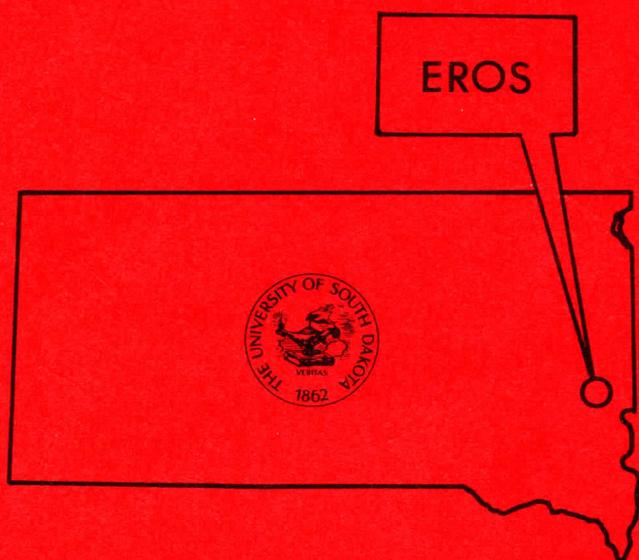


THE EROS DATA CENTER : Its Economic Impact on a Region



Bulletin Number One Hundred Twenty-One
May, 1976

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School of Business

University of South Dakota

Vermillion, South Dakota

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This booklet was printed at a cost of 80 cents per copy. A total of 1,000 copies were printed to provide useful reference materials to persons interested in the EROS Data Center in South Dakota.

THE EROS DATA CENTER:
ITS ECONOMIC IMPACT ON A REGION

Prepared for

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FOREWORD

The primary purpose of this study is to measure the direct and induced effects of the funds generated by the Earth Resources Observation Systems Data Center near Sioux Falls, South Dakota, on the economy of this region.

The EROS Data Center is located 16 miles northeast of Sioux Falls, South Dakota. It is administered by the Geological Survey and its purpose is to apply remote-sensing techniques to the inventory, monitoring and management of resources. The principal functions of the Center include the storage and reproduction of data, and user assistance and training.

The methodology of this study is a unique technique of multiplier analysis. In addition to measuring the economic impact of this new facility on the economy of this section of South Dakota, the information should be of value as a guide in the preparation of similar studies in other areas.

V. E. Montgomery, Director
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INTRODUCTION AND PURPOSE

The Earth Resources Observation Systems (EROS) program of the U. S. Department of the Interior was created in 1966. It is administered by the Land Information and Analysis Office within the Geological Survey and its purpose is to apply remote-sensing techniques to the inventory, monitoring and management of resources. To fulfill its objective the program includes research and training in the application and interpretation of remotely sensed data and provides at a nominal cost remotely sensed data to other users.

The EROS Data Center (EDC) is located 16 miles northeast of Sioux Falls, South Dakota. Its principal facility is the 120,000 square-foot Karl E. Mundt Federal Building. It is operated by the EROS Program to provide access to NASA's LANDSAT imagery, aerial photography acquired by the U.S. Department of the Interior and NASA from research aircraft and from Skylab, Apollo and Gemini spacecraft. The principal functions of the Center include the storage and reproduction of the data and user assistance and training.¹



¹Adapted from THE EROS DATA CENTER, U.S. Department of the Interior, Geological Survey, USGS: INF-74-73.

The map on the following page illustrates the location of the Data Center relative to the surrounding communities.

On September 1, 1975 the Center employed approximately 320 people with a payroll exceeding \$3.1 million per year. Purchases locally of equipment, materials and peripheral services were \$908,336. Projected for FY1976 is employment of 370 people with a payroll of \$4.3 million and local expenditures of \$1.3 million for equipment, material and peripheral materials.

A funding and staffing profile for the Data Center is shown in Table A for FY1972 through projected FY1976.

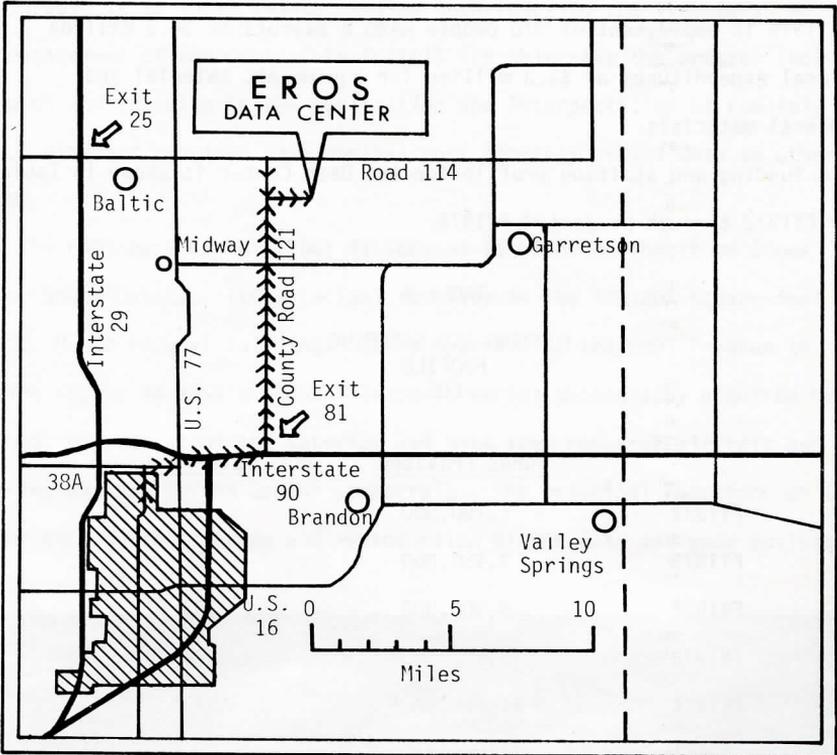
TABLE A
FUNDING AND STAFFING
PROFILE
EDC

	<u>Funds Provided</u>	<u>Staffing</u>
FY1972	1,700,000	13
FY1973	3,950,000	50
FY1974	5,900,000	303
FY1975	8,510,000	320
FY1976	11,645,000*	370*

*Projected

Table B provides a summary of those employees who are classified as professional versus those that are technician/clerical. Also included is the percentage hired locally as contrasted to those that are from outside the local area.

AREA MAP



SIoux FALLS

TABLE B
STAFFING BREAKDOWN

	Percentage Total Employees	Percentage From Local Area	Percentage From Outside Local Area
Professional	25	17	83
Technician/Clerical	75	92	8

Finally, facility investment up to October 1975 is provided in Table C. Sizeable additional investment is anticipated in the future.

TABLE C
EROS DATA CENTER
FACILITY INVESTMENT

Land Purchase	\$ 125,000	Donated
Facility Construction	5,575,000	20-year Lease Purchase
Water Line Construction	400,000	10-year Lease Purchase
Facility Support Building	465,000	12-year Lease Purchase
Central Computer Complex	4,000,000	5-year Lease Purchase
Equipment	<u>6,000,000</u>	Government Owned
Total Capital Investment	<u>\$16,565,000</u>	

These tables show the dramatic growth of the Data Center. This growth is projected to continue as the role and demand for services continue to expand at the Center.

Local purchases and the payroll of the Data Center represents new dollars being injected into those communities surrounding the Data Center. The purpose of this study is to measure the direct and induced effects of these exogenously injected funds into the economy of the region. The direct

effects are defined as those dollars received by the initial recipient of the payment from the Data Center. Once the initial disbursement is made a respending cycle is triggered adding to the income of other members of the community. The summation of the benefits to the community, as a whole, over time represent the induced effects. These induced effects are measured by expenditure category and location of incidence.

The methodology of the study is multiplier analysis. Though multiplier analysis is standard in regional economic analysis, the technique of estimation used in this study is unique. Elaboration on multiplier analysis is the topic of the first section.

SECTION I
MULTIPLIER ANALYSIS

Expenditure Multiplier²

The popularized version of the multiplier is attributed to John Maynard Keynes.³ Conceptually the multiplier has been developed previously by R. F. Kahn⁴ in 1931 though this earlier version was not operational as was the Keynesian multiplier.

Conceptually a multiplier may be thought of as a repetitive process continued to infinity. In the case of an expenditures multiplier the repetitive process is a respending process. Given an exogenously injected additional dollar into the region a portion of that dollar is respent over and over generating income which is a multiple of the initial injection. In the case of the Data Center, a dollar of income paid to an employee multiplies as each time a portion of that dollar is respent. The sum of the income generated represents the expected effects upon the regional economy of the initial injection made by the Data Center. The expenditures multiplier provides a tool for measuring how much total expenditures (income) will increase (decrease) given the respending process.

The extent to which the initial injection will expand depends upon the leakages (non-expenditure of additional income received) from the expenditures pattern. If an individual receives an additional dollar and

²A more complete discussion of multiplier analysis can be found in Regional Impact Via Multiplier Analysis of Primary Industries, Jerry W. Johnson and Leonard A. Poth, Business Research Bureau, University of South Dakota, Vermillion, South Dakota, 1974.

³J. M. Keynes, The General Theory of Employment, Interest and Money, Harcourt, Brace and World, 1936.

⁴R. F. Kahn, "The Relation of Home Investment to Unemployment", Economic Journal, 1931.

saves the entire dollar then the respending cycle ceases and induced expenditures from the initial dollar will be zero. On the other hand, had he respent eighty cents of the dollar in the first two cycles, a dollar and eighty cents of new income would have been generated with eighty cents being the induced portion. If the respending continued with 80 percent of the receipts being respent, the initial dollar will expand by five times. Had they respent only 50 percent then the initial dollar would have expanded by two times. Indeed the larger the leakages the smaller the expected multiplier effects as the respending cycle becomes smaller. This becomes clear when the multiplier is stated in equation form as $1/\text{leakages}$. Likewise it is clear that the problem of its computation becomes one of estimating these leakages.

