HOUSING PLANNING TASK FORCE
424 s.w. main street
portland, oregon 97204

# FINAL REPORT

# INFORMATION COORDINATION WORKING COMMITTEE

# HOUSING PLANNING TASK FORCE

OCTOBER 1972

# OUTLINE

I. Summary

II. Statement of Problem

III. Argument for an Information System

- A. Overlaps
- B. Gaps
- C. Consequences of Failure to Develop an Information System
- D. Possible Suppliers/Users of a Housing Information System

IV. Explanation of Information Systems

- A. Report on Information Systems: Determining Requirements, Design, Development and Implementation
- B. Information Systems of Other Cities and Regions

V. Recommendations of Working Committee

VI. A Proposal for a Regional Information System - CRAG Staff

Norm Boice - Chairman

Jo Brown - Staff

## I. SUMMARY

Since the Housing Task Force members all had some form of expertise in the housing field, they were well aware of the need for data coordination when they organized the working committees and gave one of them the task of Information Coordination. But few of the Task Force members had had much experience in the information field or understood the magnitude of the problem. Therefore, the working committee was expanded to include some people with this needed skill, a staff member was assigned for a three-month period, and a proposal for design of a housing information system was requested from CRAG, the regional Council of Governments.

By the time the CRAG proposal was submitted, though, the committee had concluded that its knowledge of the needs for such a complex system and of the objectives for that system to meet were insufficient upon which to base a decision regarding the proposal. Staff was assigned to research agency generation, uses and distribution of housing and other data and the decisions made based on that data. Results of this research are covered in other sections of this report in more detail, but in summary they were: (1) there are considerable duplications and many gaps in data needs, (2) a more in-depth needs assessment is necessary for actual systems design purposes, and (3) much of the data used or wanted could serve a wider use than just for a housing information system.

One particular need for data appeared to be very urgent. The Portland Development Commission was having difficulty producing sufficient data on available vacancies for expected relocations, as required in their planning applications to HUD. They were also concerned with preventing the use of duplicate counts of vacancies by the other dislocating agencies, such as the State Highway Division and the Port of Portland. PDC was pursuing the possibility of a survey to be conducted annually, which would give them vacancy rates plus other social data needed for other planning purposes.

Since surveys are expensive and since the major portion of the resulting data would be available later from the proposed Information System, the Task Force and the Development Commission reached an agreement to work together in achieving the System. It was decided to write a Request for Proposals (RFP) for technical assistance from a consulting firm on the data needs assessment, with financial support coming from the Task Force, PDC, and other agencies, such as the Highway Division or Model Cities.

There was much discussion regarding the scope of the Information System. Should it be just "housing" data or should it be an Urban Information System? Since housing agencies and interests often need comprehensive data that could serve other agencies also, an urban system seemed wiser. It was also felt that criteria for systems design should take into account all major components of an urban system from the first in order to build in horizontal integration of components when the system is fully operational. The Task Force took a firm stand in favor of the Urban Information System approach.

Should the system be city-wide or regional in scope? It was recommended by the committee that the RFP should speak to the need for a regional system, with housing data receiving the first priority, and that the City of Portland base would be the first evolutionary step. Region-wide data could be gathered, but the housing component inside the City would be the first programmed.

These general objectives for an Urban Information System will demonstrate how it can serve our City:

(1) The system must be envisioned as a permanent entity within City government; it must be continually updated and maintained by City employees.

(2) The system must relate to citizen needs, not simply to City departments.

(3) The system must provide City officials and administrators with objective information to aid in decision-making.

(4) The system should provide input to the City's annual budgeting cycles.

(5) To effectively maintain an up-to-date data base, the system should utilize existing, continually-updated City operating files as its primary data source.

(6) The system should provide input to all planning activities for the City, such as the City Planning Commission, the Portland Development Commission, Model Cities and/or the Bureau of Human Resources, District Planning Organizations, etc.

(7) The system should incorporate monitoring, evaluation, and feedback capability to permit, for example, growth, improvement in City programs based on neighborhood evaluations, and adjustment in methods of operating agencies.

(8) The system should produce output on both a regular basis and in response to special queries by using agencies. The output must be so structured that it can be readily comprehended by officials from the using agencies.

(9) The system should include provision for obtaining information directly from citizens involved in individual City, Model Cities or District/Neighborhood Planning Organization projec and programs.

