CURRENT CHECK OUT SYSTEMS IN RETAIL FOOD STORES

Thesis for the Degree of M. A.

MICHIGAN STATE COLLEGE

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1951

This is to certify that the

thesis entitled

Current Check-Out Systems
In Retail Food Stores

presented by

Richard B. Royer

has been accepted towards fulfillment
of the requirements for

M.A. degree in General Business
Curriculum in Food Distribution

Kenneth Wilson
Major professor

Date July 9, 1951

CURRENT CHECK OUT SYSTEMS IN RETAIL FOOD STORES

By

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A THESIS

Submitted to the School of Graduate Studies of Michigan State College of Agriculture and Applied Science in partial fulfillment of the requirements

for the degree of

MASTER OF ARTS

Department of General Business

Curriculum in Food Distribution

July 1951

ACKNOWLEDGEMENTS

The author wishes to express his sincerest appreciation to Dr. Kenneth Wilson, Director of the Curriculum in Food Distribution, under whose guidance and supervision this investigation was undertaken.

Grateful acknowledgement is due Mr. William C. Ferguson, Director of Personnel, of the American Stores Company, for his helpful suggestions and assistance in obtaining materials used in the preparation of this thesis.

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Purpose of Study

A major operating problem which is common to almost all self-service food stores is that of reducing the time required to "check-out" customers when their shopping has been completed. Checking consists of arrangement of merchandise prior to tallying, accumulation of charges on special cash registers, making change, and sacking the merchandise.

No great amount of research is necessary to discover the importance of this problem - it is apparent to the newest store clerk, and is usually in the mind of any person asked to comment on super markets. Most of us who shop even occasionally for our families have had the unfortunate experience of spending more time in line at the check-out than in selecting the food we have been requested to buy.

In the studies cited in this project, the check-out function accounted for more than 20 percent of the total man-hour requirements of store operation. Its importance is further emphasized by its recognized position as the common bottleneck in the store during peak periods of the week. It is not uncommon for self-service food stores to handle from 60 to 70 percent of their weekly volume on Friday and Saturday. Peak periods within these high-volume days place an immense load on check-out operating personnel and equipment.

It is an accepted fact in the industry that store sales volume is directly affected by the rapidity with which customers are accurately

processed through the check-out operation. Customers do not like to wait in line, and a dissatisfied customer will go elsewhere if she thinks she can get her shopping done more quickly. In stores where parking facilities are limited, increased service at the check-out operation during peak periods may lead to increased volume through a larger turn-over in the parking areas.

Much has been done by the super markets to enable the customer to get her shopping done more quickly. Waiting has been reduced or eliminated by self-service grocery departments, pre-packaged meats and produce. A customer can obtain all her desired merchandise and be ready for check-out without having had personal contact with any store employee. Thus, with self-service grocery, meat and produce merchandising, the cashiers at the checkstand often become the only personal contact with the customer. This further increases the need for a pleasant reaction by the customer to check-out personnel and equipment. The checkstand operator makes a lasting impression on the customer leaving the store.

The purpose of this study is to present the main types of check-out operations in use currently and to analyze the methods by which their advantages and disadvantages may be determined.

Scope of the Study

There are three phases to the study. The first phase deals with the physical types of check-out operations.

The second phase deals with the methods by which check-out operations can be evaluated.

The third phase deals with the personal element in the operation. The importance of adequate personnel training is emphasized here.

Sources of Data

The data pertaining to checkstand types and their construction were obtained in most part from checkstand manufacturers and from the writer's personal observation of the various types of checkstands in operation.

The methodology of evaluating checkstand operation is derived from two major sources. The first is the January 1951 study of the check-out operation completed by the United States Department of Agriculture in cooperation with the Kroger Company of Cincinnati, Ohio, and Stop and Shop, Incorporated, of Boston, Massachusetts. The second is a study recently completed by a major retail food chain. This is a controlled time-study comparison of four current types of checkstands.

The information on personnel training in the check-out operation was obtained from the Personnel Department of the American Stores Company of Philadelphia, Pennsylvania, and from a study on grocery checking procedures by the University of Texas, Division of Extension, in cooperation with the Texas Educational Agency, Vocational Division.

Additional information pertaining to the check-out operation was obtained from current periodical information devoted to the retail food store industry.

In the research conducted by the author it was readily observed that there is considerable progress to be made in adapting specific types of checkstands to varying volumes of operation. It is felt that chain operators, especially, can realize more efficient performance by install-

ing in each separate store that type of checkstand which will adapt itself most readily to the store's volume and weekly pattern of operation.

CHAPTER II

THE MAIN TYPES OF CHECK-OUT OPERATIONS

This chapter deals with the description of the main types of checkstands in current use. The physical description of each checkstand is accompanied by a breakdown of the component parts of each operation, termed elements.

The Conventional Check-out Operation

The conventional check-out operation is also frequently termed the "L-shape stand" and the "straight-line" stand. About two-thirds of the checkstands in present use are of this type.

This type checkstand is usually about six feet, eight inches long by four feet wide and requires 26.7 square feet of floor area. The cash register is placed on the stub of the "L". Underneath the long leg of the "L" is a storage area for paper bags.

This stand represents the basic pattern of all stands - a register platform and a longer unobstructed surface where the check-out operation may be carried out. Figure 1 shows the conventional check-out counter.

The conventional check-out counter was designed for operator-unloading of the order from the baskart[1] to the sorting area on the counter. The operator, usually called the cashier, performs the following elements in processing the average order:

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1 baskart - in this study refers to the carriage used by the customer in collecting and transporting her merchandise.

Figure 1. The conventional check-out counter.

1. Unload baskart.

2. Sort items (according to departments) as/or after placed on counter.

3. Ring up order.

4. Subtotal, add tax, and total order.

5. Take money from customer.

6. Make change; give to customer.

7. Obtain and position bag.

8. Bag items.

Each item is handled three separate times (as unloaded, rung-up, and bagged). Where items are sorted in departmental groups after unloading, each item is handled four separate times.

The Push-Pull Type Checkstand

The push-pull type checkstand is also termed the Weingarten, the shuttle-arm, pull-arm, draw bar, or merchandise rake device. It is shown in Figure 2.

Next to the conventional stand, this type has probably found more widespread acceptance than any other type. The push-pull checkstand is of the same basic construction as the conventional checkstand. The counter is extended ahead of the register and a "U"-shaped device slides back and forth ("pushed and pulled" by the operator) on the counter. This enables the checker to be ringing up the items in one customer's order while the next customer is unloading her basket on the counter within the "U". The counter under the "U" (when it is returned to loading position) is marked off by painted lines into sections labeled groceries, meat, and produce.

Figure 2. The push-pull type checkstand

The customer is thus encouraged to place each item in the desired departmental group.

The cashier performs the following elements in processing the average order (assuming the customers unload their baskarts as requested).

1. Pull presorter forward; push presorter back.
2. Sort after using presorter (usually larger orders).
3. Ring up order.
4. Subtotal, add tax, and total order.
5. Take money from customer.
6. Make change; give to customer.
7. Obtain and position bag.
8. Bag items.

If presorting is accurate, each item is handled twice (as rung-up, and bagged). If sorting is necessary before ringing, each item is handled three times.

The Split Counter Type Checkstand

The split counter type checkstand is also called the Delchamps split-stand system and the split checking stand. The use of this type of stand is probably heaviest in the western part of the United States.

The split counter checkstand is again of the same basic plan as the checkstand described above. It differs in that a slot is placed diagonally at the right angle of the "L" that forms the checkstand. The slot is wide enough for a baskart to be pulled from the customer to the other side of the working platform. Here, the customer is separated from her baskart. The principal feature of this system is that the checker unloads the

baskart with one hand while simultaneously ringing up the items with the other, thus combining into one step two of the basic operations of the conventional method.

The following elements are performed:

1. Pull baskart through diagonal slot in checkstand.
2. Remove items from baskart and ring-up simultaneously, placing them on checkstand platform.
3. Subtotal, add tax, and total order.
4. Take money from customer.
5. Make change; give to customer.
6. Obtain and position bag.
7. Bag items.

Items are handled twice in this operation as the unloading and ringing operations are combined.

The Simplex Unit

The Simplex unit checkstand was developed by the United States Department of Agriculture, Production and Marketing Division, in cooperation with the Kroger Company of Cincinnati, Ohio, and Stop and Shop, Inc., of Boston, Massachusetts. It is shown in Figure 3. The unit measures 6.5 feet in length and is 6.2 feet wide. The total space required is 40.3 square feet.

The Simplex unit is similar to the split counter checkstand in that the customer is separated from her baskart by the working platform of the stand. The baskart is positioned directly to the cashier's left. The cashier checks each item directly from the baskart to a bag, held open by a suction device which applies a vacuum through two rubber cups built into the walls of a holding well.

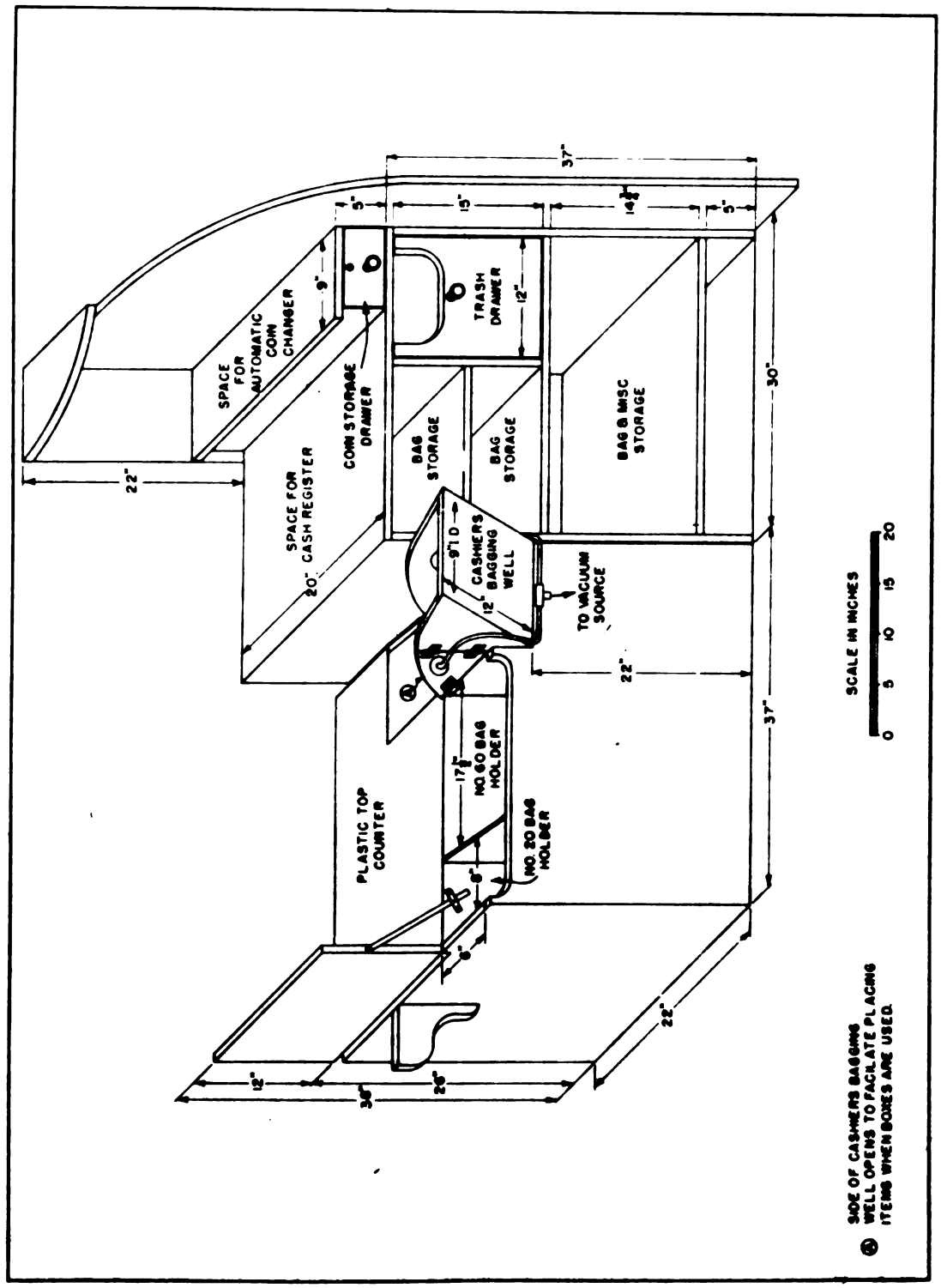

Figure 3. The Simplex unit

The cashier, upon receipt of the order in the baskart, performs the following elements in processing the average order:

1. Position baskart.
2. Obtain and position bag; turn on vacuum.
3. Ring up and bag items.
4. Subtotal, add tax, and total order.
5. Take money from customer.
6. Make change for customer.
7. Remove bag from well; position for customer.

