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ABSTRACT

A mechanism is provided whereby individuals who wish to make instructional systems--for example, manuals or papers--available to others may examine in advance the cost factors involved in such an effort. The analysis conducted outlines detailed procedures for scrutinizing total costs, both for reproduction and distribution. The total for the former is comprised of the sum of the costs of: Xeroxing, paper, other supplies, labor, and collating; that for the latter is a function of the costs of accounting, packaging, postage, and handling. Use of the method makes it possible to determine whether it is economically feasible to make available a particular item. (Author/BP)

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INSTRUCTIONAL SYSTEM REPRODUCTION

AND

DISTRIBUTION COSTS

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Instructional System Reproduction And Distribution Costs

A major goal of TAP from its beginning in July, 1971 has been to make available to the educational world, instructional materials developed by individuals or groups who, on their own, could not make these materials or systems available to benefit other educators.

TAP has now identified, to the point where they can be made available to the educational world, several Instructional Systems developed by individuals who, for a variety of reasons, are not able to make their system available to others. Before anyone enters into the business of selling Instructional Systems, it is prudent to stop and examine the cost factors that will be encountered in the reproduction and distribution of these systems.

The reproduction and distribution of Instructional Systems must involve a considerable amount of planning to develop alternative procedures and processes that will keep the cost factors at a point where the Instructional System or product will be economically competitive on the market.

In the analysis that follows, reproduction and distribution costs for producing Instructional Systems are examined in detail. The cost factors identified in this analysis may be useful in determining whether it will be economically feasible to reproduce and distribute Instructional Systems.

Part I
Reproduction Costs

Reproduction costs are the costs of making copies of an Instructional System (IS) from a master copy. In the reproduction process, costs are incurred for xeroxing, paper, supplies, labor and collating.

I. Xeroxing Costs

The costs for xeroxing are based on the use of a Xerox 2400 with the following instructional pricing breakdown:

<u>No. of Copies</u>	<u>Cost per Copy</u>
1-4	.0475
5-499	.005

A. Computations of xeroxing cost for 1, 20 and 400 copies of an Instructional System (IS).

1. Cost for 1 copy of an IS:

1 copy of 1 page of IS material =
1 page @ .0475 = .0475/page

.0475/page x No. of pages in IS = Total Cost

2. Cost for 20 copies of an IS:

20 copies of 1 page of IS material =
4 pages @ .0475 = .19
16 pages @ .005 = .08
Total = .27

.27/pages x No. of pages in IS = Total Cost

3. Cost for 400 copies of an IS:

400 copies of 1 page of IS material =
4 pages @ .0475 = .19
396 pages @ .005 = 1.98
Total = 2.17

2.17/pages x No. of pages in IS = Total Cost

B. Summary of xeroxing cost for 1, 20 and 400 copies of an Instructional System.

<u>No. of Copies</u>	<u>Total Cost</u>
1	.0475 x No. of pages in IS
20	.27 x No. of pages in IS
400	2.17 x No. of pages in IS

II. Paper Costs

Xerox 1524 Dual-Purpose paper was used to compute the paper costs. The following cost based on a 40 carton order were used:

<u>Size</u>	<u>Color</u>	<u>Stock No.</u>	<u>Price per Ream</u>
8 1/2 x 11	White	3R480	\$1.10
8 1/2 x 11	Colored	3R474, 470	1.15
		466, 462	
8 1/2 x 14	White	3R484	1.40

A. Computation of paper costs for an Instructional System.

1. Cost using 8 1/2 x 11 white paper:

Price per ream ÷ 500 sheets per ream = cost per sheet $\$1.10 \div 500 =$
 .0022 per sheet

.0022 per sheet x No. of sheets in IS x No. of copies = Total Cost

2. Cost using 8 1/2 x 11 colored paper:

Price per ream ÷ 500 sheets per ream = cost per sheet $\$1.15 \div 500 =$
 .0023 per sheet

.0023 per sheet x No. of sheets in IS x No. of copies = Total Cost

3. Cost using 8 1/2 x 14 white paper:

Price per ream ÷ 500 sheets per ream = cost per sheet $\$1.40 \div 500 =$
 .0028 per sheet