## II. Statement of Problem

Initial staff research of the many governmental agencies--City, County, regional, State and Federal--involved in housing, directly and indirectly, has determined there is much duplication of time and effort in collecting the information necessary for decision-making and planning.* Since the sources of information for this fractured "non-system" include data collected by most of the agencies involved, it becomes apparent that information availability is scattered.

Other sources, such as Census and Assessor's records, are commonly used by many of the housing agencies, but each must do its own footwork. There are also supplementary types of data, such as economic or transportation, that are used frequently by some of the agencies, but which are now researched independently.

Current information is most desirable, but at present available data is updated on varying schedules ranging from daily to ten years. The majority of locally collected data is probably done within a one-year range, but this is not yet being correlated centrally with the Census data to keep it more current between the decennial counts.

Many representatives of agencies have expressed needs for data not now available to them for various reasons, including lack of current data and the lack of a favorable cost/benefit ratio to research it themselves. There are also desirable improvements in present data that would be of assistance to them.

## III. Argument for a Housing Information System

### A. Overlaps:

Out of 13 governmental agencies involved in Planning, Production, and Regulation of Housing, these duplications in use and/or collection of data were apparent in an initial cursory survey:

Census data--at least 11, with three wanting improvements
Assessor's records--at leat 9, with four wanting improvements
Surveys--at least 6 make own or use others
Data on Housing inventory (stock)--at least 10, with six wanting improvements
Data on housing conditions (size, number of bedrooms, quality, etc.) 12 with seven wanting improvements

*See Appendix A

Permit data--5 use or generate
Vacancy data--3 use it, 2 want it improved
Land Use, Zoning--9
Development data--7
Real Estate data--6
Housing Authority data--6
Department of Housing & Urban Development data--7
Demographic data--9--7 want improvements
Social indicators--7--7 want improvements
Economic data--9--7 want improvements
Transportation data--7--7 want improvements

These figures do not include the private sector needs, service agency needs, and needs of other miscellaneous users.

B. Information Gaps

Data would be useful, but is not presently feasible or available in these areas:

Vacancy data--6 expressed need, plus 2 other agencies not included in governmental units used in this compilation.

Data on housing conditions--1

Development data--1

Housing Authority data--1

Demographic data--1

It is probable that there are unfelt needs for data which will become apparent to the agencies in the event of a centralized information system.

C. Consequences of Failure to Plan an Information System

Currently just in the housing field alone, thousands--perhaps tens of thousands--of dollars are wasted annually in duplicate man-hours spent in collecting desired data and in hunting elusive data. Thousands of dollars are spent on consultant services and surveys to try to generate unavailable data. Without a centralized information system, the policy and decision-makers in government and in the housing industry will not have enough facts to see the magnitude of the need or the specifics of the needs. The costs of poor decisions will be suffered by both industry and the taxpayers, but most especially they will be felt by the low and moderate income households who must live in the conditions resulting from those poor decisions.

Unless new policies and determined actions to change the housing delivery system are made, these people will continue to be pushed into substandard, crowded housing because of the tight supply and inflated prices. The social costs of the attendant problems (welfare, crime, etc.) that are often caused by poor housing will continue to rise, but the cost of human potential lost is immeasurable. Another factor to consider is the impact of present deteriorating neighborhoods on the health of the other residential areas of the city.

Middle and upper income households are also affected by the lack of adequate housing supply as inflation of their purchase or rent prices partially reflects the shortage.

Unless Portland moves now toward an information system, it will lose the effective advantage provided by the Census Bureau, through its sizable output made available following the 1970 census, some of which is now being programmed into the Data Processing Authority of the City and Multnomah County. The older this data gets without being updated by other available source material the more difficult it becomes to use with any assured accuracy.

D. Possible Suppliers/Users of a Housing Information System

Regulation:

Bureau of Buildings

Building Permits
Building Inspection
Electrical Division
Plumbing Division
Heating Division
Housing Division

Fire Marshall
City-County Health Bureau

Sanitation Department

County Assessor
HUD

Economist
Planning & Relocation

Planning:

Physical -

City Planning Commission
County Planning Commission
Portland Development Commission
Oregon State Highway Division
Port of Portland
Southeast Uplift Program
Oregon State Housing Division

(Planning continued)

Social -

Portland Metropolitan Steering Committee
Portland Action Committees Together
Multnomah County Community Action Agency
Multnomah County Public Welfare Commission
Tri-County Community Council
UGN Agencies

Comprehensive -

Model Cities
CRAG
District/Neighborhood Planning Organizations

Production:

Housing Authority of Portland -

Finance and Accounts
Production
Leasing
Rentals

Financing -

Oregon Savings & Loan League

Benjamin Franklin Savings and Loan
Other Savings and Loan Institutions

Oregon Bankers Association

First National Bank - Real Estate Loan Division
U.S. National - Real Estate Loan Division
Other banks

Insurance Companies
U.S. Government Veterans Administration
Oregon State Department of Veterans Affairs

Builders and Developers -

Home Builders Association of Metropolitan Portland
American Institute of Architects Portland Chapter
Oregon Building Congress
Non-profit corporations

Distribution:

Real Estate -

Realtors of Portland
Real Estate Trends
Multiple Listing Service
Oregon Multiple Listing Service

Maintenance:

Oregon Apartment Association
Oregon Remodelers Association

Social Services:

American Red Cross
Catholic Charities
Community Care Association
Family Counseling
Foster Parents
Foster Grandparents Program
Loaves & Fishes
Jewish Welfare Federation
Jewish Family & Child Services
Multnomah County Public Welfare Commission
National Association of Social Workers
Northwest Pilot Project
Parent-Child Services
Salvation Army
UGN Agencies
Urban League
Volunteers of America
William Temple House
YMCA, YWCA
Boy Scouts of America
Girl Scouts
Campfire Girls
Boys Clubs

Information Agencies:

Census Bureau
Data Processing Authority
R.W. Polk Company
Daily Journal of Commerce
Portland State Univeristy Population Center
Bureau of Governmental Research

Utilities:

PGE Research
Pacific Power & Light
Water Bureau
Pacific Northwest Bell
Northwest Natural Gas

Others:

Chamber of Commerce
Tri-Met
Police
Courts
Portland Public Schools

## VI. Explanation of Information Systems

### A. Report on Information Systems: Determining Requirements, Design, Development and Implementation

The purpose of this section is to describe the process of creating an effective information system. Our concern will not be with the detailed technical aspects of this process, but with the overall flow of activity throughout the creation of the system. Emphasis will be placed upon the key review steps in the process at which management decision and understanding are essential to obtaining an effective system. To facilitate our discussion, the process of information system creation will be viewed as a seven-step process. These steps are:

Determine system objectives (subsection III)
Prepare preliminary plan (subsection IV)
Specify system requirements (subsection V)
Design system (subsection VI)
Develop system (subsection VII)
Implement completed system (subsection VII)
Maintain and expand operational system (subsection VIII)

Each of these steps will include the "product" resulting from the manager's role during that step. The first two subsections are an introduction to Information Systems and Basic Components of an Information System.

# I. INTRODUCTION TO INFORMATION SYSTEMS

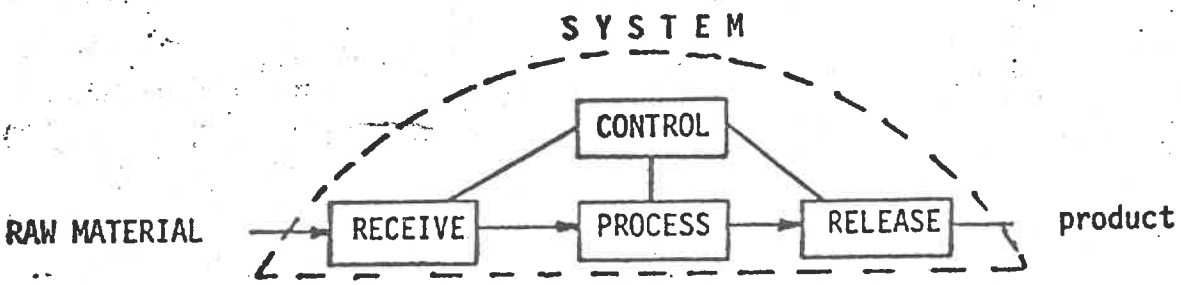
## 1. Concept: What is an information system?

To develop the concept of an information system, we might first define what we mean by information. Webster* suggests two definitions:

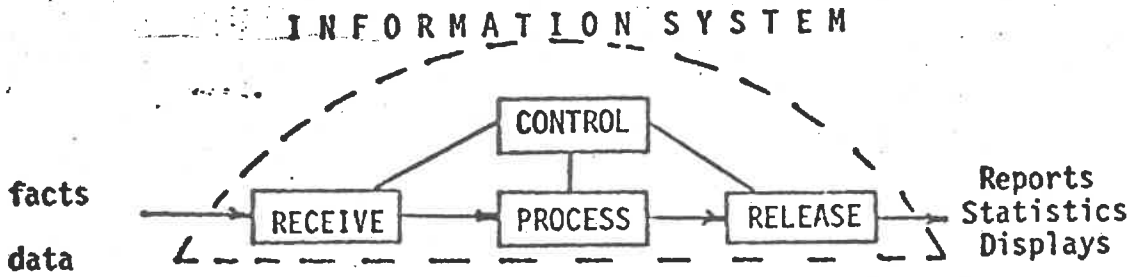
> Information n 1: the communication or reception of knowledge or intelligence
> 2 a: knowledge obtained from investigation, study or instruction
> b: intelligence, new c: facts, data.

