

THE HOWARD WAY LETTER

A guide for improving productivity in warehousing and distribution

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“MEND THE WAYS OF YOUR ERRORS”



Please excuse the slightly twisted biblical warning but do heed the message. The message is as follows: Know

where your errors are coming from and recognize their impact on your goals. From our exposure at seminars and consulting assignments, we are quite sure that the level of sophistication in error control is very low. And this also applies to our larger and better known clients as well. When we ask for a show of hands to indicate how many actually know their error rate, the response is minimal. Not enough distribution operations are aware of their real error rate. Equally sad is the level of error that people feel is acceptable. A sophisticated operation would be shocked at the error level set as a goal by some operators.

Our points to be made in this treatment are that it is necessary to

be aware of the real cost of an error and that a seemingly low rate can amount to a major leak in profitability. A saving, a waste or an error may be small in itself, but when multiplied by many occurrences can be of impressive magnitude and may indeed be the difference between profit and loss. The very best way to reduce errors is to not make them in the first place! There is an old saying that says “an ounce of prevention is worth a pound of cure”. taken literally; one dollar spent preventing errors should remove the necessity for sixteen dollars spent on correction. In today’s metric world, we would also endorse the new saying that “one ‘gram of prevention is worth a kilo of cure”. This improves the benefit ratio to 1000 to one and in truth this may be even closer to the need and power of prevention. This reasoning holds true when attempting to reduce errors by improving the picking methods and techniques. This is not only more

cost effective than rigorous inspection, it is easier to do. Remember this, the calculated cost of an error in a system multiplies rapidly when the many thousands of opportunities for error are considered.

Although the reasoning used in this article applies equally well to case or unit load picking errors, it is intentionally directed towards broken case or repack case type of order selection. We feel that this area has received too little attention in the past.

ERROR REDUCTION

There are some obvious approaches to error reduction, i.e., lessening the number of selection errors that actually leave the warehouse. The first, and probably the

most popular, is by checking the picked orders. Another as mentioned above is to improve the picking situation.

CHECKING

This is an operational solution that has the dubious advantage of requiring little or no top management approval. Error complaints are received, so checking is initiated. It requires no capital expenditure, and, even though it may cost more in the long run, it can help to stop the complaints. Furthermore, it *may* somewhat influence the care taken in picking, by letting the stock selectors know that their work is being checked for accuracy. The pros and cons of checking have been covered elsewhere (see HWL Vol 1, No 5 "Checking vs No Checking, and No 6 "Is Checking a Profit Leak in Your Warehouse?).

IMPROVE PICKING

Another technique is to modify the picking environment and its control by such salutary efforts as improved lighting, more legible labels, a good locator system and sequenced pick documents. This starts to cost money, thereby entering the realm of investment that must be economically justified. More radical changes; mechanized picking equipment such as mini-load systems, flow rack with computer controlled pick sequence indicators, automated order pickers and carousels, represent a large investment and must be thoroughly justified in hard dollars and savings. In addition to the savings due to labor productivity increases and space utilization, there is a real saving,

often overlooked, which is due to the reduction in errors at the source. It is the evaluation of that saving (or, more properly, the avoidance of cost) to which this article is directed.

ERROR TYPES

Looked at analytically, there are only four types of errors: errors of count, errors of substitution, errors of omission and the error in which an item is included that was not ordered at all. All error problems are variations on these four themes. The most frequent offender is the error of substitution, followed by the error of count. Third in frequency is the omission of an entire item, and last comes the (fortunately rare) case of inclusion of an item unordered.

ERROR OF SUBSTITUTION

This is normally hard to detect with anything less than a 100% item and count check. If a piece count is the checking method, all will appear correct until the consignee performs his receiving count. This is also one of the more complicated and therefore more costly errors to correct, as it involves a credit for the missing item, a billing and/or a return freight for the item substituted and, often, premium priced outbound freight for the re-ship of the item originally ordered.

ERROR OF COUNT

For full case picking, the error of count is relatively easy to discover, because the total number of

cases is known, and individual item counts will add up to the total. In the instance of a split-case order, the possibility of an item miscount going undetected is greater. Split cases can be subject to substitution errors as well. This, combined with the laborious detail of checking split-case orders, makes the concept of avoidance far more desirable than that of catching errors later.