.0028 per sheet x No. of sheets in IS x No. of copies = Total Cost

B. Summary of paper cost for an Instructional System.

<u>Type of Paper</u>	<u>Total Cost*</u>
8 1/2 x 11 White	.0022 x No. of sheets in IS x No. of copies
8 1/2 x 11 Colored	.0023 x No. of sheets in IS x No. of copies
8 1/2 x 14 White	.0028 x No. of sheets in IS x No. of copies

III. Supplies Cost

The costs of various consumable and non-consumable supplies that are required in the production process can be estimated by prorating the initial cost by the items expected life or number of copies that the given item will yield. The following supply items and estimated cost are derived from initial costs and prorated life and usage figures:

<u>Supply Item</u>	<u>Costs for 1000 Copies</u>
Xerox Developer	.25
Xerox Toner	.30
Electricity	.10
Office Supplies (Staplers, paper punches, file cabinets, and expendable supplies, etc.)	.30
Miscellaneous	<u>.05</u>
	1.00

Cost per page of copy = 1.00/1000 = .001

A. Computation of supply cost for 1, 20 and 400 copies of an Instructional System.

1. Cost for 1 copy of IS:

1 copy of 1 page of IS material =
1 page @ .001 = .001 per page

.001 per page x No. of pages of IS = Total Cost

*These total cost formulas can be used regardless of whether printing is done on one side of a page or on both sides because they are based on the number of sheets of paper used in the IS. If printing is done on only one side of a sheet the total cost formula becomes: cost factor x No. of pages in IS x No. of copies.

2. Cost for 20 copies of an IS:

20 copies of 1 page of IS material =
20 pages @ .001 = .02 per page

.02 per page x No. of pages in IS = Total Cost

3. Cost for 400 copies of an IS:

400 copies of 1 page of IS material =
400 pages @ .001 = .40 per page

.40 per page x No. of pages in IS = Total Cost

B. Summary of supply cost for 1, 20 and 400 copies of an Instructional System.

<u>No. of Copies</u>	<u>Total Cost</u>
1	.001 x No. of pages in IS
20	.02 x No. of pages in IS
400	.40 x No. of pages in IS

IV. Labor Costs

The labor costs are based on a person who receives \$450. per month. On an hourly basis, the \$450. per month, plus 15% for benefits, works out to \$2.94 per hour. The work process of the person doing the reproduction work is as follows:

1. Retrieve the master copy.
2. Set up the machine.
3. Run the copies.
4. Remove copies from machine, check for completeness and quality, and staple.
5. Refile master copy.
6. File copies.

The time to do the first two and last two parts of the production process, steps 1, 2, 5 and 6 are independent of the number of pages in the Instructional System. Because they are independent, the cost involved for a particular number of copies run will be constant.

The time to run the copies and to remove, check and staple is dependent on the number of pages in the IS and the costs will therefore vary with the IS length.

The formula for labor costs, therefore, consists of two parts, one for the constant costs, and one for the variable costs. The formula is:

Constant costs + Variable costs x No. of pages in IS = Total Costs

A. Computation of labor costs for 1, 20 and 400 copies of an Instructional System.

1. Cost for 1 copy of an IS:

a. The times to do each step in the reproduction process are:

1. Retrieve master = 2 minutes
2. Set up machine = 2 minutes
3. Run copies = .175 minutes per IS page

It takes 7 seconds for each page in the original to be copied by the Xerox machine. Allowing 50% for machine difficulties, it takes 10.5 seconds or .175 minutes to run each page of IS material.

4. Remove, check and staple = .025 per IS page

A person can remove, check and staple a 40 page copy in one minute.