The first definition speaks of the input (reception) and output (communication) of knowledge. The second definition speaks of "knowledge obtained from investigation or study" interchangeably with "facts" and "data". Thus we could say that an information system is a system which allows the input and output of facts or data obtained from study or investigation. But what is a system?

A system, even in the sense that we are concerned with, has been defined in many different ways. But generally a system can be said to be a controlled means of receiving a raw material, processing it into a product, and releasing that product outside of itself. This can be illustrated as follows:




Of course, the system may be capable of receiving several different raw materials, processing them, and releasing several different products. Thus, an information system can be depicted as follows:




*Webster's Seventh New Collegiate Dictionary, G. & C. Merriam Company, Springfield, Mass., 1969.

To further define an information system, we can tack an adjective in front of it that describes the kinds of facts and data it receives and the subjects of the reports, statistics, and displays it produces. Thus a management information system would receive facts and data about the thing being managed (budgets, costs, production figures, time cards, staffing levels, etc.), process them, and produce reports, statistics and displays of interest to those who manage it (financial reports, cost analyses, labor statistics, production schedule displays, etc.). Or, an urban information system would receive facts and data pertaining to an urban area (land use, building and construction figures, income data, educational achievement scores, hospital case loads and types, police and fire records, etc.), process them, and produce reports, statistics, and displays of interest to those who plan, manage, or attempt to improve the urban area (population projections, income trends and patterns, housing deterioration analyses, health statistics, crime rates, etc.).

2. Benefits: How can an information system aid in City planning, management, and evaluation?

It should be apparent that an information system can be of tremendous assistance in the planning, management and evaluation of city projects. We can list sample products of information systems operating at two distinct (but not necessarily unrelated) levels within a city or an agency to illustrate their potential benefits.

A management information system (MIS) could provide, in addition to any specifically requested item(s) of information, the following aids to city management and evaluators:

(1) Schedule vs. actual accomplishment of project and program milestones.
(2) Estimated (budgeted) vs. actual cost breakdowns and analyses for individual projects and the total program.
(3) "Automatic monitoring" of either of the above so that a "flag" is raised at any point at which trouble is developing in terms of over-budget or behind-schedule projects.
(4) "Automatic re-allocation" within a project of either money or time when budgets or schedules have been violated, with new candidate budgets or schedules being automatically produced to bring the project back inside the fixed limits of time or money remaining.
(5) "Automatic re-allocation" within the total program, but between projects, to take time or (more likely) money from one project which is meeting its committments and still has a surplus, and give it to other projects which cannot meet their committments because of insufficient budgets.
(6) Contract monitoring aids such as contractor overhead calculations, manpower cost analyses, production rates and costs, etc., compared with contractual committments.

Such MIS aids would perhaps be of most importance to top management, although they would certainly have bearing on the evaluation of individual project efficiency and, to some extent, effectiveness. Of more importance to the entire city, however, would be an urban information system (UIS). Such a UIS would provide information more directly related to the measurement of effectiveness of both individual projects and the total program, such as:

(1) Amount and rates of change of key indicators of community status, such as:
- drop-out percentages
- reading achievement scores
- communicable disease rates
- infant mortality rates
- available low-cost housing units
- numbers of serious crimes per thousand persons, by area
- numbers of fires and false alarms
- family income
- employment and unemployment figures
- population numbers and patterns
- accessible recreation space per person
- available transportation units (public or otherwise) per thousand persons and per area
- (The list is nearly endless, and is limited only by the imagination of the user and resources of the system in terms of data and money).

(2) Comparisons of the above indicators by area, both with the city and between it and nearby areas.

(3) Projections of future conditions over time and by area, using the rates of change provided by (1) above.

(4) Analyses of the interactive effects of change in one indicator upon another.

(5) Analyses of the effectiveness of individual programs in terms of the total number of eligible citizens affected vs. the total number of eligible citizens.

Again, this list can be almost limitless, and is constrained only by the imagination of the user and the analytical tools available within budget constraints.