ERROR OF OMISSION

This is the one that you will hear about in loud clear tones. The customer complains, the credit must be given, the phone calls placed and the special delivery arrangements made. It is not only costly but harmful to the company image as well.

ERROR OF INCLUSION

The error of including items not ordered generates a no win situation. First of all, to all intents and purposes, there is no such thing as an over-shipment; not for an over-count and not for an item that does not appear on the invoice. Human nature being what it is, it is rare for a customer to point out that you have sent him goods for which he has not been charged. In this case, you have lost the pick labor, the merchandise and the freight. Depending on the merchandise cost, this expense grows rapidly and never shows up on a cost control statement.

ASSUMPTIONS

The assumptions are spelled out in detail so that you may change them, line by line, to suit your own conditions. It is important to note that the sensitivity of these assumptions is such that they may be drastically changed and still develop a shocking cost per error.

LABOR COST:

- Warehouse labor = \$14.00, per hour including fringes.
- Customer service labor = \$18.00 per hour including fringes.
- Cost to produce 1 business letter = \$30.00.

TRANSPORTATION COSTS:

- 5 pound package via Fedex overnight = \$32.50..
- 5 pound package via Fedex 2nd day = \$17.00.
- 2 pound overnight express mail, USPS = \$9.35.

PRODUCTIVITY:

- Customer service time = .5 hour per complaint.
- Single pick from bin = .033 hours per piece as part of regular selection cycle.
- Pack a split carton = .1 hour or .005 hours per piece.
- Special trip to pick from a bin = .1 hours per item.

ERRORS :

- All shortages are errors of substitution, i.e., the overall piece count is right.
- Selector error rate = .2%, or 2 per 1000 picks.
- Shortages claimed by consignee = 100%.
- Overages reported by consignee = 50%.
- Orders with shortages = 55%.
- Orders with overages = 45%.
- Two errors per complaint.

ORDER PROFILE:

- 10 line items and 20 pieces per order.
 - 10 pounds per repack case.
 - Average weight per item = 10/10 = 1 pound.
 - 500 orders per day.
- Value per piece = \$6.00.

THE ELEMENTS OF COST

The following elements of cost are those associated with the types of errors defined above. Each element is related to an individual error, and each is real and tangible. It should be noted that none of the elements defined imply a savings based on overhead. Each is related to a direct and real cost, and, to the best of our ability, has had such items as management burden removed. It is a common error when

justifying an investment to use labor or equipment rates that include a distributed share of burden. The huge savings thus developed must be discounted, because using a machine or facility fewer hours does not reduce the overhead, it merely distributes that same overhead on a smaller base.

It is our feeling that the total cost per error developed below is remarkable. To some it may even appear incredible. It may be modified by changing the assumptions or whole elements of cost may be arbitrarily discarded, and the total error cost is still frightening and should inspire the warehouse manager to search for ways of decreasing the error rate.

A. Cost of Picking and Packing Over-shipped Goods

This is the cost of picking and packing an item that need not have been picked. This cost will disappear into overhead or the overall labor budget, but it is nevertheless real. For each piece, pick + pack = .033 + .005 = .038 hours. .038 x \$14.00 = \$.53.. Since only 45% are overages, multiply \$.53 x .45 = \$.24 per error.

B. Cost of Re-picking and Re-packing Shortages

This is the cost of a separate or special selection that occurs after the warehouse is notified of a shortage. It is conservatively estimated at .1 hour or 6 minutes per error. \$14.00 x .1 = \$1.40; since only 55% are shortages, multiply by \$1.40 x .55 = \$.77 per error.

C. Cost of Shipping Overages or Substitution Errors

This is the cost of shipping something that need not have been shipped. Consider only the incremental increase at an average of \$.75 per pound.(Example, 2nd day Feed for 1 pound= \$13.00, 5 pounds is \$17.00, average per pound increase is \$.75) Average weight per item is 1 pound. $1 \times \$.75 = \$.75$ per error.

D. Cost Of Returning Errors

This is the cost of returning the goods over-shipped via UPS collect. Since this will only happen 50% of the time, the result must be halved. The goods will travel at the pound minimum rate. One pound minimum = \$2.00. $\$2.00/2 = \1.00 per error.

E. Cost of Special Shipping of Shorted Items

If these are items urgently needed by your customer, you will salvage your reputation by shipping air freight or overnight delivery via US Postal Service. USPS costs \$9.35 minimum for a two pound package. One pound at the minimum rate = \$9.35 per error. Since only 55% of the errors are shortages, $\$9.35 \times .55 = \5.14 per error.

F. Cost of Correspondence

The cost of a business letter is estimated by office automation experts to be \$30.00. Since there is an average of two errors per complaint, the cost is divided by two. Cost = \$15.00 per error

G. Cost of Customer Service

A conservative estimate of the telephone and expediting time spent by service personnel is one half hour per complaint. Since there are two errors per complaint, the cost is $(\$18.00 \times .5)/2 = \4.50 per error.

H. Cost of Issuing Credit or Refund

The cost of the paperwork required to issue a check and/or a credit memo is conservatively estimated at \$30.00. If you think that is high, try to get a refund check signed by the owner of a privately held company. Because there are two errors per complaint, the cost per error is \$15.00. Since only 55% of the errors are shortages, the cost = $\$15.00 \times .55 = \8.25 per error.

I. Cost of Unreturned Overages or Substitutions

This is the lost cost from unreported over-shipments. Since 45% of the errors are over-shipments and only half are returned, the loss is the item value $\times .45/2$. If only one piece over is shipped per error, $\$6.00 \times .225 = \1.35 per error.

J. Cost of Checking

This cost will not be considered here so that the cost of errors made can be analyzed and compared to the cost of either preventing them or catching them with a checking system. For a discussion of relative checking costs, see HWL Vol I, Nos. 5 and 6. It is axiomatic that there is no such thing as a zero error rate for goods leaving the warehouse. This is true even with a 100% item and count checking sys-

tem. If an error is not made (i.e., if it is prevented), it cannot leave the warehouse. An error made can and will slip past the most stringent checks.

THE COST OF AN ERROR

If the assumptions made are reasonable, it follows that the cost per error is constant for any given number of errors. The only variable is the value of the merchandise, and, unless you are shipping diamonds, this is one of the smaller elements. In spite of our emphasis on tangible costs, there are circumstances when the intangible cost of an error overrides all else. If the product is a piece of life support equipment or a critically needed medicine, then life or death may literally depend on selection accuracy.

Adding the various cost elements will yield an approximation of the total cost per error. **Thus Dollar cost = A + B + C + D + E + F + G + H + I = \$37.25**

For our assumed situation of 500 orders per day with an order consisting of 10 line items, we assumed an error rate of .2%. This yields a probable error figure of 10 errors per day on the 5000 line items picked (500 orders \times 10 line items per order \times .002). The cost per day is $10 \times \$37.25$, or approximately \$372.50 per day. For a five-day week, this is \$1862.50 per week, or **\$93,125.00 per 50-week year**. This figure is developed using a very low error rate. The total goes up directly as the error rate increases (see Figure 1, Error Cost vs Error Rate). If we consider a