With the Simplex unit sorting of merchandise is eliminated. The ringing and bagging elements are combined in a simultaneous operation.

The Belt Type Checkstand

The belt type checkstand is also called the conveyor belt stand, the continuous belt conveyor unit, the "Dayton Speedline", the "Rapistan", the "Quick-Chek". This type checkstand is made by the following manufacturers:

1. The Rapids-Standard Company, Inc., Grand Rapids, Michigan under the trade name of "Rapistan".
2. The Robert Becht Company, Cincinnati, Ohio, under the trade name of "Quik-Chek".
3. Standard Dayton Corporation, Dayton, Ohio, under the trade name of "Dayton Speedline".
4. Wynn Electric Conveyor Checkout, Cincinnati, Ohio.

The Robert Becht Company unit, the "Quik-Chek", is presented in Figure 4. This is a typical unit of the type. It is nine feet, nine inches in length and is three feet, ten inches in width.

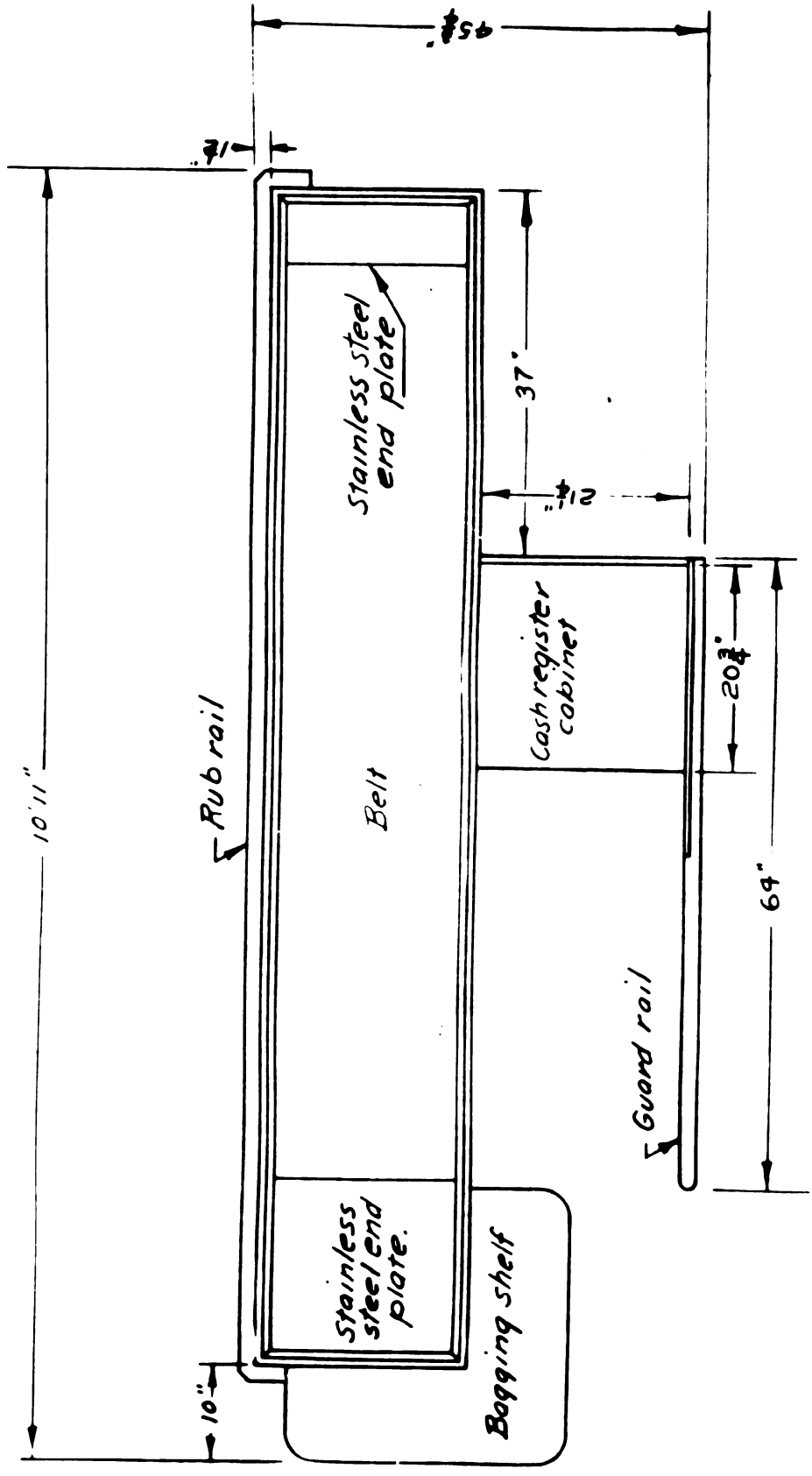

Figure 4. The belt type checkstand
(The Robert Becht Company "Quik-Chek"

The belt type checkstand is much the same as the conventional unit, except that the entire counter surface is covered by a continuous 18-inch belt conveyor. The movement of the belt is controlled by a foot pedal, operated by the cashier.

The customer unloads items from the baskart to the moving belt. Items are rung-up by the cashier as they pass by on the moving belt. At the end of the counter surface is a stationary stainless steel end plate. From this plate the merchandise is sacked either by the cashier or during rush hours by an assistant.

The cashier performs the following elements in processing the average order.[2]

1. Ring up items.
2. Subtotal, add tax, and total order.
3. Take money from customer.
4. Make change and give to customer.
5. Obtain and position bag.
6. Bag items.

The merchandise is seldom handled by the cashier in the ring-up process. In most cases the cashier only handles the merchandise in the bagging operation.

The Disc Type Check-Out Operation

The disc type check-out operation is also called the rotary type, the "Turn-ez", and the "Spee-Dee". The "Turn-ez" checkstand is shown in Figure 5.

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2 If the customer does not unload the baskart, the cashier will have to stop the moving belt and unload the baskart. In this case the checkstand is operated in the same manner as the conventional type.

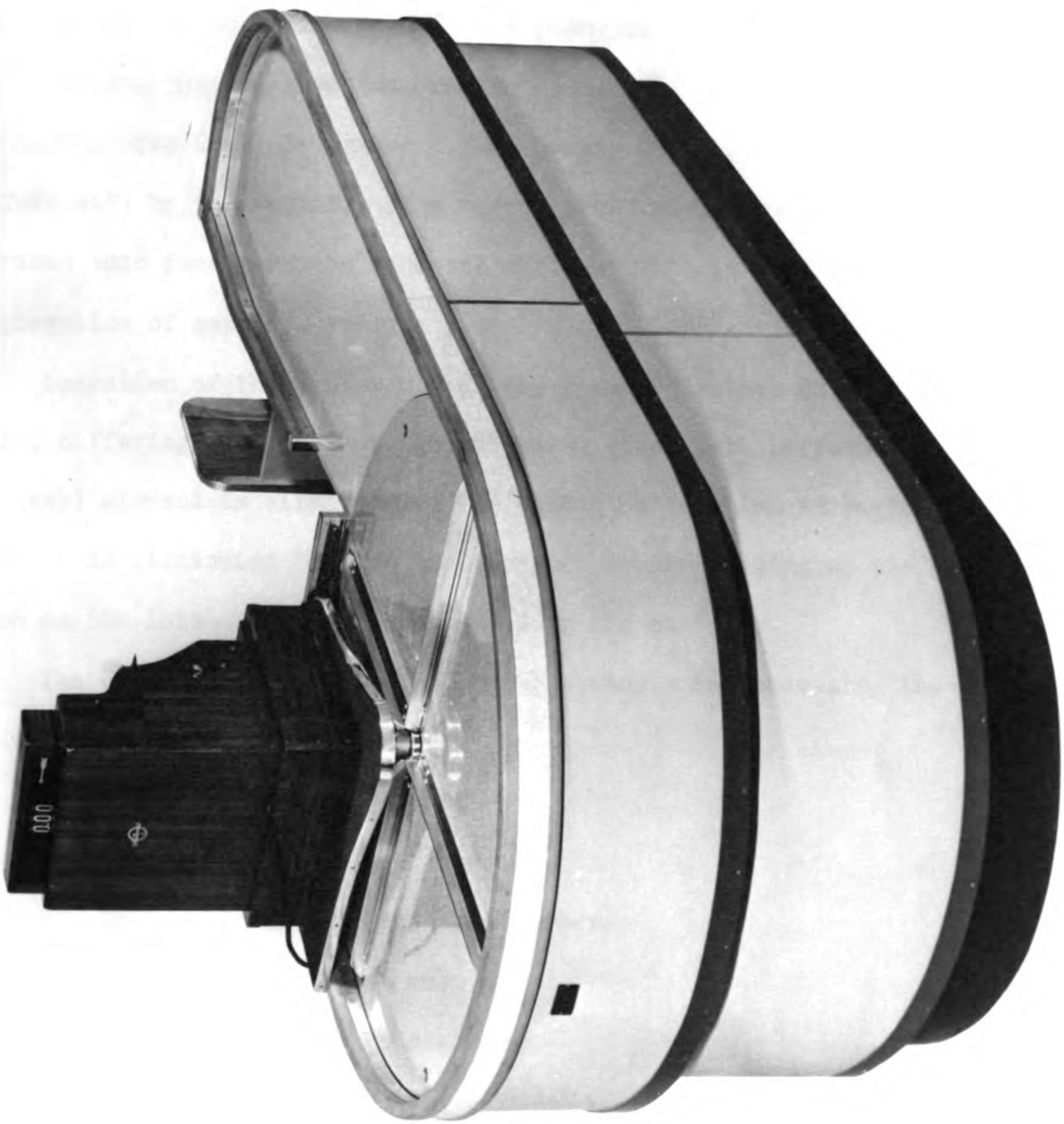

Figure 5. The disc type checkstand

It is four feet wide, nine feet long, and 34 inches high.