SECTION II

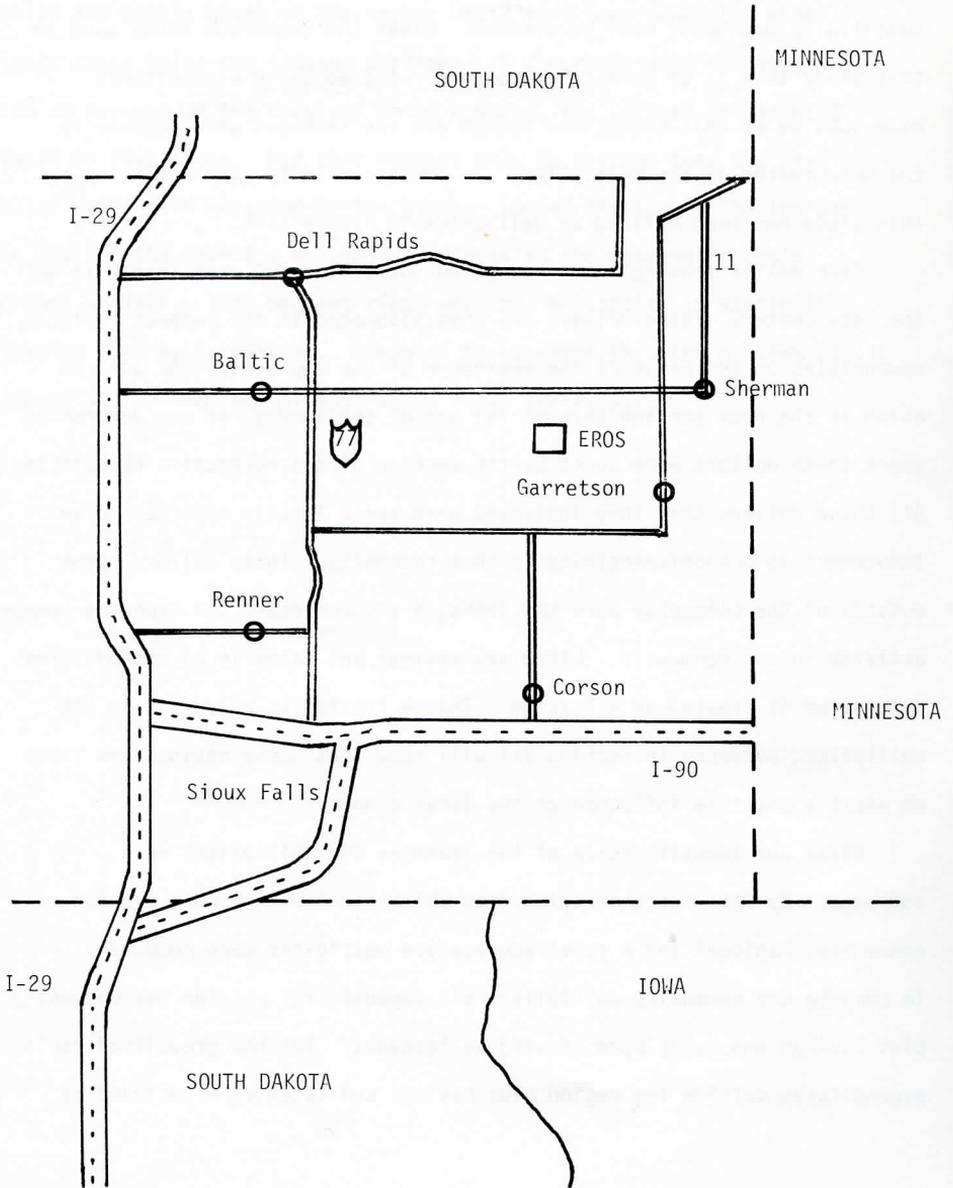
DEFINITION OF REGION FOR REGIONAL ANALYSIS

Before the leakages can be computed the region from which the outflow potentially may occur must be defined. Given the technique being used in this study this is of particular concern. Indeed those expenditures made outside of this predefined region are the leakages which appear in the denominator of the multiplier. To further clarify, the region in this study has been defined as delineated in Figure II-A.

Each dollar flowing into the region due to the EDC goes initially to the Data Center. These dollars are then allocated to the respective local communities on the basis of the residence of the employees. As will be noted in the next section through the use of the survey, it was determined where these dollars were spent by the members of the respective communities. All those dollars that they indicated were spent locally represented an inducement to economic activity in that community. Those dollars spent outside of the community were the leakages and decreased the expected economic activity in the community. Likewise, savings and taxes in an expenditures multiplier is treated as a leakage. Though treated as a leakage in the multiplier, evidence in Section VII will show that these savings and taxes do exert a positive influence on the local economy.

Given the identification of the leakages the multipliers were computed. By defining the region from which the leakages were flowing, community, regional and a total aggregative multiplier were computed. To compute the community multipliers all expenditures outside the community plus savings and taxes were treated as leakages. For the predefined region expenditures outside the region plus savings and taxes were included as

FIGURE II.A
PRE-DEFINED REGION



leakages. Finally for the total aggregative multiplier only savings and taxes were included as a leakage.

In the next section the measurement of the expenditures and leakages are discussed. A step by step summary of the computations including the multipliers is provided in Appendix B.

SECTION III
MEASUREMENT AND DIRECT EFFECTS
OF PAYROLL DOLLARS

The Survey

To determine the necessary leakages to be used in the computation of the multipliers, a sample survey of EDC employees was used. The survey was prepared by the Business Research Bureau at The University of South Dakota. It was distributed and collected by personnel at the EROS Data Center. A total of 320 surveys were distributed to all employees as of November, 1975. Of those distributed 25.94 percent were returned. All cities within the region in which employees reside were represented in the sample.

The survey essentially asked, 1) employees income class, 2) percent of income spent on each expenditure category, and 3) location at which expenditure was made. In each case the respondent was requested to fully allocate his income either as an expenditure or as savings and taxes.

Table III.A summarizes the total employees residing in each community, the number of survey returns from each community, and number returned stated as a percentage of total. Table III.B summarizes the survey results by income group. A copy of the survey is included in Appendix A.

Summary of Expenditure Pattern

Reported in Table III.C is a summary of the average percentage spent by expenditure category based on the residence of the respondee. These then were averaged from an overall summary of percentages spent by expenditure category. This summary presented in Table III.D includes the percentage of savings and taxes in addition to that spent for goods and services. Table III.D reveals that on the average 68.71 percent of gross income

TABLE III.A

SUMMARY OF SURVEY RESULTS
BY COMMUNITY

	Employees Residing in Community	Number Surveys Returned	Percentage Returned
Sioux Falls	205	52	25.37
Brandon	21	6	28.57
Dell Rapids	14	8	57.14
Garretson	36	3	8.33
Other	44	14	31.82
Total	320	83	25.94

TABLE III.B
SUMMARY OF SURVEY RESULTS
BY INCOME GROUP

Income Group	Number Surveys Returned	Percentage* of Total Returns
4,000- 6,000	4	4.82
6,000- 8,000	14	16.87
8,000-10,000	14	16.87
10,000-12,000	10	12.05
12,000-14,000	5	6.02
14,000-20,000	13	15.66
20,000-25,000	9	10.84
25,000-35,000	13	15.66
Over-35,000	1	1.20
TOTAL	83	

*Does not total to 100 percent due to rounding.

TABLE III.C
 AVERAGE PERCENTAGES SPENT BY EXPENDITURE
 CATEGORY BASED ON RESIDENCE

	1	2	3	4	5	6	7
Food	15.4808*	19.7500	18.0000	17.0000	14.4444	15.0000	15.0000
Apparel	6.0769	6.2500	6.6667	6.3333	5.0000	5.0000	6.0000
Transportation	10.4808	8.2500	15.0000	13.1667	9.3333	10.0000	10.3333
Furniture	4.7500	4.6250	6.0000	4.5000	4.8889	5.0000	3.6667
General Merchandise	4.8269	7.2500	4.0000	4.5000	3.0000	6.5000	7.0000
Recreation	5.1731	4.7500	3.6667	3.8333	3.2222	5.0000	4.0000
Personal Services	3.7885	3.0000	3.0000	3.0000	3.2222	2.0000	4.0000
Other	17.7692	13.2500	16.6667	19.0000	23.8889	14.5000	16.3333

For the numbered column heads:

- Sioux Falls = 1
- Dell Rapids = 2
- Garretson = 3
- Brandon = 4
- Rural Minnehaha County = 5
- Balance of South Dakota = 6
- Out of State = 7

*Should be interpreted as the percentage on the average of total income spent on food by employees residing in Sioux Falls.

TABLE III.D

AVERAGE PERCENTAGES SPENT, SAVED AND TAXED:
FOR REGION AND NATIONALLY

	<u>For Region***</u>	<u>National** Average</u>
Food	15.9518*	17.97
Apparel	5.9879	6.61
Transportation	10.4819	12.72
Furniture	4.7470	4.26
General Merchandise	4.9277	2.90
Recreation	4.7229	4.80
Personal Services	3.5301	3.14
Others	17.9156	17.21
Savings	8.6385	7.72
Taxes	23.0961	22.67

*Interpret as the percentage on the average spent for food by all employees of the Data Center.

**Helen Axel, (ed.), A Guide to Consumer Markets 1974/1975 (New York: The Conference Board, Inc., 1974).

***The sum of the percentages spent on goods and services does not equal the 68.71 percent referred to in the text. This is due to the manner in which this column is computed. The 68.71 percent is the more accurate of the two and is the percentage used in the algorithm as suggested by the sum of the final row in the percentage distribution matrix.

before taxes is spent for goods and services. Of the remainder 8.63 percent is saved and 23.09 percent is taxed away including all taxes.

These figures compare favorably to the national average for comparable income classes as shown in Table III.D. In this study housing falls under the other expenditure category. Nationally the percentage spent on housing for individuals in a comparable income class is 12.32 percent of gross income.

Location of Expenditures

To summarize where the expenditures by income class were made eight expenditure interflow matrices were constructed. One for each expenditure category. Table III.E.1 through III.E.8 report the interflow of expenditures between the respective locations. Each element in the matrices may be interpreted as the total expected expenditures made for a given expenditure category by individuals living in the location designated across the top to the location designated on the left of the table. As an example, in Table III.E.1 for employees living in Sioux Falls it was estimated that they spent \$296,373 for food in Sioux Falls given the flow of income from EDC in FY1975. Table III.F represents the estimated source and flow of income to each of the locations. Total expenditures for food by Sioux Falls residents was \$313,341 which is the sum of the first column of Table III.E.1. This can also be obtained by multiplying the \$2,024,070 of payroll dollars flowing to Sioux Falls times the percentage spent on food in Table III.C. The estimated total dollar expenditures on food in Sioux Falls from all locations can be obtained by summing across the first row of Table III.E.1. It can be seen that this was estimated to be equal to \$389,830. This figure is of interest in that it may be interpreted

TABLE III.E.1

POPULATION INTERFLOW MATRIX FOR FOOD

	1	2	3	4	5	6	7	Row Totals
Sioux Falls	296,373.00	11,939.40	13,162.20	25,352.40	35,774.50	0.00	7,229.20	389,830.40
Dell Rapids	0.00	12,363.40	0.00	0.00	116.70	0.00	437.70	12,917.90
Garretson	2,976.50	618.40	43,548.40	255.80	969.70	0.00	0.00	48,368.80
Brandon	449.00	0.00	0.00	10,672.40	292.70	0.00	0.00	11,414.10
Rural Minnehaha County	1,653.20	265.00	0.00	0.00	1,292.90	0.00	0.00	3,211.20
Balance of South Dakota	2,449.30	1,060.10	2,171.40	0.00	538.70	8,930.20	0.00	15,149.70
Out of State	9,440.70	0.00	0.00	214.00	0.00	0.00	5,787.20	15,441.90
Column Totals	313,341.60	26,246.30	58,881.90	36,494.60	38,985.20	8,930.00	13,454.10	

Each entry represents an expenditure by the residents of the cities across the top to the locations on the left.