Based on this, the time per IS page can be computed as follows:

$$\frac{\text{No. of pages in IS}}{40} \times \text{No. of copies} = \text{Time}$$

for 1 copy the formula is:

$$\frac{\text{No. of pages in IS}}{40} \times 1 = \text{Time}$$

or, $1/40 \times \text{No. of pages in IS} = \text{Time}$

or, $.025 \times \text{No. of pages in IS} = \text{Time}$

5. Refile master copy = 1 minute

6. File copy = 0 minutes

(When a single copy is run, it is assumed that it will go directly into distribution thus, not requiring filing.)

b. The costs involved with the above times are:

1. Constant Costs:

Constant Time portion of process = 5 minutes
(Step 1, 2, 5 and 6 = 2 + 2 + 1 + 0 = 5)

Allowing 15% for inefficiencies and 10% for breaktime, it takes 6.325 minutes or .1054 hours to complete these steps.

.1054 Hrs. @ 2.94 = .31 in Constant Cost

2. Variable Costs:

Variable time per page of IS = .2 minutes
(Step 3 and 4 = .175 + .025 = .2)

Allowing 15% for inefficiencies and 10% for breaktime it takes .253 minutes or .0042 hours to complete steps 3 and 4.

.0042 Hrs. @ 2.94 = .0124 per page of IS

c. The total cost for 1 copy is:

.31 + .0124 x No. of pages in IS = Total Cost

2. Cost for 20 copies of an IS:

a. The time to do each step in the production process are:

1. Retrieve master copy = 2 minutes
2. Set up machine = 2 minutes
3. Run copies = .8875 minutes per IS page

The first copy, as noted above, takes 7 seconds to run. The remaining are run at 1.5 seconds each for a total time of 35.5 seconds. Allowing 50% for machine difficulties, it takes 53.25 seconds or .8875 minutes to run 20 copies of each page of an IS.

4. Remove, check and staple = .5 minutes per IS page

Using the same formula as developed above, the time per IS page is as follows:

$$\frac{\text{No. of pages in IS}}{40} \times 20 \text{ copies} = \text{Time}$$

$$\text{or, } 20/40 \times \text{No. of pages in IS} = \text{Time}$$

$$\text{or, } .5 \times \text{No. of pages in IS} = \text{Time}$$

$$5 \text{ Refile master copy} = 1 \text{ minute}$$

$$6. \text{ File copies} = 1.5 \text{ minutes}$$

b. The costs involved with the above times are:

1. Constant Costs:

$$\begin{aligned} \text{Constant time portion of process} &= 6.5 \text{ minutes} \\ (\text{Step 1, 2, 5 and 6} &= 2 + 2 + 1 + 1.5 = 6.5) \end{aligned}$$

The total time including 15% for inefficiencies and 10% for breaktime is 8.22 minutes or .137 hours.

$$\underline{.137 \text{ Hrs @ } 2.94 = .403 \text{ in Constant Cost}}$$

2. Variable Costs:

$$\begin{aligned} \text{Variable time per page of IS} &= 1.3875 \text{ minutes} \\ (\text{Step 3 and 4} &= .8875 + .5 = 1.3875) \end{aligned}$$

With the 15% inefficiencies and 10% breaktime, it takes 1.75 minutes or .0292 hours to complete steps 3 and 4.

$$\underline{.0292 \text{ Hrs. @ } 2.94 = .0858 \text{ per page of IS}}$$

3. The total cost for 20 copies is:

$$\underline{.403 + .0858 \times \text{No. of pages of IS} = \text{Total Cost}}$$

3. Cost for 400 copies of an IS:

a. The time to do each step in the production process are:

$$1. \text{ Retrieve master copy} = 2 \text{ minutes}$$

$$2. \text{ Set up machine} = 15 \text{ minutes}$$

(Long runs require frequent paper refills in addition to the initial setup.)

3. Run copies = 15.14 minutes per IS page

It takes 605.5 seconds to run 400 copies (1 x 7 sec. + 399 x 1.5 sec. = 605.5 sec.) Allowing 50% for machine difficulties, it takes 908.24 seconds or 15.14 minutes to run 400 copies of each page of an IS.

4. Remove, check and staple = .5 per IS page

Only 20 copies will require this step because the other 380 will require hand collation. Therefore, the time is the same as when 20 copies were run.

5. Refile master copy = 10 minutes

After all copies have been collated, filing will be required for the 400 copies.

b. The costs involved with the above items are:

1. Constant Costs:

Constant time portion of process = 28 minutes
(Steps 1, 2, 5 and 6 = 2 + 15 + 1 + 10 = 28)

Adding 15% for inefficiencies and 10% for breaktime, it takes 35.42 minutes or .59 hours.

.59 Hrs. @ 2.94 = 1.736 in Constant Costs

2. Variable Costs:

Variable time per page of IS = 15.64 minutes
(Steps 3 and 4 = 15.14 + .5 = 15.64)

Adding 15% for inefficiencies and 10% for breaktime, it takes 19.78 minutes or .3297 hours.

.3297 Hrs. @ 2.94 = .969 per page of IS

3. The total cost for 400 copies is:

1.736 + .969 x No. of pages in IS = Total Cost

B. Summary of labor costs for 1, 20 and 400 copies of an Instructional System.

<u>No. of Copies</u>	<u>Total Cost</u>
1	.31 + .0124 x No. of pages in IS
20	.403 + .0858 x No. of pages in IS
400	1.736 + .9693 x No. of pages in IS

V. Collating Costs

The Xerox machine will collate up to 20 copies of an Instructional System in a single run. Any collation of more than 20 copies as with a 400 copy run would require either running 20 copies at a time on the Xerox machine until the desired number of copies were run, or making one run and hand collating all copies after the 20th copy.

A. Computation of collating costs using the Xerox machine for collating 1, 20 and 400 copies of an Instructional System.

1. Cost for 1 copy of an IS:

None: no additional charges above the .0475 per page of IS material.

2. Cost for 20 copies of an IS:

None: no additional charges above the .27 per page of IS material

3. Cost for 400 copies of an IS:

To run 400 copies of an IS, 20 copies at a time, so that the machine does all the collating, would necessitate 20 runs on the machine. Making 20 runs instead of 1 run will change the xeroxing costs as follows:

1 run of 400 = 2.17 x No. of pages of IS material

20 runs of 20 = 5.40 x No. of pages of IS material

(1 run of 20 @ .27 per page of IS material x 20 runs = 5.40 per page of IS material.)

Additional costs to have the machine collate all copies of an IS = 3.23 per page of IS material (5.40 - 2.17 = 3.23)

3.23 per page x No. of pages in IS = Total Cost to have the xerox machine collate.

B. Collating by hand.

The cost to hand collate can be computed by knowing:

- o Number of copies to be hand collated.
- o Cost per minute to hand collate.
- o Collation rate per minute.
- o Number of pages in IS

The formula for Total Cost is:

$$\frac{\text{No. of copies to be collated} \times \text{cost per minute}}{\text{Collation Rate}} \times \text{No. of pages in IS} = \text{Total Costs}$$

1. Computation of hand collating cost for 1, 20 and 400 copies of an Instructional System.

a. Cost for 1 copy of an IS:

None: collation is done by the Xerox machine.

b. Cost for 20 copies of an IS:

None: collation is done by the Xerox machine.

c. Cost for 400 copies of an IS:

1. No. of copies to be hand collated:

400 copies run - 20 collated by machine = 380 copies to be hand collated.

2. Cost per minute to hand collate:

1 minute @ 2.94 per hour	=	.049
15% inefficiency (not a continuous process)	=	.007
Total	=	.056

10% breaktime	=	.006
Total	=	.062

Cost per minute to hand collate = .062

3. Collation rate per minute:

The collation rate per minute is the number of pages that a person can collate in one minute. The rate has been established as 60 pages per minute.

Collation rate per minute = 60 pages

4. Total cost to hand collate:

Using the formula above, the total cost would be as follows:

$$\frac{380 \times .062}{60} \times \text{No. of pages in IS} = \text{Total Cost}$$

$$.392 \times \text{No. of pages in IS} = \text{Total Cost}$$

C. Comparison of machine collation and hand collation costs.

1. Comparison for 1 copy.
No additional costs by either method.
2. Comparison for 20 copies.
No additional costs by either method.
3. Comparison for 400 copies.