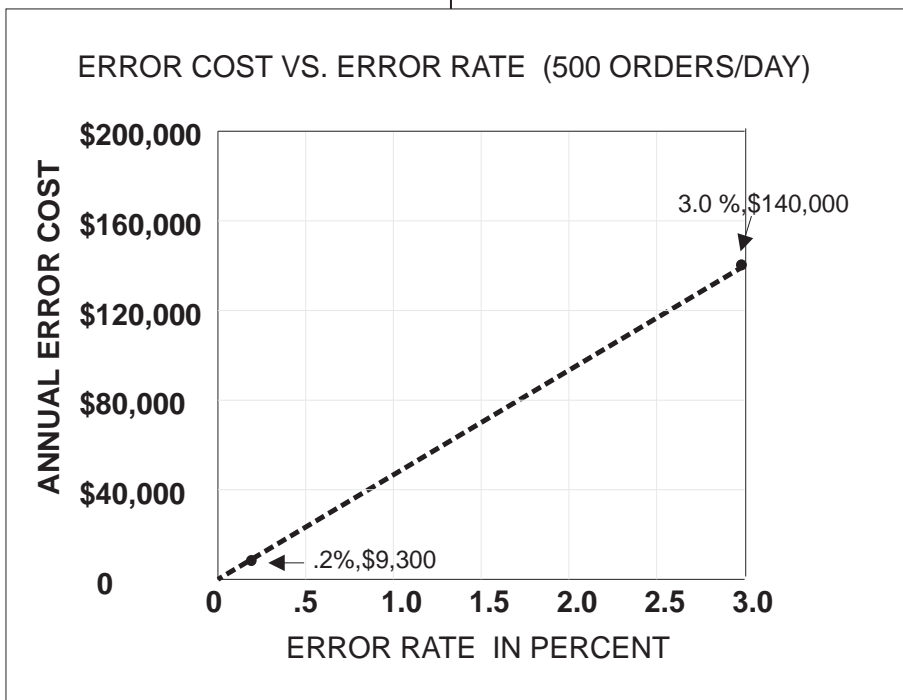


Figure 1 Error Cost Vs Error Rate

fixed error rate but assume varied levels of activity, the cost obviously rises in direct proportion to the activity (see Figure 2, Error Cost vs Activity).The hidden drawback here is that if activity increases are achieved through overtime or a second shift, the error rate will probably increase as well, and the total cost of errors will leap up at an even greater rate.

A final graph illustrates the effect of merchandise value on error cost (see Figure 3, Error Cost vs Merchandise Value). It may be interesting to note that the annual cost is more than \$8,000, even for items of no dollar value. As the value goes up, it makes a significant contribution to the total annual cost of errors. Also note that this chart assumes an error rate of .02% (nice and low).

ORDER CHECKING

As we stated earlier, we have no argument with checking as one way to reduce the number of errors, but we repeat that the cost effective way to reduce errors is to prevent them in the first place. A true compromise is probably the best solution, with the proper amount of checking to minimize net costs (see HWL Vol I, No 6 “Checking vs No Checking”). In truth, if you do no order checking at all, you do not have access to a most important piece of information—your error rate. A shocking number of distribution warehouses have absolutely no idea of their actual rate of error. Without this piece of information, it is impossible to make an economically sound decision about error reduction or about the amount of checking that is cost effective. This state of affairs exists even in situations

where extensive checking is done but records are not kept of those errors that have been caught.

We strongly suggest that the first step is to log the errors caught and corrected. This may be accomplished by either a statistical check on accuracy or a 100% item and count check. This can be done on a temporary basis long enough to develop a measure of the error rate in order selection. The checking operation may then be modified, dropped or continued, based on the economic trade-off of error cost versus checking cost. **At any rate, a gauge of the error rate is a necessity in order to reduce the error rate.**

YOUR ERROR COST

Now that you have determined the error rate for your operation, it should be possible to estimate the annual cost of errors in your specific situation. If the following steps are taken, the results will be close to the actual annual error cost.

STEP ONE

Carefully review the cost elements presented above. Modify the elements to meet your conditions. For example, if you have no customer service people, and you are positive that no one else is doing that job, strike item “G.. If you do not make up shortages by courier freight, strike item ”E”. If your productivity figures are higher or lower than those which we assumed, change them Modify the pay rates to match those prevalent in your operation. In short, make