The design of the disc type checkstand substitutes a revolving disc for the "U"-shaped device used in the push-pull type. The customer unloads the baskart, placing the items on the disc. The disc may be mechanically rotated ("Spee-Dee") by either a foot or hip switch, or manually rotated ("Turn-ez") by the cashier. The manually-operated type disc is permanently divided into four sections by metal strips. This is to facilitate the segregation of separate orders.

Operation of the equipment is very similar to that on the conventional unit, differing only in that the unloading (that part performed by the checker) element is eliminated. The unloading function as performed by the cashier is eliminated because the operator begins ringing up the order as soon as the initial items are unloaded by the customer.

The cashier performs the following elements in processing the average order:

1. Turn disc.
2. Ring up order.
3. Subtotal, add tax, and total order.
4. Take money from customer.
5. Make change; give to customer.
6. Obtain and position bag.
7. Bag items.

Items are handled twice by the cashier - first, in sliding them off the disc in the ring-up element, and second, in the bagging element.

The Redi-Chek Unit

This unit was developed in January, 1951 by the United States Department of Agriculture in cooperation with the Kroger Company of Cincinnati, Ohio, and Stop and Shop, Inc., of Boston, Massachusetts. It is shown in Figure 6.

A detailed description of the development of the Redi-chek unit will be presented in Chapter III.

This unit is currently being manufactured by the Robert Becht Company of Cincinnati, Ohio. It is 11.5 feet in length and 6.2 feet in width. The total space requirement is 71.3 square feet.

The Redi-chek unit is basically the same as the belt type unit with two important exceptions. The first is that a cashier's bagging well has been built into the stand, and second, adequate facilities are provided for a bagger when added during rush periods.

A belt conveyor is used to transport merchandise from the point of deposit to the cashier's position. Directly to the cashier's left is the bagging well. The cashier can simultaneously ring up and bag items.

During rush periods when a bagger is added, the bagging well is covered by a hinged aluminum cover. When this cover is in position the unit functions in a manner similar to the belt type unit.

The cashier performs the following elements in processing the average order:

1. Obtain and position bag.
2. Ring up and bag items.
3. Subtotal, add tax, and total order.
4. Take money from customer.

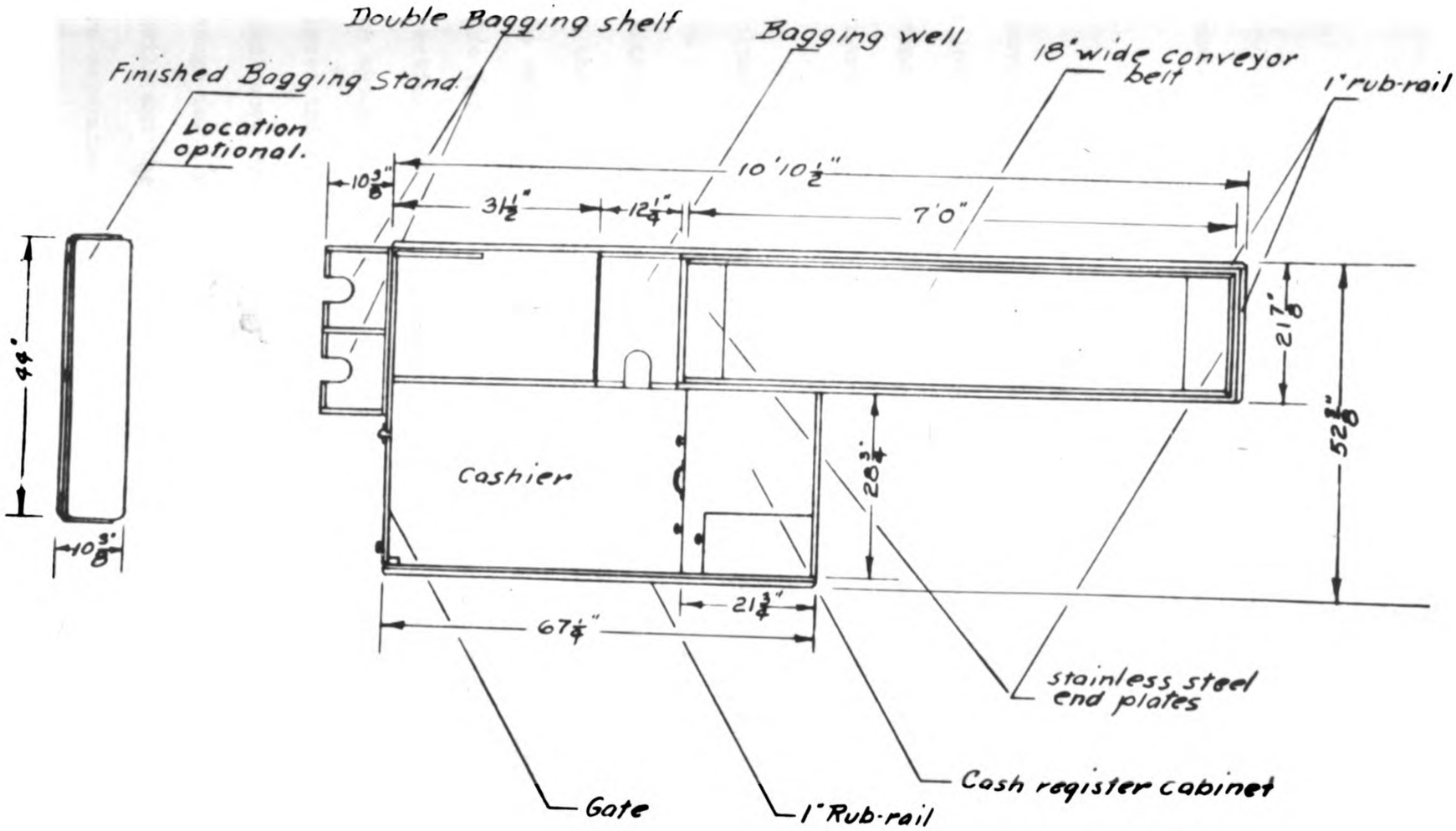

Figure 6. The Redi-chek unit

5. Make change and give to customer.

6. Remove bag from well; position for customer.

In this operation the cashier handles each item individually only once. The bagging and ring-up operations are combined.

The "No Wait" Checking Counter

This unit represents the most drastic departure to date from the conventional unit. The "No Wait" was developed by George T. Smith, Inc., a local chain in Lansing, Michigan. It is basically a belt type checkstand. It is 11 feet in length and four feet wide. It is shown in Figure 7.

The checkstand was designed to handle heavy traffic flow during peak volume periods. During rush hours, the makers of "No Wait" suggest the use of four or five attendants at the counter - one person to unload, another to check, another to act as cashier, and still another (or two) to do the sacking. In the use of this checkstand a telephone system connects the unloader with the checker. The unloader calls the items of merchandise (groceries, meats, produce, and taxables) and the prices to the checker, speaking directly into the transmitter of the head phone which he wears. The checker uses the same type of head set. She registers the items and places the itemized receipt with the final article of the order as the items move by on the belt. The cashier then picks up the receipt and makes change for the customer. All of this is being done while the belt is moving and the articles are passing on their way to the sackers. Orders are separated by the unloader with a wooden divider which is removed and returned in a special groove by the sacker. A specially designed sacking bin can handle two orders at one time by means of a hinged separator.

Figure 7. The "No Wait" checkstand

The "No Wait" can be operated by one, two, three, four, or five employees, depending upon the amount of customer traffic. When up to and including three employees are operating the checkstand, it is similar to the belt type check-out. When operated by one person, the elements performed are the same as in the belt type. The head phone device is brought into use when the fourth employee (cashier) is added.

Variations of the Foregoing

The above eight types of check-out systems represent the most common types in use today. There are, of course, variations of many kinds. Most variations are, however, minor ones.

When a new development has proved an efficient one, it is often incorporated into existing systems. An example of this is the recent development of a new model "Spee-Dee" which has a hinged sacking well identical in principle to that developed by the United States Department of Agriculture in the Redi-chek unit.

CHAPTER III

METHODOLOGY FOR EVALUATING CHECKSTAND EFFICIENCY

This chapter deals with the methodology by which checkstand efficiency may be evaluated. Two studies are used as main reference. The first is the United States Department of Agriculture's recent work;[1] the second is a study completed in April, 1951, by a large retail food chain.[2] These two studies will be described in detail.

The most common method of presenting checkstand operating results is by means of dollar per man-hour ratios. Most descriptive folders sent out by checkstand manufacturers contain figures based on this ratio. These figures are usually obtained in the following manner:

Persons conducting the study operate in a team of two. The first person, equipped with a stop watch times the check-out operation. The stop watch is started when the customer (or cashier) starts to unload the baskart, and is stopped when the customer is given her sacked items, the entire process being completed. The second person conducting the study notes the total amount that has been rung-up on the cash register. These test runs are made for a period an hour or more. The results are then added and averaged. The final figure gives the number of dollars in sales the checker averages during an hour period.

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1 Harwell, E. M., and Shaffer, P. F., The Check-out Operation in Self-service Retail Food Stores, Bulletin No. 31, United States Department of Agriculture, Production and Marketing Administration, Washington, D.C., January, 1951.

2 This study will be referred to as the "Chain Store Study" in this work.

Such results may be distorted by several variables. If these factors are not equalized or compensated for, the results may not be comparative.

First, the size of the order will affect the result. It is obvious that while it requires a longer time to check a larger order (a fifteen-dollar order, for example), it will actually give a better production rate on the basis of dollars per minute than a smaller order of two or three dollars. The unbroken ringing at the register and the making of change only once during the transaction actually takes less time than the stop-and-start method of ringing and the need of making change four or five times on smaller orders until the total amount of a large order is reached.

Second, the composition of the order will affect the results. A turkey, ham, rib roast, or other large orders of meat require only one register key to be depressed in place of possibly half a dozen to register lower priced items equaling the same amount. The same is true in the case of such grocery items as coffee and cartons of cigarettes.

Third, the flow of traffic must be considered. If there are four or five people standing in line at one checkstand, the checker will naturally work as hard as she can to see that those people are checked out quickly. Whereas, if only one customer at a time comes to the checkstand, the checker will usually slow down somewhat and be inclined not to work as fast or efficiently as in the former circumstance. Thus, the steadier the flow of customers, the fewer delays and the faster the cashier works.

Fourth, and most important, is the difference in personnel. Some employees are naturally alert and energetic; others may be slow in mind and movement. Some are new to the job; others may be seasoned workers. The relative speed of each individual is an important factor. When four

operators are used, two average baggers have no difficulty keeping up with a fast cashier and unloader, while with three operators, it takes a fast bagger to keep up with an average unloader and cashier. Teamwork also plays a part. When two or more people are operating a checkstand, the way each person performs his part of the job, of course, has a bearing, favorable or otherwise, on the performance of the next operator in line. A smart job of unloading makes for easier and faster ringing. Where and how far the cashier pushes the merchandise as she rings it speeds or slows the sacking. With three people to a checkstand, when a small order sandwiched between two large ones reaches the cashier, this gives her an opportunity to sit back and wait for the unloader and bagger to catch up - or an opportunity to lend a hand to the bagger.

In any event, comparative study using such divergent types of employees would hardly give accurate results.

In evaluating checkstand efficiency, these variables described above must be controlled. The recent study by the United States Department of Agriculture[3] offers a good example of how this can be done.

The purpose of the study was to evaluate the check-out operation to determine the advantages and disadvantages of the more common types of equipment in current use, as well as to develop and evaluate improved methods and equipment which might enable the retail food industry to give improved customer service at the same cost or at a lower cost.