3. Selection and Operation: What does the Manager need to know about information systems in order to select and use one properly?

The City Manager, in order to properly assess the benefits, costs, design, and utilization of information systems, and in order to make most effective use of them himself, must know something about them. That some sort of an information system is required for City planning, management and evaluation should be obvious from the foregoing. Thus the question is not "do we need an information system," but rather, "how much of what kind of information system do we need, and how do we obtain it?"

To expand upon this basic question, we can list the following questions, all of which the manager should have some capability of answering, if he is to function as an intelligent buyer of information system services:

(1) What are the basic components of an information system?
(2) How does the Manager determine the requirements for an information system?
(3) What role should the Manager play in the design of the information system?
(4) What role should he play in the development of the information system?
(5) What is required in implementing the information system to assure most effective utilization?
(6) What should be the responsibilities in maintaining the information system?

The remaining portion of this paper will be devoted to answering these questions.

# II. BASIC COMPONENTS OF AN INFORMATION SYSTEM

We have defined an information system as a controlled means of receiving the raw materials of information (data and facts), processing them, and releasing information products (reports, statistics, and displays). The four functions involved, reception, process, release, and control, are accomplished jointly by three basic operating components of an information system: software, hardware, and people. No one operating component accomplishes any one of the functions alone; each component contributes something to each function. Since the raw materials, and in a sense, the products of the system can also be considered components of the system, we can list altogether five basic components of an information system:

(1) input (data or facts),
(2) software,
(3) hardware,
(4) people, and
(5) output (reports, statistics, displays).

We will examine each of these components, particularly as they may relate the intelligent buying of information system services to aid planning and evaluation.

## 1. Input

The raw material of an information system can take many different forms. All of these forms are lumped together under the generic name input. Examples of input to information systems include:

- the spoken word and other sounds
- hand-written or printed symbols, words, and texts
- mechanical forces
- electrical signals
- magnetic fields

As this very partial list indicates, almost anything that conveys a meaning can be used as input to an information system.

We can think of input in at least two ways: (1) the information conveyed, and (2) the means of conveyance.

### (1) Input: Information Conveyed

For example, an urban information system might use as input any of a very large number of variables, or different types of information (the USAC (Urban Information Systems Inter-Agency Committee, chaired by HUD) efforts have resulted in the recognition of thousands; a partial data inventory for the City of Los Angeles lists nearly three thousand data items). Each item conveys a specific piece of information, e.g., number of rodent complaints received in a given month, or address of a given rodent complaint. With thousands of such items possible, and hundreds or thousands of values of each, there would be millions of possible individual data points which could be used for planning, management and evaluation purposes.

The sources of these input data are nearly as varied as the data themselves, but primarily they may be categorized as resulting from:

(1) special surveys, or
(2) permanent operating files.

Special surveys are usually taken to obtain information on subjects for which no permanent, continually updated information is generated. These surveys often take the form of polls designed to ascertain public attitudes, but any "one-shot" data collection activity falls under this category.

While special surveys may be necessary to provide specific data on conditions at a given point in time, they have several weaknesses:

(1) they are usually expensive to conduct;
(2) they provide information only on the conditions as of the time of their execution;
(3) unless repeated later, they provide no information on changing conditions;
(4) because conditions do change, they are often obsolete within a few months of their execution.

By far the more preferable source of input data for an urban information system is permanent operating files. These files are simply those records maintained on a regular and continually updated basis by operating departments, agencies, etc., of the City or other urban geographic unit. Permanent operating files are preferable because:

(1) They are continually updated by city operating department employees as a result of the normal record-keeping process.
(2) Information is always current, or very nearly so.
(3) Cost of updating is borne by operating departments, not the information system.
(4) Because they span time (unless old records are destroyed), changes over time can be measured as frequently as desired.

Some examples of permanent operating files and their priorities of importance to an urban information system will be discussed when we talk about designing an information system.

In discussing the data as input to the information system, at least two caveats are in order, particularly (but not only) if our information system involves a computer:

(1) "Garbage in, garbage out." This well-worn expression of the computer programmer serves as a constant reminder that "bad" data can only produce untrustworthy results. We are not concerned with the informational content of the data when we term it "bad," but rather with its quality and reliability -- does the data really represent what it is claimed to represent, is it accurate, is it complete, is it totally "unbiased"? If not, then the best information system employing the fastest of computers cannot produce a trustworthy result from it. We are using the computer as a "trash-masher" -- smoothing, filtering and compacting the data, perhