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Manpower Planning Model On The
Computer

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On The Computer.

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I- Introduction:

In underdeveloped and developing countries, manpower as a factor of production represents a bottleneck for social and economic development. This is so because of the lack of the required skill for the different jobs. The majority of the Manpower in these countries is unskilled. This necessitates in the short-run the importation of experts from more advanced countries. Meanwhile in the long-run policy, the preparation of citizens to replace those imported experts has to be considered very carefully. As it is well-known, industry, and specially heavy industry is the back-bone of fast economic development in any country. Industrialization in turns needs different categories of skill and know-how. This requires accordingly different levels of training and education. So, the country has to plan for this in two directions simultaneously:-

1. Short-term Manpower planning:-

This means the preparation of Manpower with the required levels of skills and experience as quickly as possible to cover the urgent needs of the established factories. For this reason, training centers have to be created for training the required Manpower in short periods. Also we can make use of the experience of foreign as well as local experts in this direction.

2. Long-Term Manpower planning

To graduate a student from the first stage of education, i.e. primary education, till the highest stage, i.e. the University, a long period is clearly required. This indicates the importance of long-term Manpower planning. To achieve the targets of social and economic plans, we must prepare the necessary Manpower having the suitable skill and experience.

Accordingly the different levels of education have to be reorganized and expanded; specially the technical education. The education and training system in the U.A.R. has developed and its capacity has expanded considerably during the last 10 years, yet much has still to be done to cope with the ever increasing needs in a society which is rapidly becoming industrialized.

Planners can make use of the conclusions and recommendations given in the different researches concerning Manpower Planning as these are the fruits of the experience and studies of experts in this field.

The bases on which this research is conducted, are the same ones agreed upon in the research "Manpower Requirements For the U.A.R. For the Period 1960 - 1985, Memo. No. 431.

manpower

II- Efforts In The Institute of National Planning

Due to the importance of this study, many efforts had been done in the Institute of National Planning trying to give useful conclusions to help the planners in preparing their plans for training and education. Groups of experts carried out the work and at present there is a new group in the Institute preparing a more developed research concerning the subject of long-term manpower planning, taking into consideration the indicators and the trends which were not tangible in the previous researches.

Many memoranda⁽¹⁾ have been published in this subject containing the results of these researches.

In the annual Long-Term Training Program of the Institute there is a special group for Manpower Planning, its purpose is to prepare the necessary Manpower planners for the different institutions. ✓

The Institute in cooperation with different institutions (Ministry of High Education, Ministry of Industry, etc.), held the seminars to discuss the problem of Manpower planning in the U.A.R. trying to get useful solutions. Due to the importance of Manpower planning, the Government, very recently decided to form a central Organization for planning, one of its main departments is the Manpower planning department. ✓

(1) See References Page (25).

III. Manpower Planning Model On the Computer:

All the calculations which were necessary for the previous researches concerning long term manpower planning were prepared manually using the normal desk calculator which requires a lot of efforts and a considerably very long time. Also these calculations can not be considered completely perfect due to the probability of errors in this case.

For these reasons we tried in this memo. to prepare a Manpower Planning Model on the I.B.M. 1620 computer available in the Operations Research Center. The use of the computer to solve this problem has the following advantages:-

1. Saving of time and efforts.
2. Giving completely perfect results.
3. Once the program is prepared it can be used for several alternatives of input data.
4. The previous researches could not be in coincidence with the preparation of National Plans due to the delay in giving the results.

In what follows we give an illustration of the program used, the input data and the results.

IV. FORTTRAN PROGRAM FOR THE PROBLEM:

The program for the problem is written in FORTTRAN language. It is internally divided into the following sections.

1. Calculation of the Value Added:

Here we considered the year 1960 as the base year, and then we applied the following formula:

$$\left[\frac{v_t}{v_0} \right]_i = \left[\frac{y_t}{y_0} \right]^{a_{1i}} \cdot \left[\frac{N_t}{N_0} \right]^{a_{2i}}$$

where

v_t = Per capita value added at year t

y_t = Per capita income at year t

N_t = Total population at year t
(at base year, $t = 0$)

i refers to a specific sector of the economy.

As the available data for the computation of the value added are the national income and the value added for every sector, the equation used in the present program becomes:-

$$V_{i,t} = \left(\frac{Y_t}{Y_0} \right)^{a_{1i}} \times \left(\frac{N_t}{N_0} \right)^{a_{2i} - a_{1i} + 1} \times V_{oi}$$

In this study the whole economy is divided into 19 main sectors as follows:

1. Agriculture.
2. Mining and Quarrying (excluding Oil extraction).
3. Oil extraction and Oil products.
4. Total Manufacturing Industries.
5. Electricity and Public utilities.
6. Construction.

7. Transport.
8. Trade and Finance.
9. Services.
10. Food, Beverages and Tobacco.
11. Spinning, Weaving, etc.
12. Clothes and Shoes.
13. Wood and Paper.
14. Printing and Publishing.
15. Leather and Rubber.
16. Chemicals (excluding Oil extraction).
17. Non-metallic.
18. Basic Metallic.
19. Metallic Products and Miscellaneous Industries.

The values of the parameters a_1 and a_2 were estimated, for each industry separately, in an international cross-section analysis⁽¹⁾.

In the program the following symbols are used:

$VA(I,IT)$ = the value added for sector
(I) at year (IT)

- ✓ $Y(IT)$ = National income for year (IT) ✓
 AY = National income for the base year.
 $A(I)$ = a_{1i}
 $B(I)$ = a_{2i} ✓
 $BN(IT)$ = Population in the year (IT). ✓
 AN = Population in the base year.
 $VO(I)$ = Value added for sector I in the base year.

(1) Dr. Linnemann, Long-Term Manpower Planning Research.
The Long Development of Different Sectors of the U.A.R.
Economy Memo. No. 285, I.N.P., April 1963.

The computer will give directly a table containing the value added for each sector of the economy during the period of estimation (1960-1985), every 5 years.

The data necessary here are:-

1. The national income $Y(IT)$, of the year (IT) . (IT)
2. The national income AY , of the base year.
3. $A(I)$
4. $B(I)$
5. The population $BN(IT)$ in the year (IT) .
6. The population AN in the base year.
7. The value added for each sector $VO(I)$ at the base year.

2. Calculation of Labour Productivity

For estimating the labour productivity, the period (1960 - 1985) is divided into 2 sub-periods, i.e. from 1960 - 1975 and from (1975 - 1985). The reason of this division is the variation of the estimated rate of increase of labour productivity of some industries along both periods. Productivity is estimated according to the following equation.

$$P_{i,t} = P_{i,0}(1 + r)^t$$

where

$P_{i,t}$ = labour productivity at year t for sector i .
 $P_{i,0}$ = " " " base year for sector i .
 r = annual rate of increase of labour productivity estimated from international cross-section analysis.

In the program the following symbols are used:-

$V(I,IT)$ = the labour productivity for sector I at year (IT)
 $VT(I)$ = the labour productivity for sector I at base year.
 $R(I)$ = annual rate of increase of labour productivity.

The computer will give directly a table containing the labour productivity of each sector of the economy during both periods of estimation 1960 - 75, 1975 - 85, every five years.

The data necessary here are:-

1. Labour productivity at base year for each sector VT(I).
2. Annual rate of increase of labour productivity for each sector R (I) for the period 1960 - 75, and F(I) for the period 1975 - 1985.
3. Total Number of Labour Force:-

✓ As it is well known, labour productivity is the result of dividing the value added by the labour force for each sector in the corresponding period, i.e.

$$\text{Total No. of labour Force} = \frac{\text{Value added}}{\text{Productivity}}$$

$$W_{i,t} = \frac{V_{i,t}}{P_{i,t}} \times 10^6$$

as applied in the program.

This means that to get the total number of labour force for each sector every five years along the period 1960-85, we have to divide each element in the table in item No. (1) with the corresponding element of the table in item No. (2).

N.B. To avoid getting fraction numbers of labour force for each sector, we multiply the result by 10^6 as the value added figures are given in million pounds.

4. The Occupational structure of the labour force:

The labour force is grouped into five main categories, i.e.

1. Managers and high professionals.
2. Technicians.
3. Clerks.

4. Skilled labour.

5. Unskilled labour.

To get the number of labour force in each category for the different sectors, we have to multiply the total numbers of labour force by the corresponding coefficients of each category. These coefficients were prepared by different studies as mentioned in Memo. No. (431).

In the program the following symbols are used:-

$P(I,IT)$ = Number of labour force in each category in sector (I) at year (IT)

$Q(I,IT)$ = Coefficient of labour force composition for sector (I) at year (IT)

$W(I,IT)$ = Total numbers of labour force for sector (I) at year (IT), estimated in item No. (3) above.

The data required here are:-

$Q(I,IT)$, which are the coefficients of labour force composition for sector (I) at year (IT), which vary from one category to another.

In what follows we shall give listing of the Input Data, the FORTRAN Program for the problem followed by the Output results.

LISTING OF THE INPUT DATA

NATIONAL INCOME -Y(IT)

1001	1282.0	1795.0	2564.0	3598.7	5114.7	7374.4
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POPULATION-BN(IT)

2001	26054.0	29806.0	34026.0	38540.0	43288.0	48282.0
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VALUE ADDED-VO(I)

3001	399.9	5.5	34.2	221.8	19.1	52.0	
3002	97.5	127.0	325.0	77.3	51.1	10.3	
3003	8.7	9.5	3.6	12.9	9.1	7.3	33.0

LABOUR PRODUCTIVITY-VT(I)

4001	108.4	332.6	4092.4	291.0	525.5	335.0	
4002	383.1	207.6	260.9	808.0	291.0	200.3	
4003	100.6	604.0	325.4	680.3	266.2	500.1	123.9

ANNUAL RATE OF INCREASE OF VT(I)-R(I)

5001	0.025	0.030	0.023	0.033	0.033	0.043	0.032	0.025	0.016	
5002	0.020	0.027	0.046	0.037	0.020	0.032	0.048	0.026	0.047	0.035

ANNUAL RATE OF INCREASE OF VT(I)-F(I)

6001	0.038	0.030	0.023	0.033	0.042	0.043	0.032	0.025	0.020	
6002	0.020	0.027	0.046	0.037	0.020	0.032	0.048	0.026	0.047	0.035

A(I)

7001	0.47	0.94	1.55	1.98	1.55	1.15	1.29	0.90	0.90	0.98
7002	1.21	1.36	1.44	1.72	1.25	1.55	1.16	1.99	1.90	

B(I)

8001	-0.15	0.00	0.17	0.00	0.00	-0.05	-0.05	0.00	0.00	-0.10
8002	0.22	-0.03	0.56	0.03	0.10	0.17	0.01	0.43	0.21	

NATIONAL INCOME, POPULATION-AY,AN

9000 1282.0 26054.0

Percentage Composition of Labour Force - Q(I,IT)

MANAGERS AND HIGH PROFESSIONALS

9001	1	0.07	0.10	0.12	0.15	0.18	0.20
9002	2	1.60	1.90	2.20	2.50	2.90	3.20
9003	3	7.20	7.40	7.60	7.80	8.00	8.20
9004	4	0.00	0.00	0.00	0.00	0.00	0.00
9005	5	2.70	3.30	4.00	4.70	5.40	6.10
9006	6	5.60	6.00	6.50	7.00	7.50	7.90
9007	7	3.40	3.60	3.90	4.30	4.30	5.00
9008	8	1.60	2.00	2.40	2.80	3.30	3.70
9009	9	8.70	9.60	10.50	11.40	12.40	13.70
9010	10	3.20	3.60	4.00	4.40	4.80	5.10
9011	11	2.20	2.60	3.60	3.40	3.80	4.20
9012	12	0.43	0.63	0.80	1.00	1.20	1.50
9013	13	0.50	1.00	1.50	2.00	2.50	3.00
9014	14	3.40	4.00	4.70	5.30	6.00	6.50
9015	15	1.50	1.90	2.40	2.80	3.40	4.00
9016	16	6.20	6.40	6.60	6.80	7.00	7.30
9017	17	2.10	2.90	3.70	4.50	5.30	6.00
9018	18	2.60	3.30	4.60	4.70	5.40	6.20
9019	19	1.40	1.90	2.40	2.90	3.40	4.00

TECHNICIANS

9101	1	0.8	0.9	0.1	1.1	1.2	1.3
9102	2	2.8	3.4	4.0	4.7	5.3	6.0
9103	3	9.1	9.3	9.5	9.7	9.9	10.1
9104	4	0.0	0.0	0.0	0.0	0.0	0.0
9105	5	2.7	5.4	7.8	10.2	13.0	15.5
9106	6	3.6	5.3	7.0	8.7	10.4	12.1
9107	7	12.9	15.5	18.1	20.7	23.4	26.0
9108	8	2.0	3.1	4.2	5.3	6.4	7.5
9109	9	12.5	14.6	16.7	18.8	20.9	23.0
9110	10	3.1	4.0	5.1	6.1	7.1	8.2

9111	11	3.3	5.1	6.9	8.7	10.5	12.3
9112	12	4.4	5.4	6.4	7.4	8.4	9.4
9113	13	2.5	4.0	5.5	7.0	8.5	10.0
9114	14	2.9	4.4	6.0	7.6	9.2	10.6
9115	15	2.7	3.5	4.3	5.1	5.9	7.0
9116	16	5.2	6.4	8.5	10.7	12.8	15.0
9117	17	2.9	4.3	5.7	7.1	8.5	10.0
9118	18	4.5	6.6	8.7	10.8	12.9	15.0
9119	19	2.7	5.0	7.1	9.1	11.4	13.8

CLERKS

9201	1	0.2	0.5	0.7	1.0	1.2	1.4
9202	2	3.0	3.3	3.6	3.9	4.2	4.5
9203	3	13.0	13.4	13.7	14.1	14.4	14.6
9204	4	0.0	0.0	0.0	0.0	0.0	0.0
9205	5	9.3	10.4	11.4	12.5	13.6	14.8
9206	6	1.9	2.2	2.5	2.8	3.2	3.5
9207	7	8.3	8.8	9.3	9.8	10.3	10.7
9208	8	6.7	7.3	7.6	8.5	9.2	10.0
9209	9	4.6	5.3	6.0	6.7	7.4	8.2
9210	10	6.9	7.3	7.6	7.9	8.1	8.2
9211	11	6.4	7.1	7.9	8.5	9.2	9.8
9212	12	0.7	1.0	1.3	1.6	1.9	2.2
9213	13	0.7	1.0	1.3	1.6	1.9	2.2
9214	14	5.4	6.0	6.6	7.4	8.1	8.8
9215	15	2.4	2.7	3.0	3.3	3.6	4.0
9216	16	11.3	12.0	12.7	13.4	14.1	14.8
9217	17	3.2	3.7	4.2	4.7	5.4	5.5
9218	18	7.9	8.6	9.3	10.0	10.8	11.5
9219	19	1.3	1.9	2.5	3.1	3.7	5.0

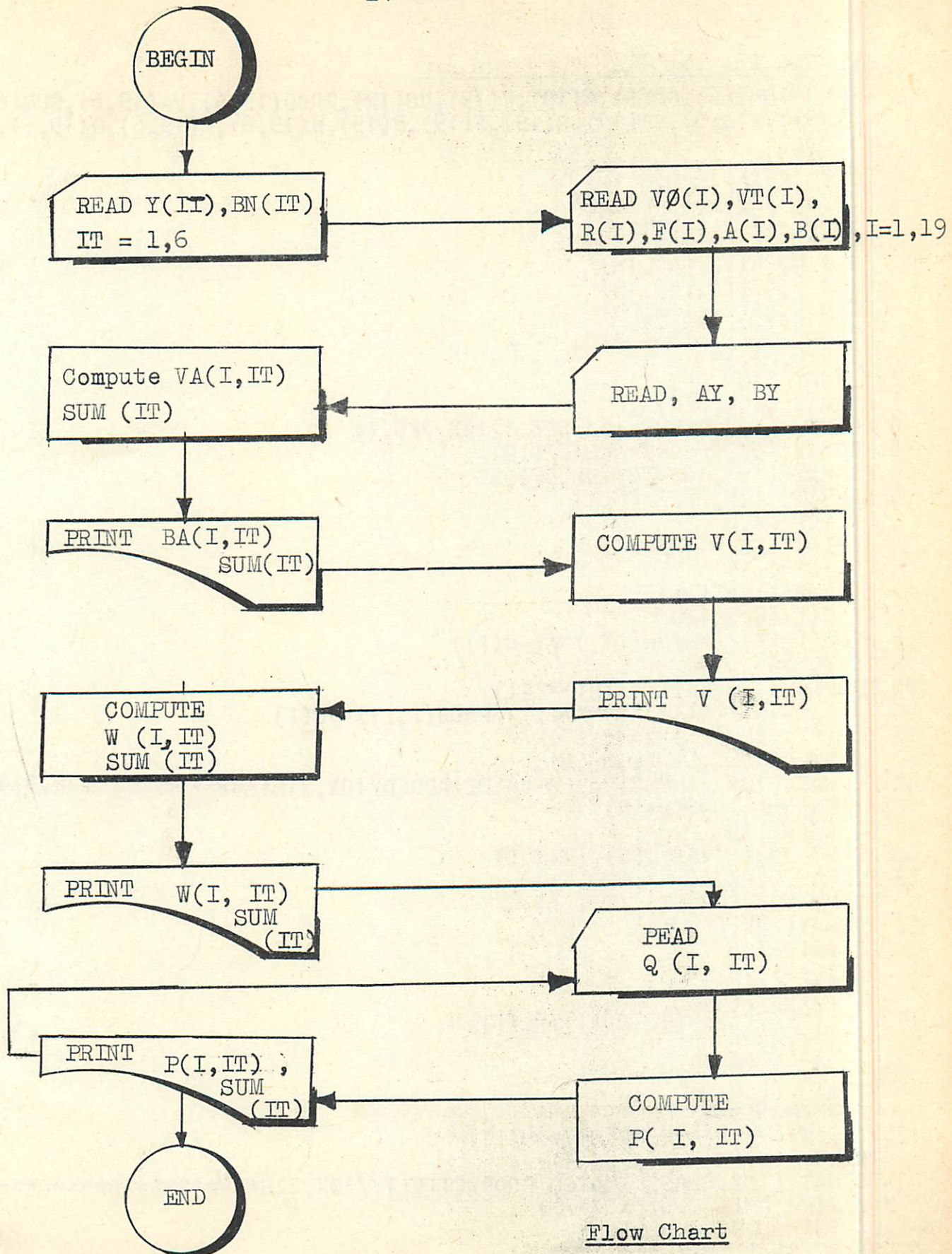
SKILLED LABOR

9301	1	0.8	1.0	1.3	1.5	1.8	2.5
9302	2	17.9	22.3	26.7	31.1	35.5	40.0
9303	3	30.8	32.3	33.9	35.4	37.0	38.5
9304	4	0.0	0.0	0.0	0.0	0.0	0.0

9305	5	27.7	29.1	30.5	32.0	33.5	35.0
9306	6	25.0	26.9	28.8	30.7	32.7	34.7
9307	7	29.1	30.8	32.5	34.3	36.1	38.0
9308	8	26.4	27.9	29.4	31.0	32.4	34.0
9309	9	16.9	18.2	19.5	20.8	22.1	23.3
9310	10	27.5	28.7	29.9	31.2	32.6	33.8
9311	11	43.8	44.6	45.4	46.2	47.0	47.7
9312	12	30.9	32.5	34.1	35.7	37.3	39.0
9313	13	33.6	34.1	34.6	35.2	35.8	36.3
9314	14	31.6	34.2	36.8	39.4	42.0	45.0
9315	15	36.8	37.3	37.8	38.4	38.9	39.4
9316	16	18.3	21.4	24.5	27.8	30.9	36.0
9317	17	30.2	31.3	32.4	33.6	34.8	35.9
9318	18	33.6	35.2	36.8	38.4	40.0	42.0
9319	19	32.4	33.8	35.3	36.8	38.4	40.0

UNSKILLED LABOR

9401	1	90.12	97.50	96.00	96.25	95.62	95.10
9402	2	74.70	69.10	63.50	57.80	52.10	46.30
9403	3	39.90	37.60	35.30	33.00	30.70	28.60
9404	4	0.00	0.00	0.00	0.00	0.00	0.00
9405	5	57.60	51.80	46.30	40.60	34.50	28.60
9406	6	63.90	59.60	55.20	50.80	46.20	41.80
9407	7	46.30	41.30	36.20	30.90	25.90	20.30
9408	8	63.30	59.70	57.10	52.40	48.70	44.80
9409	9	57.30	52.30	47.30	42.30	37.10	31.80
9410	10	59.30	56.40	53.40	50.40	47.40	44.70
9411	11	44.30	40.60	36.80	33.20	29.50	26.00
9412	12	63.57	60.47	57.40	54.30	51.20	47.90
9413	13	62.70	59.90	57.10	54.20	51.30	48.50
9414	14	56.70	51.40	45.90	40.30	34.70	29.10
9415	15	56.60	54.60	52.50	50.40	48.20	45.60
9416	16	59.00	53.80	47.70	41.30	35.20	26.90
9417	17	61.60	57.80	54.00	50.10	46.00	42.60
9418	18	51.40	46.30	41.20	36.10	31.90	25.30
9419	19	62.20	57.40	52.70	48.10	43.10	37.20



Flow Chart

FORTRAN Program For The Problem:

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DIMENSION Y(6), BN(6), A(19), B(19), VO(19), PROD(19,6), VA(19,6), SUM(6),
X, C(19), V(19,6), VT(19), R(19), F(19), D(19), W(19,6), P(19,6), Q(19,6), L(
X6), M(6)
READ 1, (Y(IT), IT=1,6)
READ 2, (BN(IT), IT=1,6)
READ 3, (VO(I), I=1,19)
READ 3, (VT(I), I=1,19)
READ 4, (R(I), I=1,19)
READ 4, (F(I), I=1,19)
READ 5, (A(I), I=1,19)
READ 5, (B(I), I=1,19)
READ 6, AY, AN
1 FORMAT (10X,6F7.1)
2 FORMAT (10X,6F8.1)
3 FORMAT (10X,6F8.1/10X,6F8.1/10X,7F8.1)
4 FORMAT (10X,9F6.3/10X,10F6.3)
5 FORMAT (10X,10F5.2/10X,9F5.2)
6 FORMAT (10X,F8.2,F8.1)
DO 10 IT=1,6
SUM(IT)=0.
DO 10 I=1,19
C(I)=B(I)-A(I)+1.
IF(C(I))8,8,100
8 PROD(I,IT)=(AN/BN(IT))**(-C(I))
GO TO 80
100 PROD(I,IT)=(BN(IT)/AN)**C(I)
80 VA(I,IT)=((Y(IT)/AY)**A(I))*PROD(I,IT)*VO(I)
10 SUM(IT)=SUM(IT)+VA(I,IT)
PRINT 40, (LT, LT=60,85,5)
40 FORMAT (10X,21HESTIMATED VALUE ADDED/10X,21H*****//
X//14X,4HI,6(6X12)//)
DO 60 I=1,19
60 PRINT 30, I, (VA(I,IT), IT=1,6)
30 FORMAT (14X,12,4X,6F8.1)
PRINT 50, (SUM(IT), IT=1,6)
50 FORMAT (20X,6F8.1)
DO 11 IT=1,4
DO 11 I=1,19
L(IT)=5*(IT-1)
11 V(I,IT)=VT(I)*(1.+R(I))**L(IT)
DO 12 IT=5,6
DO 12 I=1,19
VT(I)=V(I,4)
M(IT)=5*(IT-4)
12 V(I,IT)=VT(I)*(1.+F(I))**M(IT)
PRINT 41, (LT, LT=60,85,5)
41 FORMAT (10X,22HESTIMATED PRODUCTIVITY/10X,22H*****
X*///14X,4HI,6(6X12)//)
DO 13 I=1,19
13 PRINT 34, I, (V(I,IT), IT=1,6)

```



```

34 FORMAT (14X,12,4X,6F8.1)
DO 14 IT=1,6
SUM(IT)=0.
DO 14 I=1,19
W(I,IT)=(VA(I,IT)/V(I,IT))*10.**6
14 SUM(IT)=SUM(IT)+W(I,IT)
PRINT 20,(LT,LT=60,85,5)
20 FORMAT (10X,20HTOTAL NO. OF WORKERS/10X,20H*****//
X14X,2HI,6(8X12)//)
DO 15 I=1,19
15 PRINT 21,I,(W(I,IT),IT=1,6)
21 FORMAT (14X,12,4X,6F10.0)
PRINT 70,(SUM(IT),IT=1,6)
70 FORMAT (20X,6F10.0)
200 READ 35,
35 FORMAT (40H
DO 16 I=1,19
16 READ 7,12,(Q(I,IT),IT=1,6)
7 FORMAT (10X,12,6F6.2)
DO 18 IT=1,6
SUM(IT)=0.
DO 18 I=1,19
P(I,IT)=Q(I,IT)*W(I,IT)/100.
18 SUM(IT)=SUM(IT)+P(I,IT)
PRINT 35,
PRINT 25,(LT,LT=60,85,5)

25 FORMAT (29H*****//14X,2HI,6(8X12)//)
DO 17 I=1,19
17 PRINT 21,I,(P(I,IT),IT=1,6)
PRINT 70,(SUM(IT),IT=1,6)
GO TO 200
END

```

N.B.

With very simple modifications of the above program, the above results can be given annually instead of 5-year results. Also the program can be extended to elaborate the educational plans. Any other requirements can also be fulfilled.

OUTPUT RESULTS:

ESTIMATED VALUE ADDED

1	60	65	70	75	80	85
1	399.9	493.0	613.0	753.8	929.3	1150.4
2	5.5	7.6	10.7	14.8	20.8	29.5
3	34.2	54.7	90.4	145.9	240.8	407.3
4	221.8	378.5	673.5	1166.2	2087.9	3871.5
5	19.1	29.8	48.2	76.2	123.3	204.8
6	52.0	74.5	109.3	157.5	230.6	343.7
7	97.5	143.7	217.7	323.1	488.9	755.2
8	127.0	174.2	243.4	334.3	464.1	652.3
9	325.0	445.9	622.8	855.7	1187.8	1669.2
10	77.3	106.3	149.2	205.9	288.0	408.6
11	51.1	76.8	118.5	178.8	274.0	427.0
12	10.3	15.4	23.8	35.9	55.4	87.4
13	8.7	14.3	24.3	40.3	67.8	116.3
14	9.5	15.4	26.0	42.7	72.3	125.8
15	3.6	5.3	8.2	12.3	18.8	29.2
16	12.9	20.6	34.1	55.0	90.8	153.6
17	9.1	13.1	19.5	28.4	41.9	63.1
18	7.3	13.2	24.9	45.7	86.2	168.0
19	33.0	57.0	102.4	178.9	322.2	598.8
	1504.8	2140.2	3160.8	4652.3	7091.6	11262.7

N.B.: Item No. 4 in the above table and the next ones contains the figures of the total manufacturing industries which are given in details in items 10 to 19. This remark must be considered when dealing with the total figures to avoid duplication.

ESTIMATED PRODUCTIVITY

1	60	65	70	75	80	85
1	108.4	122.6	138.7	156.9	189.1	227.9
2	332.6	385.5	446.9	518.1	600.7	696.3
3	4092.4	4585.1	5137.2	5755.8	6448.9	7225.5
4	291.0	342.2	402.6	473.5	557.0	655.2
5	525.5	618.1	727.0	855.2	1050.5	1290.4
6	335.0	413.4	510.3	629.9	777.5	959.7
7	383.1	448.4	524.9	614.4	719.2	841.9
8	207.6	234.8	265.7	300.6	340.1	384.8
9	260.9	282.4	305.7	331.0	365.4	403.5
10	808.0	892.0	984.9	1087.4	1200.6	1325.6
11	291.0	332.4	379.8	433.9	495.7	566.4
12	200.3	250.8	314.0	393.2	492.3	616.5
13	100.6	120.6	144.6	173.4	208.0	249.4
14	604.0	666.8	736.2	812.9	897.5	990.9
15	325.4	380.9	445.8	521.9	610.9	715.1
16	680.3	860.0	1087.2	1374.4	1737.5	2196.5
17	266.2	302.6	344.0	391.2	444.7	505.6
18	500.1	629.2	791.6	995.9	1253.1	1576.6
19	123.9	147.1	174.7	207.5	246.5	292.8

TOTAL NO. OF WORKERS

1	60	65	70	75	80	85
1	3689114.	4019840.	4417976.	4801684.	4912503.	5046855.
2	16536.	19731.	23987.	28671.	34657.	42445.
3	8356.	11940.	17612.	25355.	37341.	56376.
4	762199.	1105950.	1672965.	2462571.	3748214.	5908651.
5	36346.	48349.	66418.	89163.	117433.	158736.
6	155223.	180282.	214344.	250129.	296650.	358164.
7	254502.	320623.	414768.	525903.	679725.	897020.
8	611753.	741922.	915921.	1112148.	1364543.	1694827.
9	1245688.	1578855.	2037008.	2584926.	3250057.	4136640.
10	95668.	119219.	151530.	189429.	239904.	308299.
11	175601.	231277.	312053.	412158.	552652.	753964.
12	51422.	61590.	75862.	91508.	112667.	141827.
13	86481.	118996.	168472.	232351.	325947.	466411.
14	15728.	23162.	35355.	52637.	80564.	126983.
15	11063.	14107.	18449.	23631.	30788.	40879.
16	18962.	24013.	31391.	40051.	52278.	69952.
17	34184.	43540.	56775.	72624.	94382.	124846.
18	14597.	21023.	31544.	45901.	68819.	106573.
19	266343.	387400.	586138.	862261.	1306972.	2045355.
	7549773.	9071827.	11248574.	13903103.	17306098.	22484805.

OF MANAGERS AND HIGH PROFESSIONALS

1	60	65	70	75	80	85
1	2582.	4019.	5301.	7202.	8842.	10093.
2	264.	374.	527.	716.	1005.	1358.
3	601.	883.	1338.	1977.	2987.	4622.
4	0.	0.	0.	0.	0.	0.
5	981.	1595.	2656.	4190.	6341.	9682.
6	8692.	10816.	13932.	17509.	22248.	28295.
7	8653.	11542.	16175.	22613.	29228.	44851.
8	9788.	14838.	21982.	31140.	45029.	62708.
9	108374.	151570.	213885.	294681.	403007.	566719.
10	3061.	4291.	6061.	8334.	11515.	15723.
11	3863.	6013.	11233.	14013.	21000.	31666.
12	221.	388.	606.	915.	1352.	2127.
13	432.	1189.	2527.	4647.	8148.	13992.
14	534.	926.	1661.	2789.	4833.	8253.
15	165.	268.	442.	661.	1046.	1635.
16	1175.	1536.	2071.	2723.	3659.	5106.
17	717.	1262.	2100.	3268.	5002.	7490.
18	379.	693.	1451.	2157.	3716.	6607.
19	3728.	7360.	14067.	25005.	44437.	81814.
	154219.	219573.	318025.	444548.	623402.	902749.

NO. OF TECHNICIANS

1	60	65	70	75	80	85
1	29512.	36178.	4417.	52818.	58950.	65609.
2	463.	670.	959.	1347.	1836.	2546.
3	760.	1110.	1673.	2459.	3696.	5694.
4	0.	0.	0.	0.	0.	0.
5	981.	2610.	5180.	9094.	15266.	24604.
6	5588.	9554.	15004.	21761.	30851.	43337.
7	32830.	49696.	75073.	108861.	159055.	233225.
8	12235.	22999.	38468.	58943.	87330.	127112.
9	155711.	230512.	340180.	485966.	679261.	951427.
10	2965.	4768.	7728.	11555.	17033.	25280.
11	5794.	11795.	21531.	35857.	58028.	92737.
12	2262.	3325.	4855.	6771.	9464.	13331.
13	2162.	4759.	9265.	16264.	27705.	46641.
14	456.	1019.	2121.	4000.	7411.	13460.
15	298.	493.	793.	1205.	1816.	2861.
16	986.	1536.	2668.	4285.	6691.	10492.
17	991.	1872.	3236.	5156.	8022.	12484.
18	656.	1387.	2744.	4957.	8877.	15985.
19	7191.	19370.	41615.	78465.	148994.	282259.
	261848.	403664.	577517.	909773.	1330296.	1969091.

D. OF CLERKS

1	60	65	70	75	80	85
1	7378.	20099.	30925.	48016.	58950.	70655.
2	496.	651.	863.	1118.	1455.	1910.
3	1086.	1600.	2412.	3575.	5377.	8231.
4	0.	0.	0.	0.	0.	0.
5	3380.	5028.	7571.	11145.	15970.	23493.
6	2949.	3966.	5358.	7003.	9492.	12535.
7	21123.	28214.	38573.	51538.	70011.	95981.
8	40987.	54160.	69610.	94532.	125537.	169482.
9	57301.	83679.	122220.	173190.	240504.	339204.
10	6601.	8702.	11516.	14964.	19432.	25280.
11	11238.	16420.	24652.	35033.	50843.	73888.
12	359.	615.	986.	1464.	2140.	3120.
13	605.	1189.	2190.	3717.	6193.	10261.
14	849.	1389.	2333.	3895.	6525.	11174.
15	265.	380.	553.	779.	1108.	1635.
16	2142.	2881.	3986.	5366.	7371.	10352.
17	1093.	1611.	2384.	3413.	5096.	6866.
18	1153.	1808.	2933.	4590.	7432.	12255.
19	3462.	7360.	14653.	26730.	48357.	102267.
	162475.	239761.	343726.	490076.	681802.	978597.

NO. OF SKILLED LABOR

1	60	65	70	75	80	85
1	29512.	40198.	57433.	72025.	88425.	12617
2	2960.	4400.	6404.	8916.	12303.	1697
3	2573.	3856.	5970.	8975.	13816.	2170
4	0.	0.	0.	0.	0.	
5	10067.	14069.	20257.	28532.	39340.	5555
6	38805.	48496.	61731.	76789.	97004.	12428
7	74060.	98752.	134799.	180384.	245380.	34086
8	161502.	206996.	269280.	344766.	442111.	57624
9	210521.	287351.	397216.	537664.	718262.	96383
10	26308.	34215.	45307.	59102.	78208.	10420
11	76913.	103149.	141672.	190417.	259746.	35964
12	15889.	20016.	25868.	32668.	42024.	5531
13	29057.	40577.	58291.	81787.	116689.	16930
14	4970.	7921.	13010.	20739.	33837.	5714
15	4071.	5262.	6973.	9074.	11976.	1610
16	3470.	5138.	7691.	11134.	16153.	2518
17	10323.	13628.	18395.	24401.	32845.	4481
18	4904.	7400.	11608.	17626.	27527.	4476
19	86295.	130941.	206906.	317312.	501877.	81814
	795231.	1077503.	1497140.	2035380.	2797342.	395903

D. OF UNSKILLED LABOR

I	60	65	70	75	80	85
1	3619758.	3919344.	4280135.	4621620.	4697335.	4799559.
2	12352.	13634.	15232.	16572.	18056.	19652.
3	3334.	4489.	6217.	8367.	11463.	16123.
4	0.	0.	0.	0.	0.	0.
5	20935.	25045.	30751.	36200.	40514.	45398.
6	99188.	107448.	118318.	127065.	137052.	149712.
7	117834.	132417.	150146.	162504.	176048.	182095.
8	387239.	442927.	522991.	582765.	664532.	759282.
9	713779.	825741.	963504.	1093423.	1205771.	1315451.
10	56731.	67239.	80917.	95472.	113714.	137809.
11	77791.	93898.	114835.	136836.	163032.	196030.
12	32689.	37243.	43544.	49689.	57685.	67935.
13	54223.	71278.	96197.	125934.	167211.	226209.
14	8918.	11905.	16228.	21213.	27956.	36952.
15	6261.	7702.	9685.	11910.	14839.	18640.
16	11187.	12919.	14973.	16541.	18401.	18817.
17	21057.	25166.	30658.	36384.	43416.	53184.
18	7502.	9733.	12996.	16570.	21953.	26963.
19	165665.	222367.	308894.	414747.	563305.	760872.
	5416452.	6030504.	6816231.	7573819.	8142291.	8830691.

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