Detailed studies were made on several types of equipment and were carried on in nine stores in two retail food chains - the Kroger Company

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3 Ibid

of Cincinnati, Ohio, and Stop and Shop, Inc., of Boston, Massachusetts. Observations were made of the check-out operations in stores located in various sections of the country.

The same approach was used for each separate study. The first step was to orient store personnel with respect to the purpose and plan of the project. The use of the stop watch was explained. The necessity for the operator to perform at the usual pace while being timed was stressed. The objective of making the job easier for the employee was emphasized. Employee suggestions and criticisms were welcomed and when the improved equipment was designed, the employee was made a part of the developmental work. In this way employee cooperation was assured.

The operation was broken down into its detailed component parts, called elements. Each element was timed for a large number of successive orders and the average time was used as a basis for developing performance figures for the operation. A rating factor was applied to the average elemental times for each operator studied, this factor being based on the effective speed at which the operator worked. Skill was not considered to be a factor in individual performance, as it was defined for the purposes of the study as the ability of the individual to follow a given motion pattern. Thus, with the method standardized, speed alone controlled variations in elemental times between trained operators. The rating factor was applied to the average time for each element in order to convert actual performance of the operator studied to expected performance by the average operator working with a standardized method. A fatigue and personal allowance factor of 15 percent was applied to the sum of the various elements for each time study. Avoidable delays on the part of the operator

were excluded from the standards. Operator delay time caused by the lack of customers at the checkstand was excluded. Set-up and clean-up times (consisting of the preparation of equipment for operation in the morning and cleaning up the equipment and check-out area in the evening) were excluded from all standards. No operator studied, who operated any type of equipment used the touch system; each watched the cash register keyboard and indicator when operating the cash register in order to eliminate ring-up errors.

The average order (number of ring-up items per average order) in one store contained 14.29 ring-up items. For comparative purposes, all standards were developed to conform with this size of average order. For instance, a standard of 1.879 man-minutes per order means that the checker took that many minutes to check out 14.29 items.

All phases of the study were standardized to conform with the following conditions:

1. No weighing of merchandise was performed at the check-out operation.

2. Checks were cashed and bottle refunds were made at the checkstand.

3. Customer's coupons were handled at the checkstand.

4. Cash registers were cleared daily in the midafternoon by the head cashier or store manager.

5. All merchandise was price-marked except canned milk, baby foods, bread, jellos and puddings, soft drinks, candy and tobacco, and some produce items.

6. Coffee was not ground at the check-out counter.

7. The nesting type baskart was used in all stores in which studies were made.

8. Boxes were used instead of bags for containers for orders when requested by the customer.

9. Female employees were used as cash register operators; male employees were used for all other check-out operations, such as bagging and carry-out.

Orders per hour was used as the unit of measurement rather than sales per hour because the latter does not give a true basis for comparison.

There are certain necessary parts of each operation not normally associated with the performance of each cycle. Some of these are the following:

1. Check price of item. This element consisted of asking another store employee (or manager) the price of an unmarked item.

2. Check register tape roll.

3. Correct customer's tape. When ring-up errors were detected it was sometimes necessary to make pencil corrections on the customer's tape and the cashier's error sheet.

4. Dispose of empty bottles (and make refund).

5. Handle customer coupons.

6. Install new register tape.

7. Make separate change for customer. Customers sometimes requested separate change for a bill or coin. This was made by the cashier as a separate operation.

8. Make change for other cashier.

9. Obtain box when requested.

10. Obtain change from other cashier or store manager.

11. Process produce. This consisted of cutting the tops off carrots or other produce and disposing of the unwanted parts to the waste container provided in the checkstand.

12. Rearrange baskarts in reserve area.

13. Ring for carry-out clerk.

14. Talk to customer. A necessary part of processing each order was a greeting to the customer. This greeting usually caused no delay in the operation; however, when the conversation interfered with the processing of the order by the operator, these unavoidable delays were included under "talk to customer."

The above parts of the operation were termed irregular elements.

These irregular elements were determined in each separate study. They were added to the regular elements in determining the total minutes per order.

The United States Department of Agriculture tested the following types of equipment:

1. Push-pull - 1-man
2. Push-pull - 2-man
3. Simplex - 1-man
4. Redi-chek - 1-man
5. Redi-chek - 2-man
6. Redi-chek - 3-man
7. Belt type - 4-man
8. Disc-type - 1-man
9. Disc-type - 2-man
10. Disc-type - 3-man

An example of the results determined by the above methodology is the study of the push-pull operation and the development of the Redi-chek checkstand. Table I shows the development of the production standard for the push-pull check-out-one-man operation. Table II gives the accompanying

TABLE I

DEVELOPMENT OF PRODUCTION STANDARD FOR PUSH-PULL CHECK-OUT ONE-MAN OPERATION [4]

	Description of element	No. elements per standard unit	Basic elemental time	Total elemental time	Variable percent	Weighted elemental time
				Minutes	Percent	Minutes
1.	Unload baskart and sort merchandise			0.5517	13.0	0.0717
2.	Pull presorter forward; push back			.0600	45.9	.0275
3.	Sort after using presorter			.1763	45.9	.0809
4.	Sort items as/after placed on counter			.1432	20.9	.0299
5.	Ring up order	14.29 r-u items per order /	.0292 min per item	.4173	100.0	.4173
6.	Subtotal, add tax, and total order			.0740	100.0	.0740
7.	Take money from customer			.0786	100.0	.0786
8.	Make change and give to customer			.592	100.0	.1592
9.	Obtain and position bag			.0808	114.5	.0925
10.	Bag items	12.48 r-u items per bag	.0324 min per item	.4044	114.5	.4630
11.	Sum of irregular elements			.1400	100.0	.1400
	Total minutes per order					1.6348
	Fatigue and personal allowance					1.15
	Standard in minutes per order					1.8798
	Standard in hours per order					.0313
	Standard in orders per man-hour					31.9
	Standard in orders per hour					31.9

4 Ibid, p. 42.

TABLE II

DEVELOPMENT OF PRODUCTION STANDARD FOR PUSH-PULL CHECK-OUT ONE-MAN OPERATION, continued[5]
IRREGULAR ELEMENTS

	Description of element	Total elemental time	Variable percent	Weighted elemental time
		Minutes	Percent	Minutes
1.	Break coin change in drawer	0.2181	.4	0.0009
2.	Cash check	.7658	6.3	.0482
3.	Check price of item	.2128	1.7	.0036
4.	Check register tape roll	.1000	.1	.0001
5.	Clean checkstand counter	.1472	3.9	.0057
6.	Correct customer's tape	.1829	.3	.0005
7.	Delay for carry-out clerk	.2520	.4	.0010
8.	Delay for clearing register	1.0860	.4	.0043
9.	Delay for customer unloading	.2023	6.4	.0129
10.	Discuss shortage (and note credit)	1.4900	.1	.0015
11.	Dispose of baskarts	.1858	1.7	.0032
12.	Dispose of empty bottles (and make refund)	.2412	3.1	.0075
13.	Dispose of empty bottles to back room	.4374	.2	.0009
14.	Handle customer coupons	.3340	.6	.0020
15.	Install new register tape	1.2391	.5	.0062
16.	Make separate change for customer	.1905	1.2	.0023
17.	Make change for other cashier	.3435	.7	.0024
18.	Obtain box	.2914	1.8	.0052
19.	Obtain change from other cashier or head cashier	.2941	2.6	.0076
20.	Process produce	.1083	3.4	.0037
21.	Rearrange baskarts in reserve area	.8925	.1	.0009
22.	Replenish bag supply	.5465	.4	.0022
23.	Ring for carry-out clerk	.0891	5.6	.0050
24.	Ring up extra time	.2143	1.0	.0021
25.	Talk to customer	.1544	5.1	.0079
26.	Talk to other store clerk	.3733	.7	.0022
	Total			.1400

5 Ibid, p. 43

irregular elements. Table III shows the development of the production standard for the Redi-chek check-out - one-man operation. Table IV gives the accompanying irregular elements.

In these tables the total elemental time was that time required to perform the element whenever it occured. The variable percent represented the frequency of occurrence of the element. The weighted elemental time was computed by multiplying the total elemental time by the variable percent, and represented the time allotted to each order for the element. The standard in orders per man-hour was the expected performance of the average operator working under normal conditions.

Table V shows the comparative equipment productivity and cost of check-out operation. The cost in cents per order was computed on the basis of one dollar per man-hour for all operators required in the various crew arrangements.

The United States Department of Agriculture study is an example of how scientific methods may be used in determining check-out efficiency. The breakdown of each operation into elements has one outstanding advantage - when comparing two or more separate studies it can be determined that a certain element may be out of line on one study in comparison with the same element in the other studies. It is, therefore, relatively easy to determine that part of a certain operation that appears to be accomplished considerably faster (or slower) than the corresponding part in another operation.

It is questionable whether a food chain can afford to make such a comprehensive and exacting study. Trained technicians and an ample budget

TABLE III

DEVELOPMENT OF PRODUCTION STANDARD FOR REDI-CHEK CHECK-OUT ONE-MAN OPERATION[6]

	Description of element	No. elements per standard unit	Basic elemental time	Total elemental time	Variable percent	Weighted elemental time
				Minutes	Percent	Minutes
1.	Obtain and position bag			0.1010	114.5	0.1156
2.	Ring up and bag items	14.29 r-u items per order	.0415 min. per item	.5930	100.0	.5930
3.	Subtotal, add tax, and total order			.0740	100.0	.0740
4.	Take money from customer			.0786	100.0	.0786
5.	Make change and give to customer			.1365	100.0	.1365
6.	Remove bag from well; position for customer			.0498	73.4	.0366
7.	Sum of irregular elements			.1457	100.0	.1457
	Total minutes per order					1.1800
	Fatigue and personal allowance					1.15
	Standard in minutes per order					1.3570
	Standard in hours per order					.0226
	Standard in orders per man-hour					44.2
	Standard in orders per hour					44.2

6 Ibid, p. 48

TABLE IV

DEVELOPMENT OF PRODUCTION STANDARD FOR REDI-CHEK CHECK-OUT ONE-MAN OPERATION, continued [7]

IRREGULAR ELEMENTS

	Description of element	Total elemental time Minutes	Variable percent Percent	Weighted elemental time Minutes
1.	Cash check	0.4631	6.3	0.0292
2.	Check price of item	.2128	1.7	.0036
3.	Check register tape roll	.1000	.1	.0001
4.	Clean checkstand counter	.2307	3.9	.0090
5.	Correct customer's tape	.1829	.3	.0005
6.	Delay for carry-out clerk	.2520	.4	.0010
7.	Delay for clearing register	1.0860	.4	.0043
8.	Delay for customer unloading	.2701	4.8	.0130
9.	Discuss shortage and note credit	1.4900	.1	.0015
10.	Dispose bag to order rack	.2836	.7	.0020
11.	Dispose of baskarts	.1054	2.1	.0022
12.	Dispose of empty bottles (and make refund)	.2412	3.1	.0075
13.	Dispose of empty bottles to back room	.4374	.2	.0009
14.	Fill coin changer	.3737	3.6	.0135
15.	Handle customer coupons	.3340	.6	.0020
16.	Install new register tape	1.2391	.5	.0062
17.	Make separate change for customer	.1905	1.2	.0023
18.	Make change for other cashier	.3435	.7	.0024
19.	Move completed order to side	.1561	1.0	.0016
20.	Move merchandise down conveyor	.1071	.5	.0005
21.	Obtain box	.2914	1.8	.0052
22.	Obtain change from other cashier or head cashier	.2941	2.6	.0076
23.	Process produce	.1083	3.4	.0037
24.	Rearrange baskarts in reserve area	.8925	.1	.0009
25.	Remove well cover	.0661	3.4	.0022
26.	Replace well cover	.0813	3.4	.0028