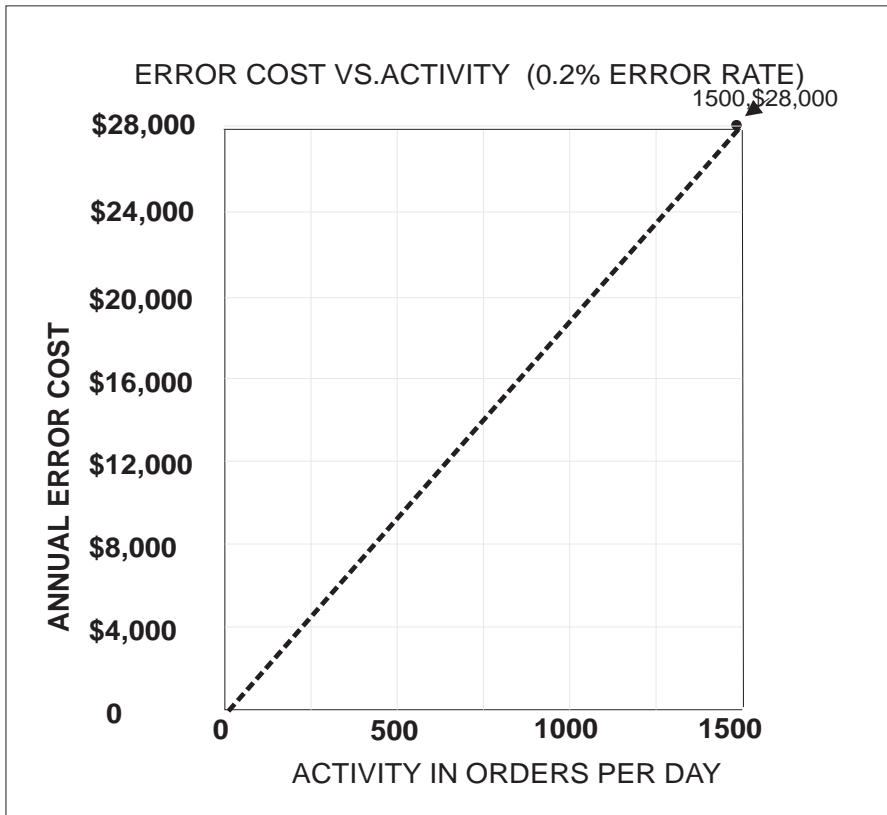


Figure 2 Error Cost Versus Activity

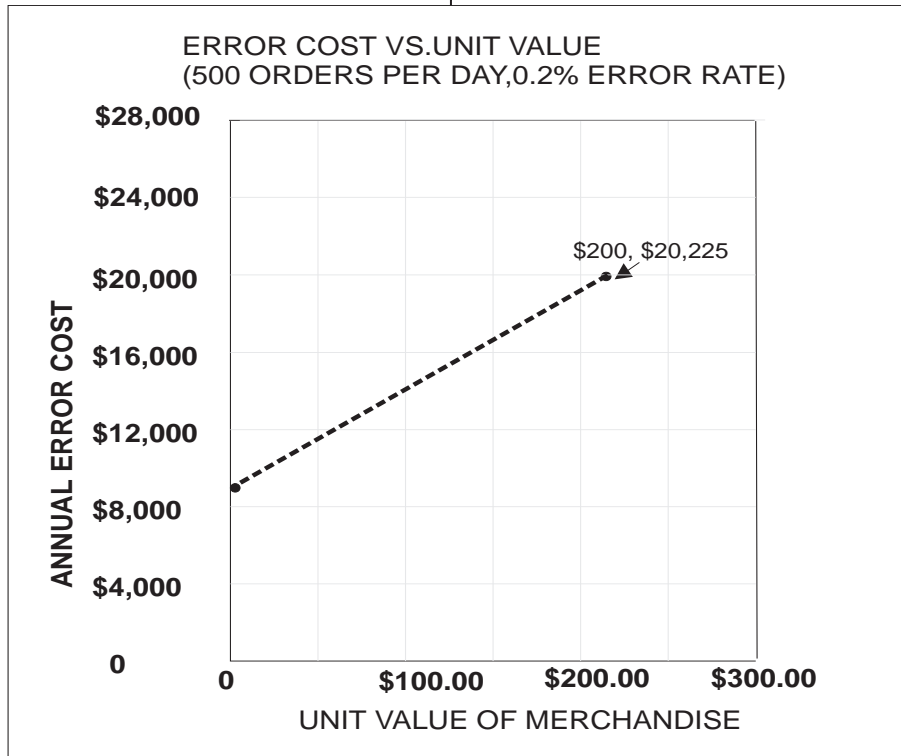


Figure 3 Error Cost Vs Merchandise Value

the assumptions and the cost elements directly applicable to your specific situation.

STEP TWO

Analyze a typical group of orders in order to develop information pertaining to the number of line items per order and the number of orders per day.

The number of orders per day multiplied by the line items per order will yield an approximation of the picks per day. Determine the average value per item in dollars for the selection unit. Take into consideration the fact that the selection unit may be a case, a small carton or a single unit.

STEP THREE

Use the following formula to evaluate the annual cost of errors (the letters "A" through "H" refer to the cost elements outlined previously.):

$$\text{ANNUAL ERROR COST} = (\text{ORDERS PER DAY}) \times (\text{LINE ITEMS PER ORDER}) \times 250^* \times (\text{ERROR RATE}) \times [A + B + C + D + E + F + G + H + (.225 \text{ MERCHANDISE VALUE})]$$

If all the cost elements are acceptable as we have stated them, the formula becomes:

$$\text{ANNUAL ERROR COST} = (\text{ORDERS PER DAY}) \times (\text{LINE ITEMS PER ORDER}) \times 250^* \times (\text{ERROR RATE}) \times [\$35.90 + .225 \times \text{MERCHANDISE VALUE}]$$

*250 days per year

When adjusted to reflect conditions as they exist in your company, these two formulae will tell you the annual cost of errors.

CASE HISTORIES

In preparing this article, we had the opportunity to discuss error costs with a number of different managers in greatly varied situations. We feel that their experiences verify the observations made in this issue—that is, that errors are expensive to catch and are even more expensive to correct. One of the cases described below is a large distributor of specialty items sold in variety stores. It is interesting to note that certain costs discussed above are either insignificant or ignored by that company's management, and, despite an apparently small error cost, the admitted annual cost is impressive.

The second case is the result of our consultation with a number of mail order distributors; it presents the results in a composite or simulated form to illustrate the magnitude to be expected in similar situations. Again, we stress that the way to find the magnitude of your error costs is to go through the exercise we have outlined and tailor the assumptions to a point where they are realistic to you and your management.

Since notable differences occur in the amount of checking performed, we will not consider it as part of the equation determining error costs. Do not forget, however, that checking can generate high costs which can be reduced as the number of errors decline. In both the composite example and that of

the specialty distributor, the level of activity is high, the merchandise varied and the orders represent a wide range of items picked in single units.

SPECIALTY DISTRIBUTOR

This operation picks 90,000 pieces per day. Their documented error rate is about .5%, as shown by a statistical check. Since the checkers only correct the small sample that passes through their hands, almost .5% of the errors leave the warehouse uncorrected.

Although the cost per error is probably not as great as it is for the composite mail order example which follows, there are many more errors that leave the warehouse. The major costs in correcting an error are the salesman's time in writing a request for credit (.05 hours at \$20.00 per hour = \$1.00) and the cost of issuing the credit (accounting and data processing, .1 hour x \$15.00 per hour = \$1.50). At a conservative estimate of only \$2.50 per error, the total exceeds \$100,000.00 per year.

The warehouse manager further stated that they would reduce the checking effort if they could approach their goal of .1% error. Incidentally, this would reduce the cost of errors by close to \$80,000 per year.

COMPOSITE MAIL ORDER OPERATION

From our conversations and interviews with mail order operations managers, we have developed the following assumptions as a base

for predicting a realistic error cost. Some of these differ from the cost elements mentioned above because they refer to a specific type of business and involve actual data from a number of mail order distributors.

- Orders per day = 5000
- Items per order = 3
- Merchandise value = \$20.00 per item
- Error rate = .4%, or 4 errors per 1000 selections
- Cost to repick an order = .1 hours x \$10.00 per hour = \$1.00
- Cost to repack an order = .1 hour x \$10.00 per hour + \$.35 for packing material =
- Average UPS cost per order = \$2.00
- Average customer service cost = .2 hours x \$12.00 + telephone call = \$2.40 + \$1.25 = \$3.65 (Note that we have assumed no letter writing cost and that all communication is handled by phone.)

By using our composite data, we can generate the cost elements described above.

