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Development Program Management Center

An international cooperation and resource center that supports program design and management in developing countries.

A PROPOSED MICROCOMPUTER SYSTEM FOR MANAGING DEVELOPMENT PROJECTS AND PROGRAMS:

Working Paper #2

USING A MICROCOMPUTER PROGRAM FOR SYSTEMATIC ITERATIVE IMPROVEMENT IN DESIGN AND APPRAISAL

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INTRODUCTION TO THE WORKING PAPER SERIES

A PROPOSED MICROCOMPUTER SYSTEM FOR MANAGING DEVELOPMENT PROJECTS AND PROGRAMS

This paper is the second in a series of papers that is being written to record progress in designing and implementing a comprehensive computerized project management system that is truly inter-disciplinary. The purpose of the series is twofold: (1) to communicate concepts, plans and progress in development of a micro system for managing projects and programs to professionals in the field; and (2) to stimulate a dialogue on additional thoughts that merit attention.

The series builds on a body of knowledge, approaches and procedures in project management that have proven to be useful in a variety of circumstances. From these, each project management group must choose and reshape those which best serve as effective means to plan, appraise, implement and evaluate projects and programs in their own context. To meet this requirement and take into account the public nature of the effort, the following specifications have been set for the system we are designing:

- The design should be modular, facilitating modifications, incremental additions and/or deletions, so that each country or project can tailor the system to its own requirements.

- The different segments should fit together and be capable of being used separately.

- The resulting program should be user friendly.

- The system must be in the public domain, freely available to all.

The expected products coming out of this series are the following:

I. A Microcomputer Program for Management Systems Which Will Support

A. Design and Appraisal of Projects or Programs

1. Listing of Goals and Priorities
2. Listing of Planning Premises
3. Process for Design and Appraisal, Covering Analysis of Economic and Other Target Clusters, Stakeholders and Redesign

B. Building Linkages within and among Target Clusters

C. Building into Design Additional Effects Based on I. and II.

D. Planning and Implementation of Plans

1. Scheduling, Monitoring of Plans and Replanning
2. Detailed Budgeting and Planning Model to Convert Authorized Projects or Programs into Implementation Plan
3. Fund Accounting System for Detailed Accounting and Financial Monitoring
4. Evaluation

II. A Library of Potentially Useful Reports that the System Can Generate

Description and Summary of Working Paper #2

Using a Microcomputer Program for Systematic Iterative Improvement in Design and Appraisal

Summary of Working Paper #2

Recent developments in microcomputer hardware and software make it possible to carry out physical planning, budgeting and appraisal processes that are required in the design, appraisal and redesign of projects and programs on a cost effective basis previously unobtainable. The speed and low cost ability of microcomputers to process data can radically reduce the amount of time that professionals have to spend on data processing. This paper presents a microcomputer program framework for the design, appraisal and redesign of development programs and projects. It describes how this program can be used on Lotus 1-2-3. Advantages of the framework include (1) generalized forms that facilitate the design of a project or program; (2) ability to trace economic and financial effects on different stakeholders under the proposed program, (3) ability to get rapid and low cost answers to "What if" questions, facilitating the creative exploration of the effects of alternatives, (4) provision of annual budgets giving a basis for continuity for later parts of the cycle, (5) very modest training requirements to operate the microcomputer system, (6) reduction of the amount of training required to train professionals and paraprofessionals, and (7) provision of an audit trail for all figures.

The model presented provides a structured and systematic way of documenting physical inputs and outputs, assumptions and calculations of estimated costs culminating in budgets, cash flows for stakeholders and, where meaningful, rates of return.

The detailed layout of the Lotus 1-2-3 program is outlined in both Lotus 1-2-3 terms as well as English descriptions.

Three types of tables are presented. Data sheets (yellow sheets) provide the lowest level data. These include calculations and feed into the higher level Worksheets (pink sheets) which calculate summary figures. These in turn feed into the third level, Schedules, which calculate summary figures that enter into cash flows for the various stakeholders.