7 Ibid, p. 49

TABLE IV, continued

DEVELOPMENT OF PRODUCTION STANDARD FOR REDI CHEK CHECK OUT ONE MAN OPERATION, continued[7]
IRREGULAR ELEMENTS

Description of element	Total elemental time	Variable percent	Weighted elemental time
	Minutes	Percent	Minutes
27. Replenish bag supply	.5465	.4	.0022
28. Ring for carry-out clerk	.0891	5.6	.0050
29. Ring up extra item	.1614	.6	.0010
30. Talk to customer	.1544	5.1	.0079
31. Talk to other store clerk	.1643	2.4	.0039

7 Ibid, p. 49

TABLE V

COMPARATIVE EQUIPMENT PRODUCTIVITY AND COST OF CHECK-OUT OPERATION[8]

	Type of equipment		Orders per hour	Orders per man-hour	Labor cost per per order
			Number	Number	Cents
1.	Push-pull	1-man	31.9	31.9	3.13
2.	Push-pull	2-man	48.4	24.2	4.13
3.	Simplex	1-man	44.3	44.3	2.26
4.	Redi-chek	1-man	44.2	44.2	2.26
5.	Redi-chek	2-man	61.2	30.6	3.27
6.	Redi-chek	3-man	67.5	22.5	4.45
7.	Belt type	4-man	62.0	15.5	6.44
8.	Disc-type	1-man	35.5	35.5	2.82
9.	Disc-type	2-man	57.8	28.9	3.46
10.	Disc-type	3-man	60.3	20.1	4.98

8 Ibid, p. 41

would be necessary. The chains would do well, however, to study the results and the means by which they were obtained. The United States Department of Agriculture study is very valuable for its methodology.

Recently a large retail food chain completed a study of check-out operations. This serves as an example of how a chain may obtain valid results and still hold expenses to a minimum. This study is described below. It is referred to throughout this work as the "Chain Store Study". The accompanying tables of operating results are taken from this study.

Four checkstands were tested. These were the "Spee-Dee", the Redi-chek, the push-pull, and the conventional. A large well-lighted room was used for the experiment; one of each type stand was set up in the room. As this did not duplicate actual operating conditions, it must be realized that the results are comparative under these conditions only. The purpose of the study was to determine which type checkstand gives the most efficient operating performance.

Variables in the operation were held to a minimum. The same twelve orders, averaging 18 items, and six dollars, were used on all four checkstands tested. Results were given in dollars per hour. By holding the size (items) and composition of the order constant, the dollars per hour figure is valid. This practice did introduce another variable - familiarity with prices and the composition of the orders. This was minimized as much as possible by getting the figures on all checkstands only after all the operators were familiar with the orders.

The flow of traffic was controlled. In all the tests on all the stands, orders were delivered as rapidly as operators could handle them,

and the trainer[9] acting as customer always had her money ready.

The personnel factors were controlled in the following manner:

1. Competence: All four cashiers used for the tests were trained and above average in ability.

2. Organization: When three and four operators were used, the two fastest girls were used as unloader and cashier on all stands.

3. Fatigue: An attempt was made to eliminate this by providing frequent rest periods for the operators.

Time studies were conducted in the conventional manner. Any delay that was not considered a normal part of the operation was not included.

The following tables (VI through XII) show the results of the "Chain Store Study". In interpreting these results, a chain may well decide which type of checkstand to install in certain volume stores.

In comparing the two above studies the United States Department of Agriculture should prove the more accurate. It was conducted on a far wider scale and greater care was used in standardizing methods and eliminating the variable factors. The "Chain Store Study" does, however, offer a good example of a reasonable test of operation conducted on a relatively small and inexpensive basis.

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9 The personnel completing the study are here referred to as "trainers".

TABLE VI

COMPARISON OF PRODUCTION WITH SINGLE OPERATOR

Complete Assembly Was Made on Push-pull and Conventional [10]
No assembly was Made on Speedee or Belt

	Speedee	Redi-chek	Push-pull	Conventional
$ checked	$1,709.04	$1,433.36	$1,851.46	$1,352.99
Average $ per hour	305.55	298.20	271.80	266.70
	Difference between fast stand (Speedee) and slow (Conventional) $38.85 per hour, or 14% plus.			
Mary				
$ checked	356.05	284.84	569.68	356.05
Average $ per hour	307.20	294.00	303.60	280.80
Lorraine				
$ checked	427.26	427.26	427.26	284.84
Average $ per hour	306.60	305.40	269.40	276.00
Margaret				
$ checked	427.26	356.05	498.47	284.84
Average $ per hour	300.60	277.80	245.40	250.80
Pauline				
$ checked	498.47	356.05	356.05	427.26
Average $ per hour	307.80	315.60	268.80	259.20

10 "Complete assembly" refers to the segregation of items by departments, (meats, produce and groceries) before ringing up the items on the register.

TABLE VII

COMPARISON OF PRODUCTION WITH TWO OPERATORS

Complete Assembly Was Made on Push-pull and Conventional
No Assembly Was Made on Speedee or Redi-chek

Average of All Operators

	Speedee	Redi-chek	Push-pull	Conventional	
Av. $ P.M.H.	$527.60	$488.40	$463.20	$469.80	
$ Spread	222.05	190.20	191.40	203.10	$64.40
% Spread	72.16	63.8	70.4	76.2	13.9%

Two Fastest Operators

$ Checked	427.26	284.84	356.05	356.05
Av. $ P.M.H.	537.60	513.00	481.20	522.60

The difference between the fastest (Speedee) operation and the slowest (Push-pull) is $57.00 per hour or 12%.

Two Slowest Operators

$ Checked	356.05	284.84	356.05	284.84
Av. $ P.M.H.	511.21	483.00	435.00	439.20

The difference between the fastest (Speedee) operation and the slowest (Push-pull) is $76.00 per hour or 17%.

Fast and Slow Combination

$ Checked	427.26	213.63	356.05	213.63
Av. $ P.M.H.	534.00	469.20	473.40	447.60

The difference between the fastest (Speedee) operation and the slowest (Conventional) is $87.00 per hour or 19%

TABLE VIII

COMPARISON OF PRODUCTION WITH THREE OPERATORS
Unloader, Cashier, Bagger

A practically complete assembly was made on all stands by the unloader.

	Speedee	Redi-chek	Push-pull	Conventional
$ Checked	$356.05	$284.84	$356.05	$356.05
Av. $ per hour	583.80	546.00	586.80	585.82

The same operators were used in the same position on each stand.

The difference between the fastest stand (Push-pull, $586.80) and the slowest (Redi-chek, $546.00) is $40.80 per hour or 7½%.

TABLE IX

COMPARISON OF PRODUCTION WITH FOUR OPERATORS
Unloader, Cashier and Two Baggers

A practically complete assembly was made on all stands by the unloader.

	Speedee	Redi-chek	Push-pull	Conventional
$ Checked	$213.63	$427.26	$356.05	$356.05
Av. $ per hour	644.40	642.60	641.40	657.00

The same operators were used in the same position on each stand.

The difference between fastest stand (Conventional, $651.00) and the slowest (Push-pull, $641.40) is $15.60 per hour or 2½%.

TABLE X

COMPARISON OF CHECKING ERRORS

	SPEEDEE						REDI-CHEK					
	$ Ckd.	Money Errors O[11] U	% of Money Errors	No. of Depts.	No. of Dept. Errors	% of Dept. Error	$ Ckd.	Money Errors O U	% of Money Errors	No. of Depts.	No. of Dept. Errors	% of Dept. Error
4 Man Team	427.26	.01 .01	.007%	258	-	-	356.05	.40 .39	.222%	215	2	.930%
3 Man Team	356.05	- -	-	215	3	1.395%	284.84	- -	-	172	-	-
2 Man Team	1,210.57	.32 3.76	.337%	731	23	3.146%	783.31	.28 .24	.066%	430	1	.209%
Single Operator	1,709.04	.36 .23	.034%	1032	8	.774%	1,424.20	3.47 2.13	.393%	860	24	2.744%
TOTALS	3,702.92	.70 4.00	.127%	2236	34	1.521%	2,848.40	4.15 2.76	.243%	1677	27	1.610%

11 "O" and "U" refer to "over" and "under" money errors.

TABLE XI

COMPARISON OF CHECKING ERRORS

	PUSH-PULL						CONVENTIONAL					
	$ Ckd.	Money Errors O	Money Errors U	% of Money Errors	No. of Depts.	No. of Dept. Errors	% of Dept. Error	$ Ckd.	Money Errors O	Money Errors U	% of Money Errors	No. of Depts.	No. of Dept. Errors	% of Dept. Error
4 Man Team	498.47	.29	-	.059%	301	-	-	498.47	-	-	-	301	-	-
3 Man Team	365.05	-	-	-	215	-	-	356.05	-	-	-	215	-	-
2 Man Team	1,129.36	.91	2.36	.287%	688	-	-	854.52	.35	.43	.091%	516	1	.194%
Single Operator	1,851.46	.33	.92	.067%	1118	-	-	1,352.99	.42	.21	.042%	817	-	-
TOTALS	3,845.34	1.53	3.28	.125%	2392	-	-	3,062.03	.77	.64	.046%	1849	-	.054%

TABLE XII

COMPARISON OF PRODUCTION PER MAN HOUR

	SPEEDEE			REDI-CHEK			PUSH-PULL			CONVENTIONAL		
	$ per hour	$ PMH	% 12 Inc. over single	$ per hour	$ PMH	% Inc. over single	$ per hour	$ PMH	% Inc. over single	$ per hour	$ PMH	% Inc. over single
4 Operators	644.40	161.10	110.9	642.60	160.65	115.5	641.40	160.35	139.9	657.00	164.25	146.3
3 Operators	538.80	194.60	91.1	546.00	182.00	83.1	586.80	195.60	115.9	585.82	195.27	119.7
2 Operators	527.60	263.80	72.6	488.40	244.10	63.8	463.20	231.60	70.4	469.80	234.90	76.2
1 Operator	305.55	305.55		298.20	298.20		271.80	271.80		266.70	266.70	

12 "% Inc." refers to "percent of increase".

CHAPTER IV

EVALUATION OF INDIVIDUAL CHECKSTANDS

This chapter deals with the advantages and disadvantages of the eight types of check-out systems described in Chapter II.

The Conventional Check-out Operation

The performance of this checkstand is rather low, especially when only one or two people are employed in the operation.

A single operator must perform all the basic elements in processing an average order. The customer is not requested to unload any of her merchandise. This is done by the cashier. Thus, one order must be completely processed before another is started. The merchandise, as unloaded, must be segregated by departmental groups - meat, produce, bakery, and grocery - before being rung up. Adequate sacking facilities are seldom provided.

The "Chain Store Study" results indicate that the comparative efficiency of the checkstand increases when the third and fourth operators are added.

The conventional checkstand has certain advantages. It is of relatively simple construction and is inexpensive to build. Many food chains have constructed their own checkstands of this type. The list price quoted by most manufacturers is two hundred dollars.

Production figures, however, show that the conventional checkstand is a poor choice for both the average operator and large-volume stores. With any of the other checkstand types, one operator can normally handle the flow of traffic during the slack periods of the day. With the

conventional unit, however, another checkstand must be operated or a sacker added to the operation to achieve the similar production results over the course of a day's business.