From the above costs figures for machine and hand collation, it can be shown that hand collation is more economical than machine collation. The savings per page of IS material are as follows:

Additional cost to have the machine collate	=	3.23
Cost to hand collate	=	<u>.392</u>
Savings by hand collation	=	2.838

D. Summary of collating costs.

Because of the savings involved when running 400 copies, it is preferable to make a single run on the Xerox and hand collate all copies after the 20th copy. Therefore, the collating costs can be computed as follows:

<u>No. of Copies</u>	<u>Total Cost</u>
1	None
20	None
400	.392 x No. of pages in IS

VI. Total Reproduction Costs

A. Total reproduction cost using 8 1/2 x 11 White paper.

Cost per page of IS material
(Constant Cost in parentheses)

<u>Item</u>	<u>1 Copy</u>	<u>20 Copies</u>	<u>400 Copies</u>
Xeroxing	.0475	.27	2.17
Paper	.0022	.044	.88
Supplies	.001	.02	.40
Collating	---	---	.392
Labor	.0124 <u>(+.31)</u>	.0858 <u>(+.403)</u>	.9697 <u>(+1.736)</u>
TOTAL	.0631 (+.31)	.4198 (+.403)	4.8117 (+1.736)

B. Total reproduction cost using 8 1/2 x 11 Colored paper.

<u>Item</u>	<u>1 Copy</u>	<u>20 Copies</u>	<u>400 Copies</u>
Xeroxing	.0475	.27	2.17
Paper	.0023	.046	.92
Supplies	.0010	.02	.40
Collating	---	---	.392
Labor	.00124 <u>(+.31)</u>	.0858 <u>(+.403)</u>	.9697 <u>(+1.736)</u>
TOTAL	.0632 (+.31)	.4218 (+.403)	4.8517 (+1.736)

C. Total reproduction costs using 8 1/2 x 14 White paper.

Cost per page of IS material
(Constant Cost in parentheses)

<u>Item</u>	<u>1 Copy</u>	<u>20 Copies</u>	<u>400 Copies</u>
Xeroxing	.0475	.27	2.17
Paper	.0028	.056	1.12
Supplies	.001	.02	.40
Collating	---	---	.392
Labor	.00124 <u>(+.31)</u>	.0858 <u>(+.403)</u>	.9697 <u>(+1.736)</u>
TOTAL	.0637 <u>(+.31)</u>	.4318 <u>(+.403)</u>	5.0517 <u>(+1.736)</u>

D. Summary of reproduction costs.

1. Using 8 1/2 x 11 White paper

<u>No. of Copies</u>	<u>Total Reproduction Cost</u>
1	.31 + .0631 x No. of pages in IS
20	.403 + .4198 x No. of pages in IS
400	1.736 + 4.8117 x No. of pages in IS

2. Using 8 1/2 x 11 Colored paper

<u>No. of Copies</u>	<u>Total Reproduction Cost</u>
1	.31 + .0632 x No. of pages in IS
20	.403 + .4218 x No. of pages in IS
400	1.736 + 4.8517 x No. of pages in IS

3. Using 8 1/2 x 14 White paper

<u>No. of Copies</u>	<u>Total Reproduction Cost</u>
1	.31 + .0637 x No. of pages in IS
20	.403 + .4318 x No. of pages in IS
400	1.736 + 5.0517 x No. of pages in IS

Part II
Distribution Costs

I. Accounting Costs

The accounting cost for a single order will remain constant regardless of how many copies of an instructional system are ordered. In other words, it costs no more to do the accounting for an order of 30 copies of an instructional system than it does for an order of one copy. The accounting cost will vary though, depending on whether cash is sent with the order or whether the order must be invoiced. It is estimated that 25% of the orders will be received with cash. The other 75% must be invoiced.

In the following, costs are developed for cash in advance orders and for invoiced orders, and finally, an average accounting cost per order is determined based on the 25% and 75% figures.

A. Accounting cost for cash in advance orders.

1. The work process and time for each task must be determined to compute cost. When a cash in advance order is received, the only accounting work that is required is to post the sale to the sales account and file the sales receipt.