USING A MICROCOMPUTER PROGRAM FOR SYSTEMATIC ITERATIVE IMPROVEMENT IN DESIGN, APPRAISAL AND REDESIGN OF PROJECTS AND PROGRAMS

The design and appraisal of a project or program, whether done manually or by computer is no better than the framework and the data that are used. The framework that is proposed is essentially one that has been utilized on many projects in a number of countries since 1961. It has been discussed in Working Paper #1 and is illustrated in Figure 1 of that paper. The characteristics of the framework are the following:

1. Uses provisional planning premises which reflect

   - the goals and values that the project or program should serve;
   - constraints and opportunities in the environment;
   - policies and procedures;
   - relevant structural relationships; and
   - considerations that are financial, economic, managerial, technological, political and social.

2. Determines cash equivalence flows of inputs and outputs over time for different stakeholders. These flows are compared with the alternative, yielding the relevant difference flow.

3. Considers iterations for alternative planning premises.

The planning premises will reflect many different dimensions and should be regarded as provisional. As they are used in the design, conflicting results arise from different premises. For example, the technology "chosen" in the initial premises may turn out to be costly in terms of resources and the time frames that were targeted.

It is common to find that the proposed base for financing yields very generous benefits to some stakeholders and insufficient net benefits to other stakeholders or national interests. Such results indicate the need to reevaluate premises to shift benefits to provide sufficient incentives for all stakeholders.

While in theory such changes can be tested using desk calculators, the ability to carry out iterations is very limited as compared to using a microcomputer program.

Recent developments in microcomputer hardware and software make it highly practical to design and appraise projects and programs through a series of iterations. Such iterations make excellent use of microcomputer strengths, e.g., economy and speed in processing numerical and other data. A microcomputer can sort, rearrange, test logic and calculate data far more accurately, quickly and economically than a human being working with a desk calculator.

Soft Factors In Design - Multidimensional Decision-Making

The design process deals with factors, considerations and relationships that tend to form clusters that do not lend themselves directly to computer processing. Target clusters such as equity, health, education, sense of fairness and opportunity can be given concrete expression in the design, both as inputs and outputs. It is the specific inputs and outputs that can be processed by the computer. Many of these softer target clusters can be both complementary and competitive with other clusters.

Management scientists are devoting increasing attention to the decision-making process involved in policies and programs.[1] They recognize that decisions made by organizations are multi-objective and multidimensional in nature, that conflicts among objectives are common and that they involve many decision makers whose interests, opinions and time horizons must be reconciled.

In discussing the common problem of multi objective decision analysis, one author points out,

> "attention has to be focussed on providing a logical framework for policy decisions regarding the system by revealing, among other things, conflicts among objectives or groups, by assessing tradeoffs among different choice options, by gauging the distributive aspects of policy measures, by identifying efficient solutions and by designing appropriate and relevant methods for policy evaluation and compromise strategies."

He calls for an interactive approach in which plans are revised to arrive at a situation in which there are no more tradeoffs that are attractive to the analyst and the decision makers. Clearly the ability to calculate the results of alternative options is important for such an approach to be feasible.

Creative solutions will not come directly from the promising capability of the computer. They come out of imaginative thinking that arises in a dialogue of professional specialists and generalists with decision makers. But the ability to calculate rapidly and economically the results of different planning premises is a necessary condition for accommodating such a dialogue.

If we examine the time and energy devoted to information processing in the physical and financial design of projects and programs we find that a large part of professional time is spent in processing information and very little time in

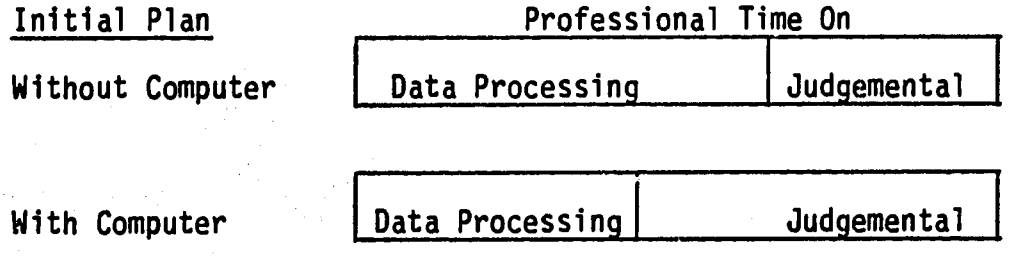
[1]Keeney, R. and Raiffa, Decisions With Multiple Objectives (1976, Wiley, New York)

[2]Haffamp, Wim and Nijkamp, Peter, "Conflict Analysis and Compromise Strategies In Integrated Spatial Analysis", Regional Science and Urban Economics 13 (1983) North Holland, pp. 116

thinking about and testing creative solutions. In effect, data manipulation crowds out professional and creative aspects either through preemption of professional time or the press of calendar time. Why come up with many creative solutions if you don't have the professional time or calendar time to give them form and testing?

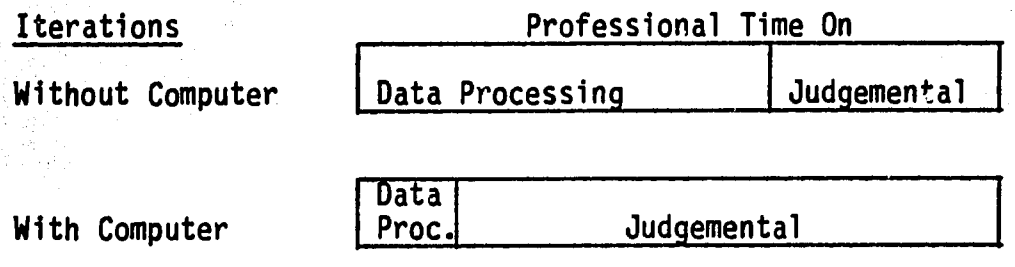
The outstanding promise of microcomputers is to make it far more practical for professionals to spend a much higher percent of their time in coming up with creative solutions. This is made possible by microcomputers that:

- Reduce the amount of professional time necessary to determine the probable results of an initial plan (data processing) and increase the amount of professional time to exercise professional creativity and judgement.



and

- Reduce even more drastically the professional time necessary to determine the effect of changes in the plan on the results.



Where the professional can make use of the processing capability of the computer in a systematic way, he/she can afford to concentrate on the creative, professional and judgemental processes.

The developments that have made it possible to use microcomputers so effectively are the availability of reasonably priced and highly reliable:

- Desk top microcomputers with 640K or even 1.2 megabytes of internal memory;
- Hard disks from 10 to 80 megabytes of external memory; and
- Electronic spreadsheet software that has as many as 256 columns and 2048 rows or 524,288 cells that can be treated as an integral whole.

The Development Program Management Center has been using its microcomputers with limited internal memory to plan its program in physical terms and budget its own operations. As part of our research and development we have created a more general system for agricultural projects using a 512K internal memory capability. We have succeeded in laying out a general framework that will accommodate the detailed physical design, budgeting, and appraisal of most large agricultural projects in a series of interconnected tables that will fit within the Lotus 1-2-3 spreadsheet. The framework includes three levels of detail on physical and money values providing an audit trail for any summary figure.
A description of the Lotus 1-2-3 Design and Appraisal Model for agricultural projects begins on page 9.

The advantages of this microcomputer framework are:

1) Generalized forms that facilitate:

   - review of the program at various executive levels;

   - cost effective training in project design.

2) Ability to trace economic and financial effects on different stakeholders;

3) Ability to ask and get rapid answers to "What If" questions that reveal the implications of proposed changes immediately. The framework and the microcomputer program:

   - Make use of rapid response to determine the effect of cr suggestions;

   - Encourage and support creative formulation of programs;

   - Sustain a persistent search for better alternatives.

4) Continuity with other parts of the project/program cycle. An approved program design in a microcomputer:

   - Serves as starting point for implementation planning;

   - Facilitates changes by the implementation group.

5) Very modest training requirements to operate the microcomputer system:

   - A three day training period would be adequate for personnel to learn to operate Lotus 1-2-3 on a routine basis;

   - A five day training period would be adequate for personnel to learn to revise the Lotus program to meet specific needs.

Using The Electronic Spreadsheet

The electronic spreadsheet is a table with a very large number of columns and rows. Lotus 1-2-3, for example, has 256 columns and 2048 rows making a total of 524,288 cells. One is tempted to put the whole design on one table since the spreadsheet can accommodate it. Such a decision would be compatible with the computer, but not compatible with the humans who have to use the results. To facilitate the human role in putting together data and using the results, the data should be broken down in the tables which can be readily grasped, followed and used by humans.

The design and appraisal program tracks the inputs and outputs pertaining to the different stakeholders. It is based on a generic table such as Table 1 which can be used for inputs or outputs. Such a table makes it possible to change one or more entries in columns 1-5 with the computer readily calculating the new answers in column 6. The contents can be readily grasped by an ordinary person.

Table 1 can be modified to fill special needs.

(a) For example, it may be important to record separately domestic costs and foreign costs. One would have two tables, one for domestic and the other for foreign or two sections of the same table.

(b) In some cases one many want to have years running from left to right rather than top to bottom.

One may want to relate the number of units of an input required to some other variable. In agriculture certain inputs relate directly to the amount of land planted. To avoid too large a table for printing and too much detail for the reader to absorb the total cost may be computed and entered in another table. Table 2 illustrates costs that are related to acreage and others that are related to time. In both cases the total cost will be computed and will appear in another table (see Table 3).

Where a cost is made up of different components, one may want to show the various components to create a record of the composition of total cost and, if necessary , readily make changes in components. Where there is a lot of detail, a table may contain just the detail with a summary figure computed in another table. Table 4 is an example of documenting detail in a datasheet that will be summed and used in another table in a worksheet.

Table 1 Generic Form of Table

(1) Year	(2) Item Description	(3) Unit	(4) Number of Units Required	(5) Price Per Unit	(6) Total Cost Formula Col.(4) x Col.(5)
1					
2					
3					
4					
5					
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Table 2 Inputs Required (Illustrating Relation With Hectares and Time)

Item Description	Units	Cost/ Unit	Units/ ha	Cost/ ha	Number of hectares Utilizing Input By Year 2	3	4	5	6
A. Related to Hectares									
Seed Rice	lb	.075	40	3	1,000	2,800	4,600	6,400	8,200
Baskets	each	.075	2	.15	1,000	2,800	4,600	6,400	8,200
Jute Bags	each	.25	4	1	1,000	2,800	4,600	6,400	8,200
Fertilizer	cwt	2.00	2	4	1,000	2,800	4,600	6,400	8,200
Labor	mandays	1.00	73	73	1,000	2,800	4,600	6,400	8,200

B. Not Related to Hectares	Units	Cost/ Unit	Number Units Needed in Project Year 1	2	3	4	5	6
Vehicle Oper. Costs	vehicle yr	1,100	1	1	1	1	1	1
Rent	mo	100	6	0	0	0	0	0
Stationery	yearly	500	1	1	1	1	1	1
Bldg Maintenance	yearly	300	0	1	1	1	1	1
Course Rice C.	each	400	2	0	0	0	0	0

Table 3 Annual Cost of Operating Inputs

Item Description	YEAR 1	2	3	4	5	6
A. Related to Hectares						
Seed Rice		3,000	8,400	13,800	19,200	24,600
Baskets		150	420	690	960	1,230
Jute Bags		1,000	2,800	4,600	6,400	8,200
Fertilizer		4,000	11,200	18,400	25,600	32,800
Labor		73,000	204,400	335,800	467,200	598,600
B. Not Related to Hectares						
Vehicle Operation Costs	1,100	1,100	1,100	1,100	1,100	1,100
Rent	600	0	0	0	0	0
Stationary	500	500	500	500	500	500
Bldg. Maintenance	0	300	300	300	300	300
Course Rice C.	800	0	0	0	0	0

Table 4 Annual Project Personnel Costs (Per Person)

Item Description	Salary Scale	Salary	Leave Bonus	Overtime	Total S+L+O	Car Allow	Vehicle	Mileage	Misc.	Other Personnel Cost
Project Manager	5&5A	5,200	34		5,234	480		300	40	820
Office Manager	A	2,328	34		2,362	480				480
Typist	F12	426	24		450					0
Driver	G2,3	366		81	477				40	40
Ag Officer	A	2,040	29		2,069	480		300	60	840