For the Numbered Column Headings

Sioux Falls = 1
 Dell Rapids = 2
 Garretson = 3
 Brandon = 4
 Rural Minnehaha County = 5
 Balance of South Dakota = 6
 Out of State = 7

TABLE III.E.2

POPULATION INTERFLOW MATRIX FOR APPAREL

	1	2	3	4	5	6	7	Row Totals
Sioux Falls	112,830.10	5,637.90	16,293.80	12,351.70	7,693.70	24.60	1,764.10	156,595.60
Dell Rapids	0.00	1,812.20	0.00	0.00	0.00	0.00	0.00	1,812.20
Garretson	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Brandon	0.00	0.00	2,866.20	818.60	0.00	0.00	0.00	3,684.80
Rural Minnehaha County	0.00	0.00	0.00	0.00	5,619.00	0.00	0.00	5,619.00
Balance of South Dakota	42.00	697.00	2,648.10	272.90	81.10	2,952.20	0.00	6,693.30
Out of State	10,129.00	158.80	0.00	152.90	101.10	0.00	3,617.50	14,159.30
Column Totals	123,001.10	8,305.80	21,808.10	13,596.00	13,494.90	2,976.70	5,381.60	

Each entry represents an expenditure by the residents of the cities across the top to the locations on the left.

For the Numbered Column Headings

Sioux Falls = 1
 Dell Rapids = 2
 Garretson = 3
 Brandon = 4
 Rural Minnehaha County = 5
 Balance of South Dakota = 6
 Out of State = 7

TABLE III.E.3

POPULATION INTERFLOW MATRIX FOR TRANSPORTATION

	1	2	3	4	5	6	7	Row Totals
Sioux Falls	188,066.90	3,374.30	10,376.20	15,700.20	12,364.60	0.00	1,518.20	231,400.20
Dell Rapids	0.00	4,922.40	0.00	0.00	0.00	0.00	0.00	4,922.40
Garretson	660.50	431.20	33,910.30	0.00	295.00	0.00	0.00	35,296.90
Brandon	324.90	0.00	0.00	11,135.20	0.00	0.00	0.00	11,460.10
Rural Minnehaha County	552.30	0.00	0.00	0.00	11,101.90	0.00	0.00	11,654.20
Balance of South Dakota	9,663.40	1,992.60	4,781.80	483.60	1,096.10	5,953.50	0.00	23,971.00
Out of State	12,870.10	243.30	0.00	946.30	332.80	0.00	7,750.10	22,142.70
Column Totals	212,137.80	10,963.70	49,068.30	28,265.40	25,190.50	5,953.50	9,268.40	

Each entry represents an expenditure by the residents of the cities across the top to the locations on the left.

For the Numbered Column Headings

Sioux Falls = 1

Dell Rapids = 2

Garretson = 3

Brandon = 4

Rural Minnehaha County = 5

Balance of South Dakota = 6

Out of State = 7

TABLE III.E.4

POPULATION INTERFLOW MATRIX FOR FURNITURE

	1	2	3	4	5	6	7	Row Totals
Sioux Falls	89,473.90	3,729.20	15,467.40	7,829.10	10,103.70	0.00	673.60	127,276.90
Dell Rapids	0.00	2,320.10	0.00	0.00	0.00	0.00	0.00	2,320.10
Garretson	0.00	0.00	2,034.60	0.00	42.00	0.00	0.00	2,076.60
Brandon	0.00	0.00	0.00	298.30	0.00	0.00	0.00	298.30
Rural Minnehaha County	0.00	0.00	0.00	0.00	2,915.00	0.00	0.00	2,915.00
Balance of South Dakota	849.40	97.00	2,125.30	298.30	134.40	2,976.80	0.00	6,481.10
Out of State	5,820.00	0.00	0.00	1,234.50	0.00	0.00	2,615.20	9,669.70
Column Totals	96,143.20	6,146.30	19,627.30	9,660.30	13,195.00	2,976.80	3,288.80	

Each entry represents an expenditure by the residents of the cities across the top to the locations on the left.

For the Numbered Column Headings

Sioux Falls = 1
 Dell Rapids = 2
 Garretson = 3
 Brandon = 4
 Rural Minnehaha County = 5
 Balance of South Dakota = 6
 Out of State = 7

TABLE III.E.5

POPULATION INTERFLOW MATRIX FOR GENERAL MERCHANDISE

	1	2	3	4	5	6	7	Row Totals
Sioux Falls	89,407.90	3,272.00	7,716.70	6,685.70	7,294.90	0.00	3,344.00	117,721.10
Dell Rapids	0.00	5,130.30	0.00	0.00	0.00	0.00	0.00	5,130.30
Garretson	134.10	759.20	3,086.70	0.00	181.30	0.00	0.00	4,161.30
Brandon	0.00	0.00	0.00	2,791.30	0.00	0.00	0.00	2,791.30
Rural Minnehaha County	2,629.60	0.00	0.00	0.00	412.50	0.00	0.00	3,042.10
Balance of South Dakota	1,641.80	473.30	2,281.50	183.30	208.20	3,869.80	0.00	8,657.80
Out of State	3,886.80	0.00	0.00	0.00	0.00	0.00	2,934.50	6,821.30
Column Totals	17,700.10	9,634.70	13,084.90	9,660.30	8,096.90	3,869.80	6,278.60	

Each entry represents an expenditure by the residents of the cities across the top to the locations on the left.

For the Numbered Column Headings

Sioux Falls = 1
 Dell Rapids = 2
 Garretson = 3
 Brandon = 4
 Rural Minnehaha County = 5
 Balance of South Dakota = 6
 Out of State = 7

TABLE III.E.6

POPULATION INTERFLOW MATRIX FOR RECREATION

	1	2	3	4	5	6	7	Row Totals
Sioux Falls	85,455.70	922.50	4,982.80	5,012.60	3,782.30	0.00	1,032.40	101,188.20
Dell Rapids	657.50	1,012.10	0.00	0.00	0.00	0.00	0.00	1,669.60
Garretson	245.10	340.70	3,884.80	0.00	121.30	0.00	0.00	4,591.90
Brandon	649.60	0.00	0.00	2,923.50	274.10	0.00	0.00	3,847.20
Rural Minnehaha County	449.10	44.80	0.00	146.50	527.10	0.00	0.00	1,167.40
Balance of South Dakota	329.10	2,994.60	3,126.90	146.50	1,270.90	2,976.80	0.00	18,844.70
Out of State	8,920.70	997.70	0.00	0.00	2,721.10	0.00	2,555.30	15,194.70
Column Totals	104,706.40	6,312.40	11,994.50	8,229.20	8,696.70	2,976.80	3,587.80	

Each entry represents an expenditure by the residents of the cities across the top to the locations on the left.

For the Numbered Column Headings

Sioux Falls = 1

Dell Rapids = 2

Garretson = 3

Brandon = 4

Rural Minnehaha County = 5

Balance of South Dakota = 6

Out of State = 7

TABLE III.E.7

POPULATION INTERFLOW MATRIX FOR PERSONAL SERVICES

	1	2	3	4	5	6	7	Row Totals
Sioux Falls	71,436.50	432.40	2,898.70	4,800.60	8,199.10	0.00	830.30	88,597.60
Dell Rapids	0.00	2,203.80	0.00	0.00	0.00	0.00	0.00	2,203.80
Garretson	32.50	42.20	5,485.40	0.00	320.40	0.00	0.00	5,880.50
Brandon	0.00	0.00	0.00	1,419.90	0.00	0.00	0.00	1,419.90
Rural Minnehaha County	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Balance of South Dakota	2,059.50	1,246.40	578.60	219.70	48.30	1,190.70	0.00	5,343.30
Out of State	3,152.50	62.00	850.90	0.00	128.80	0.00	2,757.40	6,951.70
Column Totals	76,680.90	3,986.80	9,813.60	6,440.20	8,696.70	1,190.70	3,587.80	

Each entry represents an expenditure by the residents of the cities across the top to the locations on the left.

For the Numbered Column Headings

Sioux Falls = 1
 Dell Rapids = 2
 Garretson = 3
 Brandon = 4
 Rural Minnehaha County = 5
 Balance of South Dakota = 6
 Out of State = 7

TABLE III.E.8

POPULATION INTERFLOW MATRIX FOR OTHERS

	1	2	3	4	5	6	7	Row Totals
Sioux Falls	287,367.10	5,497.60	9,380.70	27,771.90	45,605.00	0.00	1,185.00	376,807.20
Dell Rapids	0.00	4,876.70	0.00	0.00	0.00	0.00	0.00	4,876.70
Garretson	603.20	0.00	37,322.30	814.90	5,605.90	0.00	0.00	44,346.30
Brandon	0.00	0.00	0.00	7,864.50	0.00	0.00	0.00	7,864.50
Rural Minnehaha County	0.00	11.50	0.00	2,240.90	0.00	0.00	0.00	2,252.40
Balance of South Dakota	5,798.20	1,665.50	6,815.00	873.70	2,766.00	8,632.60	0.00	26,551.10
Out of State	65,893.10	5,556.90	1,002.20	1,222.30	10,498.70	0.00	13,465.00	97,638.00
Column Totals	359,661.40	17,608.30	54,520.30	40,788.10	64,475.60	8,632.60	14,650.00	

Each entry represents an expenditure by the residents of the cities across the top to the locations on the left.

For the Numbered Column Headings

Sioux Falls = 1

Dell Rapids = 2

Garretson = 3

Brandon = 4

Rural Minnehaha County = 5

Balance of South Dakota = 6

Out of State = 7

TABLE III.F

SUMMARY OF PAYROLL BY SOURCE
FY1975 AND PROJECTED FY1976

	FY1975	Projected** FY1976
Federal Government	949,703	1,239,000
Technicolor	1,855,521	2,663,000
Continental (custodial)	227,700	301,000
Per-Mar (Guard)	64,962	75,000
Cafeteria	20,000	22,000
TOTAL	3,117,886*	4,300,000*

FLOW OF PAYROLL DOLLARS
BY LOCATION
FY1975 AND PROJECTED FY1976

	FY1975	FY1976
Sioux Falls	2,024,070	2,791,475
Brandon	214,674	296,066
Dell Rapids	132,893	183,279
Garretson	327,122	451,147
Other	419,127	578,033
TOTAL	3,117,886*	4,300,000

*Direct payroll dollars, does not include fringe benefits of approximately 10 percent.

**It was assumed that the sources and the allocations by location are distributed in projected FY1976 similar to FY1975.

as the direct expected demand for food in Sioux Falls resulting from the payroll of the EDC.

It is also interesting to note that of those who do not reside in Sioux Falls, many purchase their food items in Sioux Falls. Indeed of the total demand for food by EDC employees 78.53 percent of these expenditures are made in Sioux Falls.

