested interest in making certain that the information does in fact reflect the real and current situation for consumer use. Consumers requiring specific price information can make use of the CAC, who will then have the necessary data readily available (via the CRT). In this regard, government agencies and grocery retailers take on the role of consumers in obtaining price information from the CIS. The test system, as described in Chapter V, has batch updating and local on-line query capability, thus limiting access to the system and the inherent problems of data security. Problems to be considerede in future research

are mentioned in Section 6.4.

The daily price changes which occur will be transmitted via diskette to the data centre for updating of the files. The physical location of the data centre should not be a problem because all systems suggested by vendors (Appendix I) are office type machines requiring no special facilities (e.g. raised floor, air conditioning units, etc.). Updating of the files and printing of reports requires a minimum amount of supervision and could be handled during the evening.

The number of different products (15,000) is very large, and it has been suggested that a subset be maintained on the CIS, rather than the entire product range. However, with reference to the system statistics in Exhibits 5.4, 5.5, it can be seen that this would not make an appreciable difference in storage requirements. It would also hardly change the proposed system configuration (Appendix I) and is certainly not a limiting factor. The amount of information printed and published is more critical, both from the point of view of media chosen, and impact on the consumers' decision-making process. This is where volume and variety of products must be carefully considered. Related to data security is the question of the supermarket's access to the database. This is of particular concern for the future where on-line updating of the CIS is a definite possibility. There are two main areas of concern:

a) Data belonging to a supermarket - supermarkets should have unencumbered read-access, but limited

and controlled update-access of their data. For example, supermarkets will not be able to change consumer ratings, and price changes too will need to be controlled.

b) Data belonging to competitors - This is sensitive data and should be protected. A supermarket should have access to competitor's price information only in the role of a consumer-user of the system, i.e. just as consumers will have access to the data via television channels, say, in a read-only mode, supermarkets will be able to see the data but be unable to alter it.

The possible impact on 'marginal' stores has been mentioned (Section 5.2); i.e. stores within the system which might be unable to operate competitively on the basis of price, and be forced out of business. A related, and very practical problem, is that of grocers excluded from the CIS due to lack of automation of their checkout systems. The chain may be an effective competitor on a small scale. Consideration must be given as to how publication of competitors' prices will affect operations of such small chains.

6.4 Future Research

There are many unanswered questions that have resulted from the research and analysis of the preceding chapters. Most have been discussed in some detail. They are reiterated here in order to give direction to future research.

- What is the long-term effect of price publication on prices, competition, market structure, and, more importantly, consumers' use of the information?
- How effective is price publication as a form of 'free' advertising for the supermarkets? Does it offset the loss of sales that supermarkets experience in the short-run? What effect on advertising and revenue, does the price publication have in the long-run?
- Who should take the initiative in setting up the system, and how should the costs be allocated amongst participating groups?
- What, in fact, will be the reaction of supermarket chains, and what of the smaller chains for whom automation is some way off? Should the government pursue a policy of non-interference?

Data access via some form of home 'computer' is not far off (Gray 1977, Laws 1978) and this type of information will eventually be offered in part or whole, free or for a price, by private organizations, or by the supermarkets themselves. It appears that many of the potential pitfalls could be

avoided if some expedient planning is done in advance.

A purpose of this thesis has been to point out the desirability of cooperation so that we, as a society, may take advantage of the electronic revolution in the retail (specifically grocer) industry. It is time for all parties to begin planning if we are to benefit from these innovations and avoid an interim "dark age" period.

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APPENDIX I

SYSTEMS CONFIGURATIONS AND VENDOR QUOTATIONS

BURROUGHS BUSINESS MACHINES LTD.

April 10, 1979

SYSTEM CONFIGURATION

HARDWARE

Burroughs B810 Mini Computer

B811 - 1 MHz Processor (C.P.U.)

- 96 KB MOS Memory
- 160 L.P.M. Line Printer
- DDE Console SPO
- 1 MB B.I.M.D. (Inbuilt)
- 37.6 MB Fixed Disk
- Data Comm Processor DCPP 10 MHz
- 2 TD831 Terminal 1920 Character

Purchase Price	$ 80,965.00
Burroughs One Year Lease	$ 2,116.00/mo.
Maintenance	$ 480/mo.

... above system includes system software CM800-MCP
CM800-UTL

... includes installation

... delivery period 4 - 6 months

... delivery price $500.00

BURROUGHS BUSINESS MACHINES LTD.

B810 Configuration

B810 1 MHZ field upgrade to 2 MHZ	$ 4,940.00
B810 37.6 MB Fixed Disk Package to 65. MB Disk Pack Purchase Price $80,965.00 now would be	$88,000.00
Data Comm Processor (DCPP) 10 MHZ	$ 3,100.00
37.6 MB Fixed Disk	$25,975.00
Inbuilt Burroughs Super Mini (1 MB)	$ 4,100.00
160 LPM Line Printer	$ 9,110.00
Line Printer Control	$ 2,195.00
8 KB MOS Memory	$ 1,000.00
TD 831 Display Terminal	$ 5,460.00

COMPUTE WELL SERVICES LTD.

December 1, 1978

SYSTEM CONFIGURATION

Description	Price
Dec Datasystem 538 with:	$115,000.00
PDP 11/34 CPU 256KB MOS Memory DECwriter Console Terminal 2 28MB removable Cartridge Disk Drives 4 VT100 Visual Display Units 300 LPM Line Printer CTS500 Operating System, including RSTS/E, RMS-11K (Record Management System with Multi-key Access), DATATRIEVE (Date Retrieval), BASIC-PLUS-2. Installation and 90 days on-site warranty	
5% Provincial Sales Tax	5,750.00
Total	$120,750.00

Note:

(1) Prices quoted are FOB Kanata, Ottawa, FST & Duty included, freight and insurance extra.

COMPUTE WELL SERVICES LTD.

December 1, 1978

Description	Price
(1) Compute-Well Distribution Packages including A/R, A/P, G/L, Order Entry and Inventory Control. All file, screen, report and other I-O are driven by parameters for easy modification. Packages carries one year warranty.	$21,000.00
(2) Modification of packages and new software are chargeable at $200 per man-day.	

CYBERNETICS COMPUTER SYSTEMS

November 8, 1978

SYSTEM CONFIGURATION:

(1)	Texas Instruments DS990 Model 6 990/10 Minicomputer (13 slot chassis) 128 KB Error correcting memory 2 model DS25 Disk Drives (50 MB total) 2 model 911 Video Display Terminals Single Bay Cabinet DX10 Multiprogramming Time Shares operating system Model FD800 Dual Diskette Drive	70,785
(2)	Centronics Model 6000, 600 line per minute printer	11,000
(3)	Sort/merge	3,385
(4)	Data base management system	2,705
		87,875

Monthly cost on 5 year lease @ 2.3%	2,021
Maintenance (per month)	584
	2,605

CYBERNETICS COMPUTER SYSTEMS

List of Optional or Substitute Items

Texas Instruments Model 810 Printer (150 CPS)	3,715
Texas Instruments Model 2230 Printer (300 LPM)	18,265
Texas Instruments Model 2260 Printer (600 LPM)	24,695
Texas Instruments Model DS25 Add-on Disk Drive	13,935
General Electric Terminet 340 Printer (340 LPM)	7,500
Texas Instruments Model 911 VDT Add-on	2,300
Texas Instruments Model 743 Hard Copy Terminal	1,795
Texas Instruments Model 979A Tape Drive (800 BPI)	14,850
Texas Instruments Model 979A Tape Drive (1600 BPI)	17,075
Texas Instruments Model 771 Diskette Data Entry Terminal	10,000
Add on Memory Increments - 16 KB	1,485
32 KB	2,970
48 KB	4,455

SPERRY UNIVAC COMPUTER SYSTEMS

November 20, 1978

SYSTEM CONFIGURATION:

Varian System:

128 K Bytes CPU

67 MB Disk

165 char/sec printer (90 line/min)

2 CRT terminals

Includes operating system, compilers, data communication capability.

1 diskette unit ($6,000)

Total purchase price	$73,700
Lease costs	$ 1,695/month