Post to sales @ 2 per minute	= .500 minute
File sales receipt @ 5 per minute	= .200 minute
Inefficiencies @ 15%	= .105 minute
Breaktime @ 10%	= .081 minute
Total time per order	= .886 minute or .01476 hours

Accountant supervision time @ 1 hour per 500 orders = .12 minute
or .002 hours

2. The cost of doing the tasks above, based on the time involved is as follows:

$$\begin{aligned}
 .01476 \text{ Hrs. @ } 3.27 (500 \times 1.15 - 176) &= .048 \\
 .002 \text{ Hrs. @ } 6.54 (1000 \times 1.15 - 176) &= .013 \\
 \text{Cost per order} &= .061
 \end{aligned}$$

Accounting cost per order = .061

B. Accounting cost for invoiced orders.

The accounting costs for invoiced orders are based on receiving payment of 55% of the outstanding invoices each month. The above percentage determines how many statements must be sent out. For example, if 1000 orders are invoiced and 55% are paid the first month, 450 statements must be mailed at the end of the month. In the second month, 55% of the 450 previously unpaid invoices or 248 invoices would be paid and 202 statements would have to be sent out at the end of the month. By the time payment is received on all 1000 invoices, 818 statements would have been sent out.

1. The work process and time for each task are:

$$\begin{aligned}
 \text{Post to accounts receivable @ 2 per minute} &= .500 \text{ minute} \\
 \text{File document @ 5 per minute} &= .200 \text{ minute} \\
 \text{Prepare statements:} & \\
 \sum_1^n .45^n &= .818 \text{ statement per order} \\
 \text{Type @ 1 per minute} &= .818 \text{ minute} \\
 \text{Meter, and mail @ 10 per minute} &= .082 \text{ minute} \\
 \text{Receive payment and mark invoice} & \\
 \text{paid @ 2 per minute} &= .500 \text{ minute} \\
 \text{Post to sales @ 2 per minute} &= .500 \text{ minute} \\
 \text{File document @ 5 per minute} &= .200 \text{ minute} \\
 \text{Inefficiencies @ 15\%} &= .420 \text{ minute} \\
 \text{Breaktime @ 10\%} &= .322 \text{ minute} \\
 \text{Total time per order} &= 3.542 \text{ minutes}
 \end{aligned}$$

2. The cost of invoiced order is as follows:

a. Labor costs

$$\begin{aligned}
 .03933 \text{ Hrs. @ } 3.27 &= .1286 \\
 .01967 \text{ Hrs @ } 6.54 &= .1286 \\
 \text{Total} &= .2572
 \end{aligned}$$

b. Paper and form cost for statements

Statement forms @ 6.50 per 100 = .065
Envelopes @ 1.00 per 200 = .005
Total = .07

$$\sum_1^n .07 \times .45^n = .0574$$

c. Postage

.08 per statement

$$\sum_1^n .08 \times .45^n = .0654$$

d. Total Accounting Cost per order = .38

C. As noted earlier, it is estimated that 25% of the order received will have cash sent with the order and the other 75% must be invoiced. Based on this estimate and the costs determined above, the average cost would be .30.

25% x .061 = .015
75% x .38 = .285
Total .30

Average Accounting Cost per order = .30

D. Summary of Accounting Costs.

Accounting costs are based on the cost to process an order rather than on the number of copies sold. Since orders may be either 'cash in advance' or invoiced, an average cost per order must be used for the accounting cost factor in the total distribution cost.

The average accounting cost per order is .30.

II. Packaging Costs

The packaging costs are based on the number of pages of material to be packaged. Material can be sent by manila envelope, jet bag, or box depending on the volume. The following shows type of package and the number of pages each type of package can handle.

<u>Type of Package</u>	<u>Capacity in Pages of Material</u>
10 x 13 Manila Envelope	50
No. 6 Jet Bag	125
8" x 10" x 12" Box	1816

A. Cost using a Manila Envelope. A manila envelope is to be used to mail orders with 1-50 pages of material.

1. Manila envelope 10" x 13"
6.50 per 100 = .065
2. Label 2" x 4"
2.00 per 200 = .010
3. Labor
Package and Mail (includes
breaktime and inefficiency)
8 minutes @ 2.94 per hour = .392
4. Miscellaneous Cost = .032
5. Total Cost = .50

Packaging cost for 1-50 pages = .50

B. Cost using a Jet Bag. A jet bag will be used to mail orders with 51-125 pages of material.

1. Jet Bag No. 6
25.00 per 100 = .25
2. Label 2" x 4"
2.00 per 200 = .01
3. Labor
Package and Mail
10 minutes @ 2.94 per hour = .49
4. Miscellaneous Cost = .05
5. Total Cost = .80

Packaging cost for 51-125 pages = .80

C. Cost using a Box. When more than 125 pages are to be mailed, cardboard boxes are required. A box will hold 1816 pages of material.

1. Box 8" x 10" x 12"
30.00 per 100 = .300
2. Label 2" x 4"
2.00 per 200 = .010
3. Labor
Package and Mail
15 minutes @ 2.94 per hour = .735
4. Tape = .03
5. Miscellaneous Cost = .075
6. Total Cost = 1.15

Packaging cost for more than 126 pages of material=

$$\frac{\text{(No. of pages to be mailed} \div 1816) \text{ru}^* \times 1.15}{}$$

* ru means rounded up to the next whole number. For example, 6500 pages of material would require 3.58 boxes (6500 \div 1816 = 3.58) which in actuality means 4 boxes must be used.

D. Summary of Packaging Costs.

The following table shows the type of package to use, and the cost of packaging based on the number of pages of material involved.

Packaging Costs

Pages	Type of Package	Cost
1-50	Manila Envelope	.50
51-125	Jet Bag	.80
126-up	Box	(pgs \div 1816) ^{ru} x 1.15

III. Postage Costs

Postage costs are dependent upon weight and class of postage used.

The materials used in packaging have the following weights:

<u>Item</u>	<u>Weight</u>
Paper	.16 oz. per page or .01 lbs. per page
Manila Envelope	.6 oz. per envelope or .0375 lbs. per envelope
Jet Bag	.55 lbs. per bag
Box with wrapping	.85 lbs. per box

The Postage rates are:

<u>Class of Mail</u>	<u>Rate</u>
1st	.08 per oz.
3rd	.08 for 1st oz. .02 for each additional oz.
Spec. 4th	.14 for 1st lb. .07 for each additional lb.

A. The lowest cost and highest class of mail are computed as follows:

1. One or two pages of material:

Material wt. = 2 x .16 oz = .32 oz.
Envelope = .60 oz.
Total = .92 oz.

.92 oz. rounded up = 1 oz.
1 oz. first class = .08

Mail 1 or 2 pages First Class = .08

2. Three to 21 pages of material:

Material wt. = 21 x .16 oz. = 3.36 oz.
Envelope = .60 oz.
Total = 3.96

3.96 oz. rounded up = 4 oz.
4 oz. 3rd class = .14

Mail 3-21 pages 3rd class = up to .14

The formula for the postage cost of 3-21 pages is:

$(.60 \text{ oz.} + \text{pages} \times .16)^{\text{ru}} \times .02 + .06 = \text{Postage cost}$

3. Twenty-two to 50 pages of material:

Material wt. = 50 x .01 = .50 lbs.
Envelope = .0375 lbs.

.5375 lbs. rounded up = 1 lb.
1 lb. Spec. 4th class = .14

Mail 22 to 50 pages Spec. 4th Class = .14

4. Fifty-one to 125 pages of material:

Material wt. = 125 x .01 = 1.25 lbs.
Jet Bag = .55 lbs.
Total = 1.80 lbs.

1.80 lbs. rounded up = 2 lbs.
2 lbs. Spec. 4th Class = .21

Mail 51-125 pages Spec. 4th Class = .21

5. One hundred twenty-six and up pages of material:

Material wt. = 1816 x .01 = 18.16 lbs.
Box = .85 lbs.
Total = 19.01 lbs.

19.01 lbs. rounded up = 20 lbs.
20 lbs. Spec. 4th Class = 1.47

Mail 126 and up pages Spec. 4th Class = up to 1.47 per box.