To summarize the net incidence of the expenditures, an expenditure-distribution matrix was constructed. This matrix is represented in Table III.G. Likewise an expenditure-distribution matrix for projected FY1976 payroll was also computed in Table III.H. Each element in these matrices represent the total expected dollar expenditures by expenditure group in each location after all of the interflows occur. The row totals are the total expenditures for each category resulting from the EDC payroll. The column totals are the total expenditure dollars received at each location. Table III.I summarizes the percentage of total expenditure dollars received by each location.

Summary of Expenditures and Analysis of Direct Effect

By Table III.I it is apparent that Sioux Falls reaps the greatest benefits from the first round expenditures of the Data Center in an absolute dollar sense. In a relative sense each of the remaining communities benefit considerably also. Though the percentage flow of the dollars may be smaller to these communities, in a relative sense the injection of these new dollars is significant.

The income allocated in this section represents the initial direct influence on the communities. In other words, account is not taken for respending of these dollars once they are in the community. Section VI will compute the expected induced dollar expenditures.

TABLE III.G

POPULATION EXPENDITURE-DISTRIBUTION MATRIX
FY1975

	1	2	3	4	5	6	7	Row Totals
Food	389,830.40*	12,917.90	48,368.80	11,414.10	3,211.20	15,149.70	15,441.90	496,333.80
Apparel	156,595.60	1,812.20	0.00	3,684.80	5,619.00	6,693.30	14,159.30	188,563.90
Transportation	231,400.20	4,922.40	35,296.90	11,460.10	11,654.20	23,971.00	22,142.70	340,847.20
Furniture	127,276.90	2,320.10	2,076.60	298.30	2,915.00	6,481.10	9,669.70	151,037.40
General Merchandise	117,721.10	5,130.30	4,161.30	2,791.30	3,042.10	8,657.80	6,821.30	148,325.10
Recreation	101,188.20	1,669.60	4,591.90	3,847.20	1,167.40	18,844.70	15,194.70	146,503.70
Personal Services	88,597.60	2,203.80	5,880.50	1,419.90	0.00	5,343.30	6,951.70	110,396.60
Others	376,807.20	4,876.70	44,346.30	7,864.50	2,252.40	26,551.10	97,638.00	560,335.90
Column Totals	1,589,416.00	35,852.90	144,722.20	42,780.10	29,861.20	111,691.70	188,019.20	

For the Numbered Column Headings

Sioux Falls = 1

Dell Rapids = 2

Garretson = 3

Brandon = 4

Rural Minnehaha County = 5

Balance of South Dakota = 6

Out of State = 7

*Should be interpreted as the total dollar expenditures on food in Sioux Falls.

TABLE III.H

POPULATION EXPENDITURE-DISTRIBUTION MATRIX
PROJECTED FY1976

	1	2	3	4	5	6	7	Row Totals
Food	537,630.60	17,815.70	66,707.30	15,741.70	4,428.70	20,893.50	21,296.40	684,513.70
Apparel	215,967.40	2,499.30	0.00	5,081.80	7,749.30	9,230.90	19,527.60	260,056.20
Transportation	319,133.50	6,788.70	48,679.40	15,805.10	16,072.70	33,059.30	30,537.70	470,076.20
Furniture	175,532.60	3,199.70	2,863.90	411.50	4,020.10	8,938.30	13,335.80	208,301.70
General Merchandise	162,354.10	7,075.50	5,739.10	3,849.50	4,195.50	11,940.30	9,407.50	204,561.20
Recreation	139,552.60	2,302.70	6,332.80	5,305.80	1,610.10	25,989.50	20,955.60	202,049.00
Personal Services	122,188.50	3,039.30	8,110.00	1,958.20	0.00	7,369.10	9,587.30	152,252.40
Others	519,669.90	6,725.60	61,159.70	10,846.20	3,106.40	36,617.70	134,656.30	772,781.60
Column Totals	2,192,026.00	49,446.40	199,592.10	58,999.90	41,182.80	154,038.60	259,304.20	

For the Numbered Column Headings

Sioux Falls = 1

Dell Rapids = 2

Garretson = 3

Brandon = 4

Rural Minnehaha County = 5

Balance of South Dakota = 6

Out of State = 7

TABLE III.I
PERCENTAGE TOTAL DOLLAR EXPENDITURES
BY LOCATION

Sioux Falls	74.19
Dell Rapids	1.67
Garretson	6.75
Brandon	2.00
Rural Minnehaha County	1.39
Balance of South Dakota	5.22
Out of State	8.78

Direct initial effects of \$3,117,886 results from the payroll of the Data Center. For projected FY1976 the initial direct effects are expected to be \$4,300,000. To the retailer these represent dollars for which they are competing. In measuring the interflows in this section of dollars spent by the initial recipient some idea as to how well each community is capturing these dollars is obtained. Approximately 14 percent of the expenditure dollars leak out of the region. Of the remainder some communities are not capturing all of the potential dollars that were directly injected by the Data Center. Indeed, it is clear that Sioux Falls is capturing a large portion of these dollars.

Thus far the benefits of purchases made by the EDC for goods and services have not been recognized. This is the topic for the next section.

SECTION IV
MEASUREMENT AND DIRECT EFFECTS
ON LOCAL PURCHASES

Significant purchases of goods and services in addition to payroll expenditures are also made by the Data Center. Those purchases which are made locally have a similar effect locally as did the payroll dollars. Once the disbursement is made this represents income to its recipient. Either he spends it for additional physical resources in his business or purchases the productive resources of the local community representing increased employment. Regardless of which he elects to do the respent dollars induce additional local income and expenditures in a similar manner to the payroll dollars.

Table IV.A summarizes the total expenditures by the Data Center as well as separates out those that are made locally. Additionally the local dollars have been allocated within the region as best possible. Note that approximately \$4.8 million is spent for goods and services other than payroll. It is estimated that 18.81 percent or \$908,336 is spent locally. Of these expenditures \$627,012 is spent in Sioux Falls.

It need also be noted that estimates of the local purchases is likely a conservative estimate due to difficulties in identification of many of these expenditures. A number of the purchases are made locally though the payment might actually end up outside of the region. An attempt was made to identify these cases and either note them or remove them from the analysis. Also it was found very difficult to account for dollars that flow into the region due to on-sight maintenance and service personnel. For these individuals payment would be made by an outside firm and not be included in the Data Centers budget, thus making it difficult

TABLE IV.A

SUMMARY
LOCAL EXPENDITURES
OF EROS DATA CENTER
OTHER THAN PAYROLL
FY 1975

	Total Purchases	Spent Locally	Percent Spent Locally	Allocation of Purchases to City and Region			
				Sioux Falls	Garretson	Other	Outside of Region
Travel and Transportation							
Travel (meals, lodging, etc.)	\$ 23581	\$ 472	2	\$ 472	0	0	\$23109
Travel and Transportation of family	338	67	20	67	0	0	271
Travel (common carrier)	35157	35157	100	35157*	0	0	0
Rental Passenger Vehicles	8769	0	0	0	0	0	8769
Travel-other (taxi, parking, etc.)	7200	720	10	720	0	0	6480
Technicolor-travel	19866	993	5	993	0	0	18873
Continental Systems (travel allowance)	14535	14535	100	14535	0	0	0
Temporary Living Quarters	2141	2141	100	2141	0	0	0
Real Estate Transactions	6559	655	10	655	0	0	5904
Miscellaneous Moving Expense	600	600	100	600	0	0	0
Rental of Trucks	1583	633	40	633	0	0	950
Transportation-other	13999	6999	50	6999	0	0	7000
Transportation of Household Goods	8088	0	0	0	0	0	8088
Total Travel and Transportation	\$142416	\$62972	41.65	\$62972	0	0	\$79444
Facilities							
Building Rental	\$556539	\$ 0	0	\$ 0	\$ 0	0	\$556539
Water Line Rental	68028	68028	100	68028	0	0	0
Liability Insurance	984	984	100	984	0	0	0
Management Fees	16499	16499	100	16499	0	0	0
Taxes	109380	109380	100	0	109380	0	0
Rental of Storage Space	1000	1000	100	0	1000	0	0
Equipment Rental	3017	3017	100	3017	0	0	0
Total Facilities	\$755447	\$198908	26.33	\$88528	\$110380	0	\$556539

*Initial purchase is made locally and credited to local sales; however, the actual payment frequently is made outside of the region. As the sales are credited locally they were included in the analysis since secondary effects do result from the credited sales.

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	Total Purchases	Spent Locally	Percent Spent Locally	Allocation of Purchases to City and Region			
				Sioux Falls	Garretson	Other	Outside of Region
Utilities							
Electricity	\$ 72261	\$ 72261	100		\$ 0	\$72261	\$ 0
Water	13443	13443	100	\$ 13443	0	0	0
Fuel Oil	24724	24724	100	0	24724		0
Telephone:							
Northwestern Bell	30	30	100	30	0	0	0
Garretson Telephone	59713	59713	100	0	59713	0	0
Telex	1265	0	0	0	0	0	1265
Dakota Paging	1418	1418	100	1418	0	0	0
Magnafax	456	0	0	0	0	0	456
<u>Total Utilities</u>	<u>\$173310</u>	<u>\$171589</u>	<u>99</u>	<u>\$ 14891</u>	<u>\$84437</u>	<u>\$72261</u>	<u>\$1721</u>
Other							
Services	\$1654660	\$299292	18.09				
Supplies	1248980	107016	8.57				
Duplicating Services	20329	19138	94.14				
Equipment	833876	49421	5.93				
<u>Total Other</u>	<u>\$3757845</u>	<u>\$474867</u>	<u>12.64</u>	<u>\$460621</u>	<u>\$2374</u>	<u>\$11872</u>	<u>\$3282978</u>
Total Purchases							
Other than Payroll	\$4829018*						
Total Spent Locally		\$908336					
Percent Spent Locally			18.81				
Total Allocations				\$627012	\$197191	\$84133	\$3920682

*This is estimated to exceed \$7,000,000 in FY1976 which if percent spent locally remains at 18.81 then total spent locally would be \$1,316,700.

to measure for the purposes of this study. An estimate was suggested that this could include on the average approximately a dozen individuals. For the purpose of this study it has been estimated that these personnel contribute an additional \$240,000 to the community. This represents an estimate of a salary of approximately \$20,000 per year for each employee.

Finally, the \$1,148,336, including the maintenance and service personnel, can be thought of as the initial direct effect of the Data Center on the suppliers of these goods and services. If eventually all of these dollars end up as income to individuals, demand for \$183,180 additional food expenditures would result, \$68,761 apparel expenditures, \$120,367 transportation expenditures, \$54,511 furniture expenditures, \$56,586 general merchandise expenditures, \$54,234 recreation expenditures, \$40,537 personal services expenditures, \$205,731 other expenditures, \$99,199 additional savings, and \$265,220 additional tax dollars generated. Though it is unlikely that all these dollars would end up as new income to local residents, the potential is clearly significant.

In FY1976 these initial direct effects are estimated to expand to \$1,556,700. This would represent an increase of approximately 27 percent from FY1975 to FY1976. Likewise initial demand for dollar expenditures on goods and services would increase by 27 percent as would the savings and taxes. This does not reflect the induced expenditures from the increase of 27 percent which will be computed in Section VI.

SECTION V
MEASUREMENT AND DIRECT EFFECTS
OF VISITORS TO DATA CENTER

In the introduction it was noted that one of the principle functions of the Data Center was that of providing user assistance and training. In order to fulfill this function seminars of various lengths are provided throughout the year. Attendees come from all points of the globe providing an additional inflow of dollars to the local economy.

Table V.A summarizes the estimated visitor distribution for FY1975 and projected FY1976. The first column is the length of the stay of the attendee, the second column the number in attendance, and the third column the visitor man/days resulting from the visits. In order to quantify the expected influence of these visits it was assumed that on the average each man/day required one nights lodging. An average of \$17.00 per nights lodging was used for computation. Note that the estimated visitor man/days was 7,526 for FY1975 and 9,784 for projected FY1976. This represents an increase of approximately 30 percent in anticipated service to users for 1976. As most visitor facilities are located in Sioux Falls most of the initial direct effects will be confined to Sioux Falls. Lodging expenditures for FY1975 generated \$127,942 and is expected to expand to \$166,324 in FY1976. Expenditures for food for FY1975 was \$97,838 and projected FY1976 \$127,192. Finally assuming that car rental man/days were approximately 4,000 days for FY1975 at \$16.00 per day, this generated an additional \$64,000. For FY1976 this is projected to increase to \$83,000. The remaining transportation was provided by the Data Center through bus service. This expenditure appears as part of the local expenditures as they appear in Table IV.A. To further recognize dollar expenditures generated it has been

TABLE V.A
EDC VISITOR DISTRIBUTION

Duration of Stay	Number Attendees	Visitor Man/Days
1	730	730
2	338	676
3	216	648
4	868	3,472
5	40	200
30	60	<u>1,800</u>
	TOTAL	7,526 for FY1975
		9,784 Estimated for FY1976

TABLE V.B
 ESTIMATED EXPENDITURES*
 OF VISITORS
 FY1975 AND ESTIMATED FY1976

Lodging

FY1975

7,526 x \$17.00 per night =	\$127,942.00
State Sales Tax	5,117.67
Sioux Falls Sales Tax	1,279.42

Projected FY1976

9,784 x \$17.00 per night =	\$166,324.00
State Sales Tax	6,652.98
Sioux Falls Sales Tax	1,663.24

Food

FY1975

Breakfast = \$ 2.00	
Lunch = 4.50	
Dinner = 6.50	

\$13.00 x 7,526 =	\$ 97,838.00
State Sales Tax	3,912.52
Sioux Falls Sales Tax	978.38

Projected FY1976

Breakfast = \$ 2.00	
Lunch = 4.50	
Dinner = 6.50	

\$13.00 x 9,784 =	\$127,192.00
State Sales Tax	5,087.68
Sioux Falls Sales Tax	1,271.92

TABLE V.B
(continued)

Transportation

FY1975

Estimated Car Rental Days 4,000
Rental Cost Per Day 16

TOTAL

\$ 64,000.00

Projected FY1976

Estimated Car Rental Days 5,200
Rental Cost Per Day 16

TOTAL

\$ 83,200.00

Other Expenditures

FY1975

Entertainment and Incidental
Expenditures Per Day 5

Visitor Man/Days 7,526

TOTAL

\$ 37,630.00

Projected FY1976

Entertainment and Incidental 5
Expenditures Per Day

Visitor Man/Days 9,784

TOTAL

\$ 48,920.00

assumed that each man/day generates an additional \$5.00 in entertainment and incidental expenditures. For FY1975 this amounted to \$37,630 and is projected to be \$48,920 for FY1976.

In summary, the direct effects of these visitations for FY1975 was approximately \$327,410. For FY1976 this is expected to increase to \$425,636.

SECTION VI

TOTAL EFFECTS INCLUDING INDUCED PORTION

In Section I the multiplier was discussed. It was noted that the initial expenditure represented the direct effects of the exogenous injection into the region. Further benefits are received as these initial injections are respent by the initial recipients. The past three sections have discussed the size of these effects. This section will expand these expenditures out to determine the total expected effects over time as these newly injected dollars are respent over and over.

Percentage Distribution Matrix

In order to accomplish this task a percentage distribution is computed. Table VI.A represents the percentage distribution as computed from the survey data. Each element in the matrix may be interpreted as the percentage of each additional EDC dollar spent on each expenditure category by location. As an example, the first element in the matrix is .1250, suggesting that on the average 12.5 percent of each additional EDC dollar is spent on food in Sioux Falls.

If the columns of the percentage-distribution matrix are summed the respective propensities to spend in each location is obtained. Fifty cents of each newly injected dollar is spent in Sioux Falls. If these propensities are summed we find that 68.71 cents of each dollar is spent on the expenditure categories. The remaining approximately 32 cents is saved or paid in taxes.

These percentages explicitly recognize the interflows of expenditures between cities. The impact of these interflows is to significantly increase the dollars going to Sioux Falls while decreasing the amount going to the

TABLE VI.A

POPULATION PERCENTAGE-DISTRIBUTION MATRIX

	1	2	3	4	5	6	7
Food	0.125030	0.004143	0.015513	0.003661	0.001030	0.004859	0.004953
Apparel	0.050225	0.000581	0.0	0.001182	0.001802	0.002147	0.004541
Transportation	0.074217	0.001579	0.011321	0.003676	0.003738	0.007688	0.007102
Furniture	0.040822	0.000744	0.000666	0.000096	0.000935	0.002079	0.003101
General Merchandise	0.037757	0.001645	0.001335	0.000895	0.000976	0.002777	0.002188
Recreation	0.032454	0.000536	0.001473	0.001234	0.000374	0.006044	0.004873
Personal Services	0.028416	0.000707	0.001886	0.000455	0.0	0.001714	0.002230
Others	0.120853	0.001564	0.014223	0.002522	0.000722	0.008516	0.031315
City Totals	0.509774	0.011499	0.046417	0.013721	0.009577	0.035823	0.060303

Each entry represents the fraction of each EROS dollar spent in the associated categories and cities, as an example the .125030 entry in the first element suggests that of each additional dollar injected by the Data Center 12.5 percent ends up being spent on food in Sioux Falls.

For the Numbered Column Headings

Sioux Falls = 1
 Dell Rapids = 2
 Garretson = 3
 Brandon = 4
 Rural Minnehaha County = 5
 Balance of South Dakota = 6
 Out of State = 7

other localities. This will become particularly apparent by the sizes of the respective multipliers.

Before computing the multipliers it is necessary to summarize the implicit assumptions of multiplier analysis. Assumed is that the expenditure pattern remains relatively constant as the dollars are respent over and over. In other words, on the average, the proportion spent on each expenditure category remains constant. This is a standard assumption, however, further validation of the assumption is provided through the comparison of national data to that used in this study as well as other's of a similar nature completed by this author. This author's experience suggests that the pattern is relatively stable. An additional assumption unique to this study is that the interflows are relatively constant. In other words, the proportions of each expenditure category spent in the alternative locations remains stable as well. Neither assumption is likely to be significantly harmful to the results though they should be taken cognizance of.

Induced Effects of Payroll

Given that the columns of the percentage distribution have been summed the propensities to spend are provided for each locality. Likewise recall that the row sum of the total propensities gives the percentage of income spent as contrasted to being spent or taxed away. Given this information the first four round expenditures can be computed as in Table VI.B for FY1975 and for FY1976 in Table VI.C. Each of the columns in Table VI.B and Table VI.C are geometric progressions. Carrying these progressions to infinity and summing each column will provide the total change in income and expenditure resulting from the initial injection of \$3,117,886 of payroll dollars by EROS Data Center in FY1975 and for projected FY1976 in Table VI.C.

TABLE VI.B

FIRST FOUR ROUND EXPENDITURES
OF RESPENDING PROCESS
PAYROLL FY1975

	Dollars Income Distributed Between Localities	Percent Spent on Expenditure Categories ¹	Sioux Falls ²	De11 Rapids ³	Garretson ⁴	Brandon ⁵	Rural Minnehaha ⁶	Balance of South Dakota ⁷	Out of State ⁸
Round 1	\$3,117,886	2,141,987	\$1,589,417	\$35,824	\$144,701	\$42,933	\$29,838	\$111,682	\$188,008
Round 2	2,141,987	1,471,545	1,091,920	24,611	99,409	29,495	20,498	76,725	129,161
Round 3	1,471,545	1,010,951	750,149	16,908	68,294	20,263	14,082	52,710	88,734
Round 4	1,010,951	694,523	515,352	11,615	46,918	13,920	9,674	36,212	60,960

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- 1 .687114 of dollars distributed
- 2 .509774 of dollars distributed
- 3 .011499 of dollars distributed
- 4 .046417 of dollars distributed
- 5 .013721 of dollars distributed
- 6 .009577 of dollars distributed
- 7 .035823 of dollars distributed
- 8 .060303 of dollars distributed

Percentages derived from percentage-distribution matrix.

Round 1 represents the initial dollar expenditures where initially \$3,117,886 payroll dollars are injected, of this \$2,141,987 is spent on goods and services. Of the \$2,141,987, \$1,589,417 is spent in Sioux Falls, etc. These initial expenditures become income to the recipients of these dollars who then spend another 68.71 percent or \$1,471,545. This second column expenditure then is allocated to each of the cities, etc. This continues to infinity and the sum of the columns represents total induced income by location which is the expected multiplier effects.

TABLE VI.C

FIRST FOUR ROUND EXPENDITURES*
 OF RESPENDING PROCESS
 PROJECTED FY1976

	Dollar Income Distributed Between Localities	Percent Spent on Expenditure Categories	Sioux Falls	Dell Rapids	Garretson	Brandon	Rural Minnehaha	Balance of South Dakota	Out of State
Round 1	\$4,300,000	2,954,590	\$2,192,028	\$49,407	\$199,563	\$58,996	\$41,151	\$154,026	\$259,290
Round 2	2,954,590	2,030,128	1,506,161	33,948	137,122	40,536	28,275	105,833	178,161
Round 3	2,030,128	1,394,921	1,034,898	23,326	94,218	27,853	19,428	72,719	122,416
Round 4	1,394,921	958,464	711,088	16,027	64,738	19,138	13,349	49,966	84,113

*Note footnotes on Table VI.B.

The sum of the first column or total change in income resulting from these new dollars can be found relatively simply as 1 divided by 1 minus the overall propensity to spend on goods and services, i.e., $1/1-.6871$, which is equal to 3.1961, multiplied times the initial injection or \$9,965,106 for FY1975 and \$13,743,273 for projected FY1976. The amount of this total received by each locality can be obtained by summing the columns of Table VI.B and Table VI.C for each respective locality plus its initial income or alternatively multiplying each of the local multipliers times the income allocated to each. This is summarized in Table VI.D. Note that the sum of these is equal to the total obtained from the aggregative multiplier of 3.1961. Finally, eliminating the dollars flowing out of our region we obtain the total effect on the local region alone which is \$8,857,912 for FY1975 and \$12,216,301 for FY1976.

Induced Effects of Purchased Goods and Services

In a manner similar to the computations of the induced effects of the payroll total effects of purchases of goods and services can be computed. Table VI.E summarizes these effects by expenditure category. These may be further summarized as in Table VI.F. It was further projected that FY1976 local expenditures would increase to \$1,316,700. This suggests that the total effects of FY1976 local expenditures would be \$3,740,613 in the region and \$4,208,304 in the aggregate.

Induced Effects EDC Visitors

Table VI.G summarizes the total direct and induced effects of visitors to the Data Center. For projected FY1976 the direct effects are estimated to increase to \$425,636. Regionally this will generate total effects of \$1,209,189 and in the aggregate \$1,360,379. Most of these effects will be

TABLE VI.D
TOTAL INCLUDING
INDUCED EFFECTS
PAYROLL
FY1975 AND PROJECTED FY1976

By Locality	Local Multiplier	Total Direct and Induced	
		FY1975	Projected FY1976
Sioux Falls	3.5097	7,104,021	9,797,438
Dell Rapids	1.8623	247,481	341,312
Garretson	2.4139	789,672	1,089,068
Brandon	1.6369	351,405	484,637
Rural Minnehaha County	1.3535	365,333	503,846
Balance of South Dakota	6.9961	416,514	574,432
Out of State	7.6997	690,619	952,459
TOTAL		9,965,106	13,743,273
By predefined Region			
Total Region	2.8409	8,857,912	12,216,301
By total U.S.:			
Total Aggregative	3.1961	9,965,106	13,743,273

TABLE VI.E

TOTAL DIRECT AND
INDUCED EFFECTS
OF EDC PURCHASES
BY CATEGORY
FY1975

	Direct Effects	Multiplier	Total Effects
Travel and Transportation:			
By Predefined Region	\$ 62,972	2.8409	\$ 178,897
Total Aggregative	62,972	3.1961	201,264
Facilities:			
By Predefined Region	198,908	2.8409	565,077
Total Aggregative	198,908	3.1961	635,729
Utilities:			
By Predefined Region	171,589	2.8409	487,467
Total Aggregative	171,589	3.1961	548,415
Others:			
By Predefined Region	474,867	2.8409	1,349,049
Total Aggregative	474,867	3.1961	1,517,772

TABLE VI.F

SUMMARY TOTAL INDUCED
EFFECTS OF EDC PURCHASED
FY1975

To Predefined Region	2,580,490
To Total Aggregative	2,903,180

TABLE VI.G

SUMMARY TOTAL DIRECT AND
INDUCED EFFECTS OF EDC VISITORS
FY1975

	Direct Effects	Multiplier	Total Effects
To Predefined Region	327,410	2.8409	930,139
To Total Aggregative	327,410	3.19611	1,046,438

felt in Sioux Falls as most of the lodging facilities are located in that locality.

Total Effects: All Expenditures

Table VI.H summarizes the direct effects and total effects including the induced effects from all sources for FY1975. Table VI.I summarizes the total effects of projected FY1976 expenditures. Incrementally total spending in the region is expected to increase in FY1976 by approximately \$5 million resulting from an increase in direct expenditures of almost \$2 million. Further given the assumption of stable expenditure patterns the total direct and induced expenditures may be allocated by expenditure category and location as in Table VI.J for FY1975 and in Table VI.K for FY1976.

By finding the difference between each element in Table VI.I and VI.J the incremental increase in expenditures by expenditure category by location can be determined. As an example, total food expenditures in Sioux Falls is expected to increase by \$660,426 as a result of the increased expenditures by the Data Center from FY1975 to FY1976.

Variation in Estimated Total Effects⁵

The multipliers used in obtaining the total effects are statistically estimated from the survey data. As they are statistical estimates, there exists a given probability of error. To measure this potential of error

⁵To compute confidence intervals the variances of each element to the interflow matrices were computed. These variances were carried through the computational routine to the percentage-distribution matrix. The square root of the sum of the variances of the column totals provided the necessary standard deviation to compute the confidence interval of the multiplier. It was then computed using the following formula:

$$P \left(.687114 - 1.9894 \frac{S}{\sqrt{N}} < \mu < .687114 + 1.9894 \frac{S}{\sqrt{N}} \right) = .95$$

where $S = .01331422$, $N = 83$, and $\mu = 3.196$.

TABLE VI.H
TOTAL EFFECTS
ALL SOURCES
FOR PREDEFINED REGION
AND AGGREGATIVE
FY1975

Source	Direct	Total Predefined Region	Total Aggregative
Payroll	3,117,886	8,857,912	9,965,106
Purchases Goods and Services	908,336	2,580,490	2,903,180
EDC Visitors	327,710	930,139	1,046,438
Total	4,353,632	12,368,541	13,914,724*

TABLE VI.I
TOTAL EFFECTS
ALL SOURCES
FOR PREDEFINED REGION
AND AGGREGATIVE
PROJECTED FY1976

Source	Direct	Total Predefined Region	Total Aggregative
Payroll	4,300,000	12,216,301	13,743,273
Purchases Goods and Services	1,316,700	3,740,613	4,208,304
EDC Visitors	425,636	1,209,189	1,360,379
Total	6,042,336	17,166,103	19,311,956*

*Does not include induced effects that would result from expenditures made outside of the region.

TABLE VI.J

ALLOCATED DIRECT AND INDUCED
EXPENDITURE-DISTRIBUTION MATRIX
FY1975

	1	2	3	4	5	6	7
Food	1,741,905*	89,167	263,908	93,754	39,273	56,520	56,699
Apparel	699,746	12,497	0	30,255	68,755	24,709	52,003
Transportation	1,033,635	33,954	192,522	94,106	142,589	89,342	81,354
Furniture	568,321	16,012	11,292	2,424	35,656	24,157	35,497
General Merchandise	526,123	35,389	22,663	22,911	37,190	32,279	25,069
Recreation	451,815	11,507	25,032	31,591	14,247	70,182	55,802
Personal Services	395,693	15,195	32,060	11,631	0	19,909	25,483
Other	1,683,652	33,657	241,955	64,588	27,509	99,005	358,569

For the Numbered Column Headings:

Sioux Falls = 1
 Dell Rapids = 2
 Garretson = 3
 Brandon = 4
 Rural Minnehaha County = 5
 Balance of South Dakota = 6
 Out of State = 7

*Should be interpreted as the total expected expenditures for food in Sioux Falls given total direct and induced expenditures from FY1975 injection by the Data Center.

TABLE VI.K

ALLOCATED DIRECT AND INDUCED
EXPENDITURE-DISTRIBUTION MATRIX
PROJECTED FY1976

	1	2	3	4	5	6	7
Food	2,402,331*	122,974	363,966	129,301	54,163	78,007	78,292
Apparel	965,047	17,236	0	41,727	94,823	34,408	71,720
Transportation	1,425,527	46,862	265,623	129,834	196,701	123,215	112,199
Furniture	784,774	22,082	15,573	3,343	49,175	33,374	48,956
General Merchandise	725,990	48,841	31,365	31,598	51,291	44,575	34,574
Recreation	624,096	15,905	34,523	43,568	19,700	96,849	76,958
Personal Services	545,717	20,956	44,216	16,089	0	27,457	35,145
Others	2,322,972	46,418	333,690	89,076	37,989	136,542	494,516

For the Numbered Column Headings:

Sioux Falls = 1

Dell Rapids = 2

Garretson = 3

Brandon = 4

Rural Minnehaha County = 5

Balance of South Dakota = 6

Out of State = 7

*Note footnote on Table VI.J.

a 95 percent confidence interval was computed for the total aggregative multiplier. It may be expressed as:

$$P (2.9578575 < \text{Aggregative Multiplier} < 3.4759701) = .95$$

which says that there is a 95 percent probability that the multiplier lies between 2.957 and 3.475 where recall that the calculated aggregative multiplier was 3.196. Our estimated total effect for FY1975 was \$13,914,724. Given the estimated confidence interval we are 95 percent confident that this estimate will lie between \$12,877,423 and \$15,133,094. For FY1976 we are 95 percent confident that it lies between \$17,872,368 and \$21,002,979.

Summary

Recall that the direct effects in this study have been defined as the initial injection by the Data Center. This amounted to a total of \$4,353,632 for FY1975 and \$6,042,336 for projected FY1976. In the aggregate the \$4 million increases through the multiplier process to a total of \$13,914,724. The projected FY1976 \$6 million multiplies to \$19,311,956.

On the basis of survey information the multipliers were computed. Each of these multipliers were of the apriori expected size. Indeed it is interesting that of the communities within the region the multiplier for Sioux Falls was the largest. The reason for this was due to inflows of expenditures from other communities as well as the fact that Sioux Falls people tended to spend locally. Contrasted to this was the rural multiplier where most expenditures were made in local communities, thus a very small rural multiplier.

SECTION VII
SAVINGS AND TAXES

Savings

Though in the computation of an expenditures multiplier savings is treated as a leakage from the expenditure pattern this does not suggest that the flow of savings cannot be of benefit to the local community. Indeed the flow of savings represents additional funds flowing into the regional financial centers which become available for meeting loan demand in the local markets. Once these funds are loaned out additional expenditures will result suggesting that the excess funds resulting from the savings of one individual are allocated by the financial institutions to other individuals who have needs for the funds for expenditure purposes. These additional expenditures then initiate additional induced expenditures in the local economy.

For the purpose of this study sufficient data to trace these secondary expenditures was not available though an idea of the approximate influence can be estimated. In the first round, savings of \$269,073 would be generated given FY1975 payroll. Table VII.A summarizes how it would be expected that these savings would be allocated in the region given the survey information. In FY1976 with a projected payroll of \$4.3 million expected savings of \$371,090 would result. These could then be allocated in a manner similar to the FY1975 savings.

These savings represent only those generated in the first round of the multiplier process. Each time a new expenditure occurs in the cycle, additional savings will leak out. Assuming that the pattern of savings remains constant throughout the entire process total savings from the

TABLE VII.A
 ALLOCATION OF FIRST ROUND SAVINGS
 BY LOCATION AND
 TYPE OF INSTITUTION
 FY1975

Where Savings Held	First Round Savings Made In			
	Sioux Falls	Dell Rapids	Garretson	Brandon
Savings and Loan and Bank Savings	108,502	2,735	3,396	3,064
Investments	76,253	980	0	0
Retirement Fund	42,895	3,487	108	1,356
Government Savings Bonds	2,454	260	0	1,459
Other	5,877	1,155	5,640	9,441
Total	235,984	8,619	9,146	15,322

FY1975 payroll would be approximately \$859,988 and for projected FY1976 \$1,186,044. Additional savings would accrue through expenditures made on goods and services as well as through dollars flowing in due to EDC visitors. Assuming that each of these dollars were to end up as income to the local community for FY1975 this could amount to approximately \$340,000 and for projected FY1976 \$480,578.

These figures become more significant when it is recognized that in FY1975 total savings generated by the Data Center would be equivalent to approximately .9 percent of the total savings in Savings and Loan Companies in Sioux Falls as of December 31, 1975 which was \$151,724,079. Interestingly as a percentage in this same period real estate loans in Sioux Falls were equivalent to an amount equal to 96 percent of the total savings. Thus of the savings flowing into the Savings and Loan Companies a large portion would end up as providing loans to home owners. In the survey of the employees approximately 46 percent of the savings were flowing into these institutions which means that from the FY1975 budget approximately \$616,000 in funds were provided for mortgages. For the projected FY1976 budget this should climb to approximately \$766,000. Clearly a significant contribution.

Taxes

As was the case with savings, taxes in the computation of an expenditures multiplier are treated as a leakage. However, again local benefits do accrue to local political units due to the existence of the Data Center.

In FY1975 the Data Center paid approximately \$109,000 in property taxes. Approximately 65 percent of property taxes go to the school systems in Minnehaha County suggesting that \$71,068 would go to the schools. Another

23 percent goes to the municipal governments, i.e., \$25,407, 8 percent to the county, i.e., \$9,210, and the remainder to the townships, i.e., \$3,315. These may be compared to total tax collections in Minnehaha for 1974 of \$23,980,741, school taxes of \$15,635,598, cities taxes of \$5,589,924, county taxes of \$2,025,984, and township and other taxes of \$729,228.⁶

Virtually all of these property taxes remain in the local economy. In addition to the property taxes paid by the Data Center its employees also pay additional property taxes which remain within the local economy. In an attempt to estimate the magnitude of these additional taxes recall that 23.09 percent of the income of the Data Center employees went for taxes. In the State of South Dakota of the 28.09 percent it is estimated that 71 percent goes for federal income taxes, 10.33 percent for real property taxes, 2.10 percent for personal property taxes, 9.55 percent for sales taxes, and 7.02 percent for other taxes.⁷ Given that total induced income from the FY1975 payroll is \$8,857,912 for the region this implies real property taxes of \$211,278 and personal property taxes of \$42,951 all of which will remain local. Also indirectly a portion of the sales tax of \$195,325 will remain local given the Sioux Falls sales tax of one percent. For projected FY1976 real property taxes generated from employee income is estimated to increase to \$291,382, personal property taxes to \$59,235 with sales tax of \$269,381.

⁶Data obtained from South Dakota Department of Revenue Annual Statistical Report 1973-1974.

⁷These estimates were derived from Internal Revenue Service data supplied to the Public Finance Project at The University of South Dakota. Most of the required data for the estimates can also be found in Statistics of Income, Internal Revenue Service, 1973.

Finally, firms from which the Data Center makes local purchases will also add additional income into the region from which additional taxes would result. Given the difficulty of tracing the expenditures of these firms no attempt is made to estimate the taxes which would be generated from this income.

SECTION VIII

EMPLOYMENT

The primary economic activities of a community are those activities generated by the primary or dominate industry(s) in the community. Secondary or derivative economic activities represent those activities which support those employed in the primary industries. As an example, if a community has a single factory, employment at that factory would represent the basic or primary economic activity of the community. The grocer, clothier, etc., who provides goods and services to the employees of the primary industry represent the secondary or derivative economic activities. Stated differently the primary activity provides the economic base to the community and about this base derivative activities provide the basic economic needs of those employed in the primary base.

To meet the basic needs a relatively stable relationship tends to exist between the number employed in the basic industries and the number employed in the supporting activities. This relationship may be estimated by observing the historical relationship for the community. Given that the average historical relationship might be viewed as an equilibrium relationship, deviations from this historical norm signals an expected readjustment back to the norm. In other words, if the employment in the primary activities were to increase, apriori, it would be expected that employment in the secondary activities would expand to the extent that the historical relationship between employment in the primary industries and the secondary industries would be re-established.

The EROS Data Center can be thought of as a primary industry in the predefined region. Historically the ratio between employment in the secondary industries and employment in government has been 5.06 in Minnehaha County

suggesting that for each employee at the Data Center an additional five employees are required to provide the derivative economic needs of the employees. For the years 1970 through 1973 this ratio has been relatively stable though it has climbed slightly. Given this ratio approximately 1,543 additional jobs in Minnehaha County were needed to support the employees of the Data Center. In FY1976 it is projected that employment will expand to 370 from its current 320. To support these additional 50 employees an approximate increase in secondary employment of 200 will be required. As this additional employment occurs further generation of regional income will occur.

Of the 320 employees of the Data Center in 1975 it is estimated that 85 were brought in from outside of the region including 66 professional staff and 19 technicians and clerical workers. In the survey 49.397 percent of the respondents stated that at least one additional member of the family was employed other than at EDC. Thus of those employees obtained from outside of the region another 42 members potentially could have been added to the labor force in the region.

In summary, the increment to the labor force through FY1975 was approximately 1,896 while with the projected FY1976 employment this will approach 2,100.

SECTION IX

SUMMARY

In November 1975 the EROS Data Center employed 320 full-time employees. Approximately 64.1 percent live in Sioux Falls, 6.6 percent in Brandon, 4.4 percent in Dell Rapids, 11.2 percent in Garretson, and the remainder in rural Minnehaha County and surrounding areas.

Table IX.A summarizes the total direct and induced effects resulting from EDC expenditures. In FY1976 this is expected to reach 19.3 million without the inclusion of the effects resulting from expenditures on goods and services outside of the region. Assuming that the total aggregative multiplier computed in this study is appropriate for these expenditures another 15 million of total expenditures could result. Also not recognized was the initial 16 million facility investment of which a portion would have remained locally. As was the case with the expenditures on goods and services additional induced expenditures would have resulted though since this was a single injection the expenditures would have tapered off over time.

Table IX.B summarizes how it is expected that the payroll dollars will be spent. Revealed by these figures are the demands upon the retailers for providing the expenditure needs of the employees. As an example grocery retailers can expect an estimated demand from FY1976 payroll at the Data Center of \$3,229,034.

Section VII revealed that from total induced income in the region savings of \$616,000 would result from the FY1975 budget. For projected FY1976 this is expected to increase to \$766,000. As reported in that section this represents new injections of funds into the local financial markets which become available to meet local loan demand. Also in Section

TABLE IX.A
 SUMMARY
 DIRECT AND INDUCED
 EFFECTS
 FY1975 AND FY1976

	FY1975			Projected FY1976		
	Direct Effects	Induced Predefined Region	Induced Total Aggregative	Direct Effects	Induced Predefined Region	Induced Total Aggregative
Payroll	3,117,886	8,857,912	9,965,106	4,300,000	12,216,301	13,743,273
Purchases Goods and Services	908,336	2,580,490	2,903,108	1,316,700	3,740,613	4,208,304
Visitors	327,410	930,139	1,046,438	425,636	1,209,189	1,360,379
Total	4,353,632	12,368,541	13,914,724*	6,042,336	17,166,103	19,311,956*

*Does not include induced expenditures that would result from expenditures made outside of the region.

TABLE IX.B
 TOTAL EXPECTED EXPENDITURES
 BY EXPENDITURE CATEGORY
 FROM PAYROLL
 FY1975 - PROJECTED FY1976

	<u>FY1975</u>	<u>Projected FY1976</u>
Food	2,341,226	3,229,034
Apparel	887,965	1,224,961
Transportation	1,667,502	2,299,961
Furniture	693,359	957,277
General Merchandise	701,624	968,234
Recreation	660,176	911,599
Personal Services	499,971	689,580
Other	2,508,935	3,461,203

VII taxes are summarized and it is estimated that in addition to the \$109,000 paid by the Data Center an additional \$211,278 real and \$42,951 personal property taxes are paid by EDC personnel for FY1975. In FY1976 this increases to an estimated \$291,382 real and \$59,235 personal property taxes.

Finally in Section VIII total incremental employment to the region of 1,896 is estimated with this increasing to approximately 2,100 in FY1976. The additional employment in excess of primary employment at the Center results from employment in the secondary industries necessary to provide the secondary basic needs.

Through the use of multiplier analysis it is clear that the EROS Data Center is a major contribution to economic activity in the region. Further it has been shown that considerable interflows of expenditures do occur with Sioux Falls as the primary benefactor. Used in this study is data for two years. With continuing budgets equivalent to these expenditures will remain at the levels estimated year after year.

Retailers as well as the Data Center authorities can benefit significantly from the knowledge of these demands upon local resources. Clearly they are significant and do influence current as well as potential future economic activity.

APPENDIX A
SURVEY QUESTIONNAIRE

UNITED STATES GOVERNMENT
Memorandum

TO : ALL EDC Employees

FROM : Chief, EROS Data Center

RE: OC 11-26

DATE: November 18, 1975

SUBJECT: Economic Impact Study Questionnaire

The lifeblood of any community lies in the well-being and contributions made by its citizens. The EROS Data Center (EDC) is a vital part of the local and peripheral communities. In an attempt to assess what the economic impact of EDC is on these communities, the Business Research Bureau of The University of South Dakota has been contracted to perform an economic impact study for EDC.

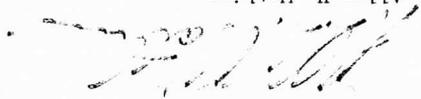
This study is important to the management of EDC, the local public authorities, and local business firms. Data and information collected from the studies can be used by these authorities to ensure adequate secondary facilities to employees of EDC as well as assist in the formulation of local, state, and federal legislation affecting EDC operations.

The attached questionnaire is being distributed to all personnel of EDC as of November 1975. You are asked to complete the questionnaire and return it to the Administrative Office by December 5. Husbands and wives and possibly other members of the family may wish to sit down together and complete the questions. It isn't necessary to calculate "to the penny" how and where incomes are spent; a well thought out percentage estimate is sufficient. All responses will be analyzed in the aggregate to ensure confidentiality of individual responses.

Your assistance in this matter is not mandatory but is important to the economy of your area, as well as to you, and will be greatly appreciated. Do not treat it as "just another questionnaire" but complete it to the best of your ability and return it by the designated date.

Attachment

Allen H. Watkins



University of South Dakota
Business Research Bureau
Economic Impact Study - EROS

In the space provided to the right of the questionnaire, enter the number of the correct answer to the question. If alternatives are not provided, enter the appropriate answer given the question.

EXAMPLE:

EROS is located: 2
 (1) North of Aberdeen, S. D. _____
 (2) North of Sioux Falls, S. D. _____
 (3) South of Sioux Falls, S. D. _____

I. Place of Residence: _____
 (1) Sioux Falls (7) Renner _____
 (2) Baltic (8) Corson _____
 (3) Dell Rapids (9) Rural Minnehaha County _____
 (4) Sherman (10) Balance of South Dakota _____
 (5) Garretson (11) Out of State _____
 (6) Brandon _____

II. Income (Total Annual Income Received from EROS Before Taxes.) _____

A. Select Appropriate Income Bracket _____
 (1) \$ 0- 999 (6) \$5,000-5,999 (11) \$10,000-10,999 (16) \$15,000-19,999
 (2) 1,000-1,999 (7) 6,000-6,999 (12) 11,000-11,999 (17) 20,000-24,999
 (3) 2,000-2,999 (8) 7,000-7,999 (13) 12,000-12,999 (18) 25,000-34,999
 (4) 3,000-3,999 (9) 8,000-8,999 (14) 13,000-13,999 (19) 35,000& Over
 (5) 4,000-4,999 (10) 9,000-9,999 (15) 14,000-14,999

B. What Percent of total family income is earned as an employee of EROS? _____
 1. If LESS than 100%, where is remaining earned? _____
 (1) Sioux Falls (7) Renner _____
 (2) Baltic (8) Corson _____
 (3) Dell Rapids (9) Rural Minnehaha County _____
 (4) Sherman (10) Balance of South Dakota _____
 (5) Garretson (11) Out of State _____
 (6) Brandon _____

C. If other members of family are employed other than at EROS, where are they employed? Place in space number employed at each location?
 (1) Sioux Falls _____ (7) Renner _____
 (2) Baltic _____ (8) Corson _____
 (3) Dell Rapids _____ (9) Rural Minnehaha County _____
 (4) Sherman _____ (10) Balance of South Dakota _____
 (5) Garretson _____ (11) Out of State _____
 (6) Brandon _____

III. Expenditure Pattern (Behind the categories please estimate the percent of your total family income before taxes, i.e., annual gross salary, spent on each category). Make sum equal 100%.

A. Food % of total income _____
 (This means foods and beverages prepared and consumed in the home and also foods and beverages, purchased in commercial establishments such as restaurants, drive-ins, etc.)

(1) What percent of this food budget is spent in the following places? Make sum equal 100%.

- | | |
|-----------------------|------------------------------------|
| (1) Sioux Falls _____ | (7) Renner _____ |
| (2) Baltic _____ | (8) Corson _____ |
| (3) Dell Rapids _____ | (9) Rural Minnehaha County _____ |
| (4) Sherman _____ | (10) Balance of South Dakota _____ |
| (5) Garretson _____ | (11) Out of State _____ |
| (6) Brandon _____ | |

B. Apparel % of total income _____
 (This includes clothing and accessories for the entire family).

(1) What percent of your total annual "apparel" budget is spent in the following places? Make sum equal 100%.

- | | |
|-----------------------|------------------------------------|
| (1) Sioux Falls _____ | (7) Renner _____ |
| (2) Baltic _____ | (8) Corson _____ |
| (3) Dell Rapids _____ | (9) Rural Minnehaha County _____ |
| (4) Sherman _____ | (10) Balance of South Dakota _____ |
| (5) Garretson _____ | (11) Out of State _____ |
| (6) Brandon _____ | |

C. Transportation % of total income _____
 (This includes all transportation expenses, such as purchases, operation and maintenance of vehicles, taxi, air, bus, etc. fares.)

(1) What percent of your total annual "transportation" budget is spent in the following places? Make sum equal 100%.

- | | |
|-----------------------|------------------------------------|
| (1) Sioux Falls _____ | (7) Renner _____ |
| (2) Baltic _____ | (8) Corson _____ |
| (3) Dell Rapids _____ | (9) Rural Minnehaha County _____ |
| (4) Sherman _____ | (10) Balance of South Dakota _____ |
| (5) Garretson _____ | (11) Out of State _____ |
| (6) Brandon _____ | |

D. Furniture % of total income _____
 (This includes furniture, appliances, radio, T.V. and other household appliances.)

(1) What percent of your total annual "furniture" budget is spent in the following places? Make sum equal 100%.

- | | |
|-----------------------|------------------------------------|
| (1) Sioux Falls _____ | (7) Renner _____ |
| (2) Baltic _____ | (8) Corson _____ |
| (3) Dell Rapids _____ | (9) Rural Minnehaha County _____ |
| (4) Sherman _____ | (10) Balance of South Dakota _____ |
| (5) Garretson _____ | (11) Out of State _____ |
| (6) Brandon _____ | |

E. General Merchandise % of total income _____
 (This includes drugs, hardware, jewelry, dry goods,
 variety gifts, and other such stores.)
 (1) What percent of total annual "general merchandise" budget
 is spent in the following places? Make sum equal 100%.
 (1) Sioux Falls _____ (7) Renner _____
 (2) Baltic _____ (8) Corson _____
 (3) Dell Rapids _____ (9) Rural Minnehaha County _____
 (4) Sherman _____ (10) Balance of South Dakota _____
 (5) Garretson _____ (11) Out of State _____
 (6) Brandon _____

F. Recreation % of total income _____
 (This includes sporting equipment, golfing, skiing
 fishing, bowling, and other recreation activities.)
 (1) What percent of total annual "recreation" budget
 is spent in the following places? Make sum equal 100%.
 (1) Sioux Falls _____ (7) Renner _____
 (2) Baltic _____ (8) Corson _____
 (3) Dell Rapids _____ (9) Rural Minnehaha County _____
 (4) Sherman _____ (10) Balance of South Dakota _____
 (5) Garretson _____ (11) Out of State _____
 (6) Brandon _____

G. Personal Services % of total income _____
 (This includes barbers, beauty shops, hotels, motels
 photographers, optometrists, lawyers, laundromats,
 accountants, and other such personal services.)
 (1) What percent of your annual "personal services" budget
 is spent in the following places? Make sum equal 100%.
 (1) Sioux Falls _____ (7) Renner _____
 (2) Baltic _____ (8) Corson _____
 (3) Dell Rapids _____ (9) Rural Minnehaha County _____
 (4) Sherman _____ (10) Balance of South Dakota _____
 (5) Garretson _____ (11) Out of State _____
 (6) Brandon _____

H. Taxes % of total income _____
 (This includes percentage spent on all taxes, i.e.,
 federal income, FICA, sales, property, etc.)

I. Others % of total income _____
 (This includes everything else purchased but not included
 in any of the above.)
 (1) What percent of your total annual "others" budget is spent
 in the following places? Make sum equal 100%.
 (1) Sioux Falls _____ (7) Renner _____
 (2) Baltic _____ (8) Corson _____
 (3) Dell Rapids _____ (9) Rural Minnehaha County _____
 (4) Sherman _____ (10) Balance of South Dakota _____
 (5) Garretson _____ (11) Out of State _____
 (6) Brandon _____

IV. Savings % of total income _____
(This includes that portion of income not spent for consumption items or for meeting tax obligations.)

- (1) What percent of savings do you hold in: (Make sum equal 100%)
- (a) Savings and Loan and Bank Savings _____
 - (b) Investments (i.e., stocks, bonds, real estate) _____
 - (c) Retirement Fund _____
 - (d) Government Savings Bonds _____
 - (e) Other _____

(2) Where are these savings held?
(Check appropriate space)

- | | |
|-----------------------|------------------------------------|
| (1) Sioux Falls _____ | (7) Renner _____ |
| (2) Baltic _____ | (8) Corson _____ |
| (3) Dell Rapids _____ | (9) Rural Minnehaha County _____ |
| (4) Sherman _____ | (10) Balance of South Dakota _____ |
| (5) Garretson _____ | (11) Out of State _____ |
| (6) Brandon _____ | |

APPENDIX B
SUMMARY OF COMPUTATIONAL STEPS

APPENDIX B

SUMMARY OF COMPUTATIONAL STEPS

Step 1 COMPUTE SAMPLE EXPENDITURE INTERFLOW MATRIX

These matrices summarize where expenditures are made between various localities. An interflow matrix for each expenditure category is computed. Each would appear as follows:

	1	2
1	x_{11}	x_{12}
2	x_{21}	x_{22}

where x_{11} would represent the amount spent by individuals in locality 1 in locality 1, and x_{12} the amount spent by individuals in locality 2 in locality 1. In each case the expenditure is for the same commodity and is measured in absolute terms taken directly from the survey.

Step 2 COMPUTE PERCENTAGE OF TOTAL EXPENDITURES ON A GIVEN CATEGORY SPENT IN RESPECTIVE LOCATION

First, sum the column in each of the matrices in Step 1. In other words, $\sum x_{11} + x_{21} = x_{.1}^*$, etc., which represents to total expenditures on a given category by individuals in location 1. To represent the percentage spent in each location divide the sum totals, i.e., $x_{.1}$ into each element in its respective column. In our example, $x_{11}/x_{.1}$ and $x_{21}/x_{.1}$.

Step 3 COMPUTE AVERAGE PERCENTAGE SPENT ON EXPENDITURE CATEGORY BASED ON RESIDENCE

This is computed directly from the surveys returned from each locality as a simple average. The resultant percentages define the expenditure patterns of the respondees by location.

*The dot notation symbolizes summation over either the row or column subscript designated by where the dot is located. In our example over the rows.

Step 4 CONVERT SAMPLE EXPENDITURE INTERFLOW MATRICES INTO POPULATION
EXPENDITURE INTERFLOW MATRICES

The income flowing into each locality is multiplied times the average spent on each expenditure category from Step 3. This product is then multiplied times the percentage of total expenditures on a specific category spent in the respective location from Step 2. Doing this for each location and expenditure category produces the population expenditure interflow matrix for each expenditure category. This set of matrices represents expenditures made in the first round of expenditures in the responding process.

Step 5 PREPARE EXPENDITURE-DISTRIBUTION MATRIX

Obtained by transposing the row totals from the expenditure-interflow matrices to row elements of the expenditure-distribution matrix.

Step 6 COMPUTE PERCENTAGE-DISTRIBUTION MATRIX

Obtained by dividing each element of the expenditure-distribution matrix from Step 5 by the total dollars flowing into the region. Each of the elements of this matrix gives the percentage of each dollar flowing into the region that is spent at each locality for each expenditure category.

Step 7 COMPUTE PROPENSITIES TO SPEND NEW DOLLARS BY LOCATION AND FOR
GOODS AND SERVICES AS CONTRASTED TO SAVING OR TAXATION

This is obtained by summing the columns of the percentage-distribution matrix to determine the propensities to spend in each locality. Summing these sums will provide the total propensity to spend on goods and services as contrasted to saving or taxation.

Step 8 COMPUTE MULTIPLIER FOR U.S.

Equal to,

$1/1$ -propensity to spend for goods and services
(Step 7)

Step 9 USE MULTIPLIER TO OBTAIN TOTAL EXPECTED CHANGE IN INCOME
(EXPENDITURES) IN U.S.

Obtained by multiplying multiplier in Step 8 times total inflow
due to the Data Center.

Step 10 ALLOCATE TOTAL DIRECT AND INDUCED INCOME (EXPENDITURES) TO
LOCALITIES WITHIN THE REGION AND TO EXPENDITURE CATEGORIES

Multiply the column sums from the percentage-distribution matrix
times the product received in Step 9. This gives total expected
change in income and expenditures by each locality. Then allocate
this to each expenditure category through the use of the
expenditure- distribution matrix.

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