The Push-pull Type Checkstand

This unit has an advantage over the conventional system in that it provides facilities for customer unloading. While one order is being processed, the unloading element of the next order may be completed. Proper departmental segregation is encouraged by marked-off sections on the unloading platform. However, produce items are placed in an area next to the presorter and there is a tendency to crush this soft merchandise when the presorter is pulled forward. There is often physical strain in pulling up heavy merchandise to the checking position. It was observed that it was often impossible to place all merchandise in the presorting area. This meant that the cashier had to pull the presorter forward, push it back, and allow the customer to unload the remainder of the large order. Here, the customer continued to unload while the cashier was checking and thus could not see the items as they were tabulated.

The construction of the push-pull checkstand, as in the case of the conventional, is simple. The list price quoted by the manufacturer was two hundred and fifty dollars.

In the "Chain Store Study" the push-pull checkstand gave better performance with one operator than did the conventional. This was due largely to the customer performance of the unloading element. The comparative efficiency of the checkstand increased when the third and fourth operators were added.

The United States Department of Agriculture found the push-pull unit to give the poorest performance of all types studied.[1]

The push-pull checkstand is an improvement over the conventional type. It does not, however, give good performance with a single operator.

In the previous two types of operation, items, as they were unloaded, were segregated into departmental groups. This meant that the cashier could ring up all grocery items together, all produce items together, et cetera. The customer, upon receiving the receipt for her order, could check the tabulated items easily as they were all grouped by departments.

In the remaining types of check-out systems discussed below, items are not grouped by departments before being rung-up. Items are rung-up as they are unloaded by the customer or as they are removed from the baskart by the cashier. No attempt is made to keep all grocery items together, for example.

This procedure presents certain difficulties not encountered in the conventional and push-pull operations. The first is the necessity of frequently changing the departmental key in the ring-up element. When items are segregated by department before being rung-up, the cashier in checking grocery items, for example, depresses the grocery departmental key and registers all the grocery items by depressing the motor bar. The same process is continued for meat and produce items. When the baskart is unloaded by the customer on a moving belt or disc, there is not such departmental regularity. The first item may be a head of lettuce, the

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1 Harwell, E.M., and Shaffer, P.F., The Check-out Operation in Self-service Retail Food Stores, Bulletin No. 31, United States Department of Agriculture, Production and Marketing Administration, Washington, D.C. January, 1951.

second, a ham, so that the cashier must continually change the departmental key. The National Cash Register Company has recently introduced a new cash register with motorized departmental keys. This means that all the operator has to do to register the sale is depress the money keys and then depress the departmental key denoting the item. Although these new registers are at present difficult to obtain, they should prove very efficient in this type of operation. The National Cash Register Company has observed in recent tests that accuracy has improved in registering items according to their proper departments. This seems logical as the operator must continually watch for departmental changes of the moving items.

A second difficulty in this type of operation occurs with merchandise that is sold in pairs or in groups of three or more. An example of this would be an item that sells for ten cents a can, or two cans for 19 cents. The customer may not unload these items together. In a large order the two items that sell for nineteen cents may be unloaded separately, and the cashier may easily make the mistake of charging the customer ten cents for each. Several attempts have been made to solve this problem, but no one has met with complete success. Signs have been posted urging customers to unload such items in their proper groups; cashiers and other operators have been instructed to be especially careful to watch for these items and place single cans on the dead plate until the second or third can is unloaded.

A third problem arises in the sacking process. The top items in a customer's baskart are usually the ones that are fragile and most easily bruised. These are unloaded first as they are the most accessible. The hard items, such as cans and boxes, are usually at the bottom of the baskart

and are unloaded last. The sacker, therefore, receives the fragile items first and the hard ones last. This means that the sacker must wait for the latter items to be processed before the sacking can be started.

A fourth problem arises in that the customer, while placing her merchandise on a moving belt or disc, has difficulty watching the cashier ring up items that are simultaneously moving down the line. Some customers insist on watching the cashier ring up each article to insure against errors. Where this occurs, the normal operation is interrupted.

All the preceding problems are inherent in the check-out operations discussed below.

The Split Counter Type Checkstand

The principal point to note about this system is that the checker unloads the baskart with one hand while simultaneously ringing up the items with the other, thus combining into one step two of the basic operations of the conventional method. This checkstand was not included in either of the studies discussed in Chapter III. In the bulletin "Check-out Clinic",[2] performance of the split counter type (with a single operator) was found to fall between the slower conventional and faster push-pull type. The cost of the split counter checkstand is two hundred dollars.

This type unit has one chief disadvantage. It is a one-man operation; an additional employee cannot be added to increase production during rush periods.

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2 "Check-out Clinic", a bulletin published by the National Association of Food Chains for its members summarizing the results of a meeting held on February 6-7, 1950.

The Simplex Unit

In contrast to the split counter checkstand, the Simplex unit provides for simultaneous unloading, ringing, and sacking by the cashier.

The time studies by the United States Department of Agriculture showed that production amounted to 44.3 orders per hour on the Simplex unit as compared with 31.9 orders per hour on the push-pull equipment. Labor costs per order were 2.3 cents and 3.1 cents respectively.

Some disadvantages, however, were noted in the study. Lack of flexibility of the equipment during peak volume periods was a definite disadvantage. On the push-pull equipment an additional employee could be added to the operation to increase production and reduce waiting time on the part of the customer. This was not possible on the Simplex unit as the latter was strictly a one-man operation. Considering the fact that the use of the push-pull checkstand operated by two persons is only 9 percent more productive than the one-man Simplex operation, and at the same time 83 percent more costly in man-hours per order, the difference in total potential capacity may seem to be a minor factor. This is true in stores where extreme volume peaks are not normal. But in stores where peaks reach substantial proportions, the Simplex unit was found to be not entirely satisfactory owing to this lack of flexibility.

Customer reactions to the Simplex unit, while favorable as a whole, were in some instances unfavorable. The United States Department of Agriculture made no statistical measurement of this reaction. The most frequent unfavorable comment was that the operation seemed to be slower. This remark was no doubt evoked by the customer when comparing the ring-up

operation only on the conventional equipment with that of ringing-up and bagging the items simultaneously.

The Simplex unit provides limited space for customer exit. Even though customer-exit aisles were made as wide as those in stores having conventional equipment (24 inches), the exit of customers with large orders was sometimes difficult owing to interference by the cash register which was located adjacent to the aisle. Store personnel carrying orders to the outside of the building also encountered this interference.

The Simplex unit enjoys several distinct advantages over the push-pull checkstand. It gives increased man-hour production at a lower cost per order. Man-hour production increased from 31.9 orders to 44.3 orders; the cost of processing the order was reduced from 3.1 cents to 2.3 cents.

Over-all space requirements were reduced to 64 percent of requirements for the conventional checkstand.

The United States Department of Agriculture found that all operators (originally trained on the push-pull equipment) indicated increased fatigue for the first few days during which they were being trained on the Simplex unit. This was believed to be caused by two factors: (1) Change of work patterns requiring use of certain body muscles; and (2) and increased number of items handled in a given period. As the operators gained experience they reported the operation on the Simplex unit to be less fatiguing than on the push-pull equipment.

The Belt Type Checkstand

The United States Department of Agriculture made a study on the belt type checkstand operated by a four-man team. This team consisted of the

cashier, two baggers, and an expediter.[3] The cashier rang up the items, computed the tax and total of the order, and took money from and made change for the customer. The two baggers bagged the order and placed the filled bags on an order rack. The expediter unloaded the baskart and sorted and placed the items, price up, on the cashier side of the conveyor by departmental group. Small cardboard order separators were provided for use by the expediter who placed one of the separaters on the conveyor after the last item of each order. It signified to the cashier and to the baggers the end of one order and the beginning of the next.

The cashier rang up the items by departmental group. Departmental keys on the cash register were not motorized. The conveyor, operated with a foot switch by the cashier, carried the merchandise from the expediter to the baggers, the merchandise seldom being handled physically by the cashier.

The baggers usually worked together on the same order. The equipment included a small platform on which the bags rested during the bagging operation. The mouth of the bag was held open by the bagger with one hand as the other hand bagged the merchandise. One bagger could not handle the load alone when successively large orders were being processed because, (1) items were received on the conveyor by departmental group and the accumulation of fragile items tended to congest the bagging area, and (2) bagging with both hands simultaneously was not possible. This is not to say that the equipment could not be operated by a three-man crew; but the

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3 "Expediter" refers to the employee who unloaded the baskart, placing the items on the conveyor.

use of only one bagger would cause considerable delay on the part of the cashier and the expediter and thereby decrease over-all production in orders per hour.

The United States Department of Agriculture's time studies showed that production (on the four-man operation) amounted to 62 orders per hour as compared with 67.5 for the three-man operation of the Redi-chek. Labor costs per order on the two types were 6.4 cents and 4.5 cents respectively.

Analysis of some of the elemental times explained differences in over-all and man-hour production. The increase in ring-up time on the belt type checkstand was caused by the inability of the expediter to sort items by department, turn prices up, and feed items onto the conveyor as fast as the cashier could check them. On the Redi-chek the expediter did not sort items by departmental groups as the register keys were motorized.

The National Association of Food Chains[4] reported that most members found the performance of the belt type check-stand to be considerably better than the conventional or push-pull units and approximately equal to that of the disc type unit.

The Robert Becht Company of Cincinnati, Ohio quotes seven hundred dollars as the list price of their belt type unit, the "Quik-Chek".

The Disc Type Check-out Operation

According to the results of the "Chain Store Study", the "Spee-Dee" checkstand, when operated by either one or two employees, had the best production performance of any of the types studied. As the third and fourth operators were added, the comparative efficiency of the checkstand decreased, although the decrease was slight.

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4 The National Association of Food Chains, op. cit.

The results of the United States Department of Agriculture on the performance of the disc type checkstand are quite different. When operated by one man, the checkstand gave production of 35.5 orders per hour. This was 11 percent more productive than the push-pull equipment (one-man), but 25 percent less productive than the Simplex unit or the Redi-chek unit (one-man). Several studies were made of the two-man team and three-man team operating the disc type check-out unit. With the exception of disc delay and the slower bagging operation, the procedures and elemental times were similar to those for the two-man and three-man operation of the Redi-chek. Production on the two-man operation was 57.8 orders per hour (at 3.5 cents per order); production on the three-man operation amounted to 60.3 orders per hour (at 5.0 cents per order).

In both studies, the performance of the disc type checkstand was comparatively high. The Will L. George Corporation, Grand Rapids, Michigan, manufacturer of "Spee-Dee", has about fifteen hundred in use in the United States and about ninety in Canada. Thus, as far as mechanized checkstands are concerned, this type is well accepted by the trade. The disc type unit gives satisfactory performance under varying volume loads. The latest model incorporates the Redi-chek bagging well, which should increase performance with a single operator. The current price of the "Spee-Dee" checkstand is eight hundred and seventy-five dollars.

A variation of this type, the "Turn-ez", by Doran-Owens, Detroit, Michigan, is identical except that the disc is hand operated and is permanently divided into four sections by metal strips. At present, no independent performance checks have been made on this checkstand, but its performance should not be far from that of its motorized counterpart.

Its chief advantage is its lower cost. The current list price quoted by Doran-Owens is three hundred and eighty-five dollars.

The Redi-chek Unit

The chief advantage of the Redi-chek unit is the provision of adequate bagging facilities. The construction of a well adjacent to the cashier's position made possible simultaneous ring-up and bagging operations. For the other types of check-out equipment observed above, no such provision was made for the efficient bagging of merchandise; the bagger had to use one hand to hold the mouth of the bag open during the bagging operation. The bagging wells provided for the bagger on the Redi-chek unit made possible movement of merchandise from the counter to the container with both hands. The width and depth for the bagger wells were the same as for the well used by the cashier when working alone. The bag was maintained in an open-mouth position by the pressure of the sides of the bag on the walls of the well. Two wells were installed instead of one so that the bagger could: (1) use idle time (available when change was being made for a customer) to position bags for a succeeding order that required more than one bag; and (2) bag a large order into two bags simultaneously.

A bag rack was installed about five feet to the rear of the checkstand, for use by the bagger in the two-man or three-man operation as a disposal point for completed orders. The customer picked up the order on the way out of the store. This rack held five full sixty-pound bags at any one time. The objective of the bag rack was to eliminate delay on the part of the bagger as he waited for the customer to pick up the completed order.

The United States Department of Agriculture study showed that production per man-hour for the one-man operation on the Redi-chek unit amounted to 44.2 orders, and labor cost per order 2.3 cents, the same as on the Simplex unit. The two-man operation of the Redi-chek unit increased production of the unit to 61.2 orders per hour. Labor cost per order increased from 2.3 to 3.3 cents.

In comparing the time study standard with that developed for the two-men operation on the push-pull equipment it was noticed that the ring-up time per item decreased from .0291 to .0287. This reduction reflects the use of the motorized departmental keys. The standard for two-man operation of the Redi-chek unit showed a considerable increase in the time required to take money from the customer. This was caused by two factors: (1) The customer had less time to get her money ready for payment, as she had to unload her baskart and place the items on the conveyor (at the same time her order was being processed more rapidly, frequently simultaneously with the unloading, than with the other types of equipment); and (2) the cashier had little opportunity to utilize delay time while waiting for the customer to pay for the order. The production per hour for the two-man operation on the Redi-chek unit was 38.5 percent higher than the one-man operation on the same equipment, and 26.4 percent higher than the two-man operation on the push-pull unit.

By adding the expediter to the two-man operation on the Redi-chek, production was increased from 61.2 orders per hour to 67.5 orders per hour, an increase of 10 percent; at the same time labor cost per order increased from 3.3 cents to 4.5 cents, an increase of 36.4 percent. The time for taking money from the customer was .0712 minute as compared with .1307

minute when the equipment was operated by two men and .0786 when operated by one man. With the addition of the expediter, the customer no longer had a part to perform in the processing of the order (she had to unload the baskart when no expediter was used) and, therefore, more frequently had her money ready when the total of the order had been announced by the cashier.

The Redi-chek had certain disadvantages. The cost of the unit amounted to six hundred and thirty-four dollars as compared with two hundred dollars for the conventional checkstand.

Delays occurred for both the bagger and the expediter during the operation. Each experienced unavoidable delay time between each order. Both were caused by unbalanced loads in the operation.

Personnel had to be trained in the use of the Redi-chek equipment in order to assure efficient performance. Several days were needed to train personnel properly in the simultaneous ring up and bagging of items so that the principles of good bagging of merchandise could be maintained.

The advantages of the Redi-chek unit were significant. Man-hour and over-all production was the highest of any type tested by the U.S. Department of Agriculture. Fewer checkstands were needed to process a given volume, which permitted maximum utilization of floor space. Customers were processed faster for all periods during the week, whether it was a one-man operation during slack periods, or a two- or three-man operation during peak periods. Finally, reactions from customers, management, and store personnel were very favorable.

The "No Wait" Checking Counter

The "No Wait" checkstand was developed to handle peak-volume traffic. It will find its best application in large markets. During the slow periods of the week, the "No Wait" may be operated by one, two, or three persons. In the latter cases it performs as the belt type unit.

With the exception of the cashier's bagging well, the "No Wait" has bagging facilities as ample as those provided by the Redi-chek unit.

The "No Wait" has one distinct advantage. By adding the cashier to the operation, a balanced division of work resulted. Unbalanced division of work between the cashier and baggers was one of the objections of the Redi-chek unit. By dividing the duties of the cashier, by putting the bags within easy reach of the bagger, and by furnishing ample bagging space, the designers of "No Wait" have developed a unit that gives a smooth and continuous operation.

No comparative data were available on the "No Wait" operation. The National Cash Register Company made several surveys on the operation of this checkstand and reported that at peak periods the volume performance was 1,032 dollars per hour. This, of course, is a dollar per hour figure which can be affected by many variables. It does, however, give some idea of the speed with which the unit operates.

George T. Smith, Inc., Lansing, Michigan, the manufacturer of "No Wait" advertises the following more conservative figures - 650 dollars or more per hour, 130 dollars or more per man hour, and 7,800 dollars or more per 12-hour day. Four "No Wait" checking counters are now operating in a super market doing 35,000 dollars weekly. In this market, there is no waiting at the checkstand at peak periods.

There are some problems which are raised by the use of a checkstand of this nature. The first is that duties such as cashing checks, weighing produce, selling candy and cigarettes, and bottle returns, must all be eliminated at the checkstand. The performance of these duties would interrupt the balanced operation of the unit. Also, to realize the maximum performance from the "No Wait" unit, personnel training becomes quite important. Since the system is so different from any other in use currently, careful retraining of checkers and other supporting personnel will be necessary.

Customer reaction to the "No Wait" is favorable. Some people complained that it was difficult to follow the procedure to check on any cashier errors. But most people were greatly impressed by the speed of the unit and the resulting advantage of having their orders processed very quickly.

The prices of the "No Wait" unit, F.O.B. Plant, Charlevoix, Michigan are: (1) one to five checkstands at 1,298 dollars each; (2) six to ten checkstands at 1,198 dollars each; and (3) 11 or more checkstands at 1,098 dollars each. These prices are considerably higher than the prices of other units discussed previously. However, the manufacturer points out that three "No Wait" units can replace six conventional units, with a saving of 3,000 dollars in cash register cost. This saving is more than enough to make up for the comparative price difference between the two units.

CHAPTER V

CHECKER TRAINING

The checker[1] may be the only store employee with whom the customer comes into contact when shopping in a super market. The impression that the checker leaves with the customer will often determine her preference for the store. It is, therefore, extremely important that the checker receives proper training in the performance of her duties. This chapter describes two checker training programs - one conducted by the American Stores Company, Philadelphia, Pennsylvania, and the other developed by the University of Texas in cooperation with the Texas Educational Agency.

The American Stores Company selected the conventional operation as a method for training checkers. The reason for this was two-fold. First, the majority of checkstands in current use by the company[2] are of the conventional type. Second, the conventional method contained all of the separate elements that make up the checking operation. It was felt that when a checker was properly taught each single element, the combination of these elements in another type operation would be made easier.

Trainers for the checking school were usually selected from among the most able checkers. This is a job which requires exact, constructive, and patient direction. Once the program was launched, it was the trainer upon whom management depended to instruct conscientiously the program

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1 In this chapter the terms "checker" and "cashier" are synonomous.

2 Where the words "the company" are used in this chapter, it refers to the American Stores Company, Philadelphia, Pennsylvania.

as originally agreed upon. Unless the trainer had been completely sold on what the company was doing and the methods that were employed, difficulties would have arisen.

Training, to be effective, must start from the top down. Therefore, the first trainees of the program were sales managers and general superintendents. Next to be trained were store superintendents, then market managers, and finally the utility help. In this way every man knew exactly what those under him were supposed to do and was then held responsible for seeing that the training program was carried out.

The checker training program lasts three days; students attend on company time with all expenses paid. Out of town employees are put up at local hotels at full company expense. Six schools are located in cities near the center of a large number of company outlets.

After students are welcomed and introduced to their co-workers they receive an "entrance examination" which consists of checking six test orders. By having trainees run through a series of orders it helps the trainer spot weaknesses, and shows him where to put emphasis when training the individual. This test establishes their rating before schooling and provides a basis for comparison with their work following completion of the course. It also provides a source of information as to how well a particular store manager is carrying out the training program in his store.

Students then receive careful, individual instruction on the handling of the cash register, in correct fingering and in coordination. Next, they receive a test of simple arithmetic problems, including group prices. Correct assembling of orders on the checking counter comes next. Trainers

show how to group items, putting small items in front, and large-sized items in back to avoid the possibility of overlooking small items when ringing. Students are taught to assemble orders close to the cash register, to place merchandise where it belongs the first time it is handled, and to see that items are placed so that prices can be read easily. They are also shown how to handle meat, produce, and dairy purchases already packaged.

To ring purchases, trainers impress students with the need for using both hands - one on the cash register, the other on the item being rung-up - being careful to point out that as the motor bar is depressed the item must be moved at least six inches along the checking counter.

Change-making is discussed at length. Students are shown how to use the subtotal key until money is received, call out the amount of the sale, and count the amount, first from the cash drawer and again to the customer; money received from the customer is left on the cash register ledge until the entire transaction is completed.

The sacking operation is then practiced under the watchful eyes of the trainers. It is pointed out, of course, that breakable and perishable goods must go on top of the other merchandise.

The second day is devoted to a review of the first day's teaching, with emphasis placed on practice. In addition, the handling of empty bottles and the making out of cash-refund forms is taught. Checkers also receive instruction (1) in handling cash for deposit and completing the necessary forms for the manager; (2) the mechanics of the cash register,

such as changing the cash register and detail rolls, and finally, (3) the proper procedure in cashing checks. (All checks must be endorsed by the manager or the checker cashing them is held responsible in case of a bad check).

During the third and last day, students, under constant supervision, are allowed to practice until the necessary coordination is achieved. Service to customers is stressed in building good will. Under this category come personal appearance, courtesy and the proper manner of handling complaints.

Very few students are "washed out" of the course. When this occurs it is usually with the thought that the employee can serve elsewhere to better advantage, perhaps as a stock handler or at another job for which he or she is better suited.

The course has specific standards of speed and accuracy. While a trainee is in class, however, the trainer never speaks in terms of speed but rather in terms of coordination. Speed will only come with practice, and if stressed in the training program, it would result in a sacrifice of accuracy. Students are, however, timed (without their knowing it) and those who are extremely slow may be "washed out" if it is felt that further improvement is doubtful.

In each group there will be some trainees who will learn faster than others. A capable trainer will use these trainees to an advantage by having them help the slow or inaccurate individual. This provides the trainer with an opportunity to work individually with other trainees. It is important to realize here that a classroom training program governed by a limited time can only teach people how to do the fundamentals of a

job. It takes practice on the job before a person becomes skillful at a given task.

Equally important to the success of checker training is the follow-up method used. After students are trained, trainers visit each store to see if the checking principles are being followed. When there is a misunderstanding, the trainer demonstrates the proper method and is always ready with advice. In addition, accuracy tests are given to make certain that students are maintaining their training-school accuracy. In order to point-up a good performance, score cards are used which indicate both the good and bad points of the trainee's performance. Scores serve as a guide for improvement and also as a check on the effectiveness of follow-through. These cards summarize the fundamentals of a good store operation and provide an excellent performance rating for both managers and superintendents. The following points are rated on the score card:

		Points
1.	Is the assembly correct?	15
2.	Are two hands used at the same time?	10
3.	Is the merchandise pushed at least six inches when motor bar is pushed?	20
4.	Is the subtotal being used properly?	5
5.	Is the change drawer arranged properly?	5
6.	Are the amount of sale and amount received called out and the change counted from drawer and aloud to customer?	10
7.	Is the register receipt given to the customer?	5
8.	Is the proper bag size selected?	5
9.	Are cans slid into bag and two hands used after the bag is standing?	10
10.	Is there a "thank you" with a smile?	15
	Total	100

Further points to notice are:

1. Are the carriages pushed through check stands?
2. Are check stands free of merchandise?
3. Is the cash-disbursement pad used properly?
4. Are rebates recorded correctly?
5. Are bottle bins used correctly?

These latter questions receive no point score rating, and are answered by merely a "yes" or "no" entry. The check list is recorded in triplicate and copies are disbursed as follows: one to the general superintendent, one to the training school, one retained at the store.

While training and operating go hand in hand, there is a clear line separating the responsibility of the superintendent and the trainer. Training can supplement supervisory effort by seeing that employees acquire the necessary "know-how", but it remains for the manager and the supervisor to enforce store performance. The trainer should never supercede in authority either the superintendent who reports to his superior, the general superintendent, who in turn reports to the sales manager. The trainer can and should help supervision, but he never should short circuit their authority. The trainer's primary function is to bolster morale and improve performance by making the trainees know their job, thus helping the manager and superintendent get top performance from the personnel working under them.

The University of Texas, in cooperation with the Texas Educational Agency, has recently completed a two-volume work entitled, Grocery Checking Procedures. These two volumes are intended as guides to instructors in checking procedures.

A sample of this work is taken from the outline section entitled, "Actual Checking Procedure":

5. Check remaining Grocery department items on cash register. Grocery items are more conveniently checked first, and after checking are ready to be placed in the bottom of the bag or box.

    a. Depress Grocery Department key with first finger of right hand, placing the left hand on the first item to be checked.

b. Record the amount of that item as follows:

(1) Use thumb to depress keys:

1¢ through 4¢
10¢ through 40¢
$1 through $4

(2) Use first and second fingers to depress keys:

5¢ through 9¢
50¢ through 90¢
$5 through $9

c. Roll right hand to the right and depress the motor bar with the heel of the right hand. This records the price charged on the customer's register receipt.

d. Slide item recorded down the counter as far to the left of the line as possible. If a packer is working with the Checker, this movement of the merchandise tells the packer the item has been recorded and is ready for packing. USE BOTH HANDS to record and move merchandise.

The use of an emphatic motion and the sound of the register will make the customer realize that the item being moved by the right hand is the one being recorded by the right hand. The indication at the top of the register shows her that the item has been correctly registered.

e. Bottled items should be checked next and the customer should be charged for the container as well as the merchandise. Care should be used in handling all merchandise; items should never be slammed on the counter, nor be moved too vigorously down the counter.

f. Breakable items such as eggs, glassware, or merchandise packed in glass should be checked next.

g. Record all nonbreakable merchandise remaining from the Grocery department.[3]

A further section gives instruction on packing of customer's purchases:

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3 The University of Texas, Grocery Checking Procedures, the University of Texas, Division of Extension, in cooperation with the Texas Educational Agency, Vocational Division, p. 67.

D. PACKING OF CUSTOMER'S PURCHASES

1. Ask customer which would be more convenient, bag or carton.

a. Packing merchandise in bags. (Do not pop bags open in customer's face. Do not use a bag when a carton or box will do.)

(1) Have adequate stock of all different sizes of bags (saves needless waste.)

(a) Use correct size bag. When too small, bags split; when too large, they are hard to carry.

(b) Do not attempt to squeeze merchandise into a bag that is too small.

(2) Place heavy nonbreakables snugly in the bottom of the bag.

(a) Builds a solid foundation
(b) Helps to keep bag open
(c) When heavy items are not placed in bottom of bag, the bag might topple over, or tear, causing damage to merchandise and delay and annoyance to customer.

(3) Place meat next.

(4) Place yeast and butter wrapped in heavy paper in a sack to prevent absorption of odors and flavors. Place on top of order.

(5) Place bottles of milk in a proper size sack before packing it in a larger paper sack. (Moisture weakens sacks.)

(6) Place bread and produce next.

(7) Eggs, light globes, glassware, potato chips, etc., should be placed on top so that they will not be broken. Such items are frequently placed in separate sacks before packing.

(8) Foods with liquids in paper containers should be individually sacked and handled separately.

(a) Might spill
(b) Moistness weakens sacks
(c) Might soil customer's clothing

(9) Place large sacks of flour in a separate sack. Keeps flour dust off customer's clothes and car.

(10) Remember can keys if merchandise purchased requires such.

b. Packing merchandise in cartons.

(1) Use cartons whenever possible. (Saves expense.)

(2) Keep adequate supply on hand.

(3) Follow same procedure as for packing customer's order in a bag.

2. Place Cash register receipt in customer's package unless requested otherwise.

a. Push down inside bag or carton.

b. Permits customer to check order at home.[4]

These outlines can be used as reference for checking procedure and form an excellent background for the development of a checker-training program. Therefore, for those companies who wish to initiate such a program, there is ample material currently available.

The advantages of a company training program are many. Standardization of the best checking operation is encouraged. Adequate follow-through helps to spot weak points and improve efficiency. New employees receive instruction in the correct methods at the start. Such a program also provides direct communication between the rank and file and headquarters. It provides a good opportunity to spot the employee with above average ability, who, in a large organization, could be overlooked.

4 Ibid, p. 70

CHAPTER VI

SUMMARY AND CONCLUSIONS

The check-out operation presents a major problem in the operation of a modern super market. The best check-out arrangement must be a combination of equipment and personnel which meets needs from three different points of view: (1) the customer, who wants fast, accurate checking, careful handling of merchandise by checker and bagger, and friendly, courteous treatment; (2) cashiers (or checkers), who want equipment which will facilitate fast and accurate checking and sacking of merchandise and which will reduce, as far as possible, the fatigue element; and (3) the owner, who wants a system which will show a competitive advantage, will increase sales, reduce the cost of the check-out operation, increase accuracy, and save space.

Since the check-out problem is very nearly universal in self-service food retailing, a number of solutions have been proposed. These include improved training of cashiers, elimination of all but the cashiering functions from the check-out operation, additional personnel at each checkstand to assist in arranging and sacking merchandise, many variations in the construction of checkstand units, and various mechanical contrivances designed to speed checking and to reduce over-all shopping time.

Experiments have been conducted to evaluate many of the suggested changes and innovations. The United States Department of Agriculture has recently completed a comprehensive study of the problem. Several food retailers have conducted similar experiments, and some of their findings are currently available.

Many current reports on comparative checkstand efficiency are derived from surveys in which no attempt has been made to control the variables that may distort the results. The following factors must be equalized or compensated for: (1) the size of the order; (2) the composition of the order: (3) the flow of traffic; (4) the difference in personnel.

The United States Department of Agriculture, in the study of the check-out problem, recognized all of these variables and controlled them in the following manner. The operation was broken down into its detailed component parts, called elements. Each element was timed for a large number of successive orders and the average time was used as a basis for developing the performance figures for the operation. A rating factor was applied to the average elemental times for each operator studied, this factor being based on the effective speed at which the operator worked. The rating factor was applied to the average time for each element in order to convert actual performance of the operator studied to expected performance by the average operator working with a standardized method. A fatigue and personal allowance of 15 percent was applied to the sum of the various elements for each time study. The average order contained 14.29 ring-up items. For comparative purposes, all standards were developed to conform with this size of average order. Orders per hour was used as the unit of measurement. All phases of the study were standardized to conform to specific operating conditions. Thus, with the method standardized, speed alone controlled variations in elemental times between trained operators.

The above study is an example of how scientific methods may be used in determining check-out efficiency. It is questionable, however, if a food chain can afford to make such a comprehensive and exacting study. Trained technicians and an ample budget would be necessary.

Recently a large retail food chain completed a study ("The Chain Store Study") of check-out operations. This serves as an example of how a chain may obtain valid results and still hold expenses to a minimum.

Four checkstands were tested. A large well-lighted room was used for the experiment; one of each type stand was set up in the room. As this did not duplicate actual operating conditions, it must be realized that the results are comparative under these conditions only. Variables in the operation were held to a minimum. The same twelve orders, averaging 18 items, and six dollars, were used on all four checkstands tested. In all tests orders were delivered as rapidly as operators could handle them. Personnel factors were controlled.

The food chains can, therefore, test checkstand performance in a relatively simple and inexpensive manner. The purpose of "The Chain Store Study" was to determine which type checkstand gave the most efficient operating performance. The management of the particular chain was well-satisfied with the survey and the methods used in the testing.

The importance of personnel training in the check-out operation must be emphasized. The checker may be the only store employee with whom the customer comes into contact when shopping in a super market. The impression that the checker leaves with the customer will often determine her preference for the store. It is, therefore, extremely important that the checker receives proper training in the performance of her duties.

No one single checkstand can be chosen as the best system under all conditions. Differences in the operating conditions and policies of super market organizations and the varying conditions in the thousands of stores make it almost impossible to select that one unit which will

satisfy all the objectives of an efficient operation. Specific types of checkstands should be adapted to varying volumes of operation. Chain operators especially can realize more efficient performance by installing in each separate store that type of checkstand which will adapt itself most readily to the store's volume and the weekly pattern of operation. The current trend is toward mechanized conveyor units; the older conventional unit is fast becoming out-moded.

In delegating personnel to checkstand operation the following schedule should be followed to increase checkstand production:

1. Open additional checkstands, operated by a cashier alone, as increased customer traffic enters the store, instead of waiting until lines begin to form at checkstands already in operation.

2. Add baggers on the same basis until all checkstands have a cashier-bagger team.

3. Next, add unloaders (expediters) on the same basis until all stands are manned by teams of three: unloader, cashier, and bagger.

4. Finally, add a second bagger.

5. Use the most competent help available as cashiers.

6. Place the next most competent help in the position of unloaders.

7. Segregate carrying out orders from the check-out operation.

In the future the check-out operation will receive considerably more attention. Operators realize today more than ever before its importance in the entire super market operation. An efficient check-out operation acts as a salesman in building good-will for the individual super market. In a recent weekly news magazine the following articles point out the development of new features in the check-out operation:

In Eugene, Oregon, the Big Y store installed four "Rest-a-Checks" at the check-out stations so that customers could take it easy while waiting to pay bills. The Rest-a-Check is a circular turntable divided into three sections, each with a foam rubber seat big enough to hold three people. When the check-out clerk is ready, he presses a lever which rotates the seats in merry-go-round fashion; the customer pays sitting down.[1]

The second article stated:

In a glass and marble building just outside Philadelphia last week, the Baltimore Markets Chain (25 stores) opened what it called "the world's largest super market". Inside the $1,000,000 air-conditioned building were such customer come-ons as a television lounge, haberdashery, glass-enclosed bakery, luncheonette and a fancy "cosmetics bar".

But it was at the check-out counters that customers got their pleasantest surprise. As they filed past the bank of 18 cash registers, their purchases were put on a 500-ft. conveyor belt leading underground to the five-acre parking lot outside. Car owners simply drove to the belt unloading point, presented their numbered sales slips, and had their purchases loaded into their cars. The new super market's first four-day total: 170,000 customers, more than $200,000 in sales.[2]

The above developments show the trend toward greatly improving the check-out operation. While it will be a long time before such developments are common-place, their present existence shows the great possibilities in improving the efficiency of the operation toward providing better and faster customer service and resulting higher turn-over.

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