The formula for the postage cost of more than 125 pages is:

Pages of material \div 1816 = Boxes

Full Boxes x 1.47 +

Part Box @ (.85 lb. + Pages x .01)^{ru} .07 + .07 = Postage Cost

B. Summary of Postage Cost.

The table below shows the type of package to use, the best class of mail, and formula for total cost, all based on the number of pages of material mailed.

Pages	Type of Package	Class of Mail	Total Cost
1-2	Manila Envelope	1st	.08
3-21	Manila Envelope	3rd	(.60 oz. + pgs x 16 oz.) ^{ru} +.06
22-50	Manila Envelope	Spec. 4th	.14
51-125	Jet Bag	Spec. 4th	.21
126-up	Box	Spec. 4th	Pgs \div 1816 = Boxes Full Boxes x 1.47 + Part Box @ (.85 lb + pgs x .01) ^{ru}

IV. Order Handling Cost

The order handling cost includes the cost to open orders, typing invoices, batching orders, and the cost of invoices. The costs below are computed as a cost per order processed.

A. Labor Time:

Open orders	@ 6 per minute	=	.10 minute
Type invoices	@ 1 per minute	=	1.00 minute
Batch orders	@ 4 per minute	=	.15 minute
Inefficiencies	@ 15%	=	.19 minute
Breaktime	@ 10%	=	.14 minute
	Total	=	1.58 minute or .0263 hour

B. Costs:

.0263 hours @ 2.94	=	.08
Invoice forms (Quad)		
6.25 per 125	=	.05
Total Cost	=	.13

Order Handling Cost per order = .13

Part III
 Cost Estimates for Selected Instructional Systems

Myrtle Gray, "Writing the Research Paper"

Data: 120 pages of material on 8 1/2 x 11 white paper
 Sales expectation - high volume
 Order size expectation - 30 copies

1. Reproduction Cost.

<u>Copies</u>	<u>Cost Formula</u>	<u>Cost</u>	<u>Average</u>
400	$1.736 + 4.811 \times \text{No. of pgs}$	579.14	1.45

2. Distribution Cost.

<u>Order Size</u>	<u>Cost Item</u>	<u>Cost</u>
30	Accounting	.30
	Packaging (2 boxes)	2.30
	Postage	2.87
	Order Handling	.13
	Total	5.60
	Average	.19

3. Total Cost per IS sold.

Reproduction	1.45
Distribution	.19
Total	1.64

Phil Nelson, "Teacher's Guide for Survival in the Classroom"

Data: 22 pages of material on 8 1/2 x 11 white paper
 Sales expectation - low volume
 Order size expectation - 1 copy

1. Reproduction Cost.

<u>Copies</u>	<u>Cost Formula</u>	<u>Cost</u>	<u>Average</u>
20	$.403 + .4198 \times \text{pgs}$	9.64	.48

2. Distribution Cost.

<u>Order Size</u>	<u>Cost Item</u>	<u>Cost</u>
1	Accounting	.30
	Packaging (manila env.)	.50
	Postage (Spec. 4th)	.14
	Order Handling	.13
	Total	<u>1.07</u>

3. Total Cost per IS sold.

Reproduction	.48
Distribution	<u>1.07</u>
Total	<u>1.55</u>

Denise Lacey, "Shakespearean Sonnet"

Data: 32 pages of material on 8 1/2 x 11 white paper
 Sales expectation - very low
 Order size expectation - 1 copy

1. Reproduction Cost.

<u>Copies</u>	<u>Cost Formula</u>	<u>Cost</u>	<u>Average</u>
1	.31 + .0632 x pgs	2.33	2.33

2. Distribution Cost.

<u>Order Size</u>	<u>Cost Item</u>	<u>Cost</u>
1	Accounting	.30
	Packaging (manila env.)	.50
	Postage	.14
	Order Handling	.13
	Total	<u>1.07</u>

3. Total Cost per IS sold.

Reproduction	2.33
Distribution	<u>1.07</u>
Total	<u>3.40</u>