A. Cost of Picking and Packing Overshipped Goods : (\$ Pick + \$ Pack) x .45 = \$2.00 x .45 = \$.90

B. Cost of Re-picking and Repacking Shortages: (\$ Pick + \$ Pack) X .55 = \$1.10

C. Cost of Shipping Overages or Substitution Errors: Incremental UPS cost @ \$.08 per pound = \$.08

D. Cost of Returning Errors:
50% of the time at \$2.00 UPS
Cost = \$1.00

E. Cost of Special Shipping of
Shorted Items: 50% of the time at
\$2.00 = \$1.00

F. Cost of Correspondence: We
have assumed no letters to be writ-
ten, therefore no cost.

G. Cost of Customer Service:
\$3.65

H. Cost of Issuing Credit or Re-
fund: \$3.00

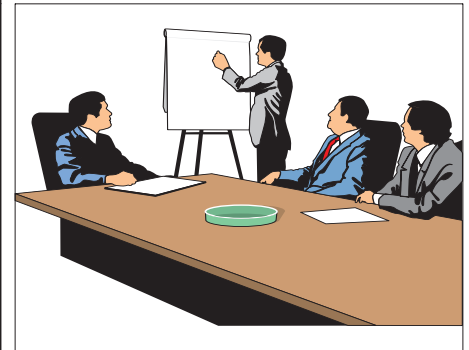
I. Cost of Unreturned Overages
or Substitutions: Since only 45%
are overshipments and only half of
these are returned, cost = $.45/2 \times$
 $\$20.00 = \4.50

**The total of these costs is
\$15.23 per error.** At an error rate
of .4% and 5000 orders per day
with three items per order, the total
errors per year equal 15,000. At
\$15.23 per error, the total cost is
\$228,000.00 per year. Note that
this includes no letters of explana-
tion and no cost assumed for check-
ing. This is a very realistic cost
and partially avoidable by *prevent-*
ing errors from occurring.

All of distribution is a series of
trade-offs. The only way to make a
rational decision is to be aware of
the costs and savings involved.
The techniques that have been dem-
onstrated here should help in devel-
oping an awareness of the trade-
offs involved in error prevention
and error correction.

Error avoidance is very differ-
ent from error discovery and cor-
rection, in that some portion of the
errors made will always slip past a
discovery and correction system. In
spite of this, error discovery in the
form of order checking prior to
shipment is the most popular
“band-aid” for excessive errors.
Perhaps this is because error costs
seem trivial compared to the cost
of the equipment and systems to
prevent them. It is interesting to
note that whenever a system or
piece of hardware with an error re-
duction capability is proposed, it is
described as “an improvement in
customer service”, a nice, but in-
tangible advantage. We believe
that this a significant misstatement,
and we hope to convince our read-
ers that **there is strong and tangi-
ble justification for improve-
ments in pick accuracy.**

UNIVERSITY SEMINARS



Fall is here

Despite the date on this issue, fall
is here. We are giving an important
seminars in October and we want
you to know about them well in ad-
vance. Your editor regularly sched-
ules such seminars to help you stay
abreast of the newest technology and
the best practice basics. Often you
will have an employee who would
benefit from exposure to a learning
experience. The particular seminar
will be held under the sponsorship of
The George Washington Univer-
sity in Washington, DC.

AUTOMATING WAREHOUSE OP-
ERATIONS will be held on Octo-
ber 7th through 8th, 1998 at Wash-
ington DC. This course outlines the
methods for designing and imple-
menting an automated system and
goes more heavily into implementa-
tion of computerized and automated
warehouse systems. To register or
for more information please call
800/424-9773 or Fax 202/872-0645
Also see the **GWU Home Page.**

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FOUNDER: HOWARD E. WAY JR.
EDITOR: ARTHUR S. LIEBESKIND, IE, ME
ASSOCIATE EDITOR: PATRICIA GORDON
EDITORIAL AND SUBSCRIPTION OFFICES:
P.O. BOX 5387, BALTIMORE, MARYLAND 21209
TELEPHONES: VOICE 410-542-4446
FAX 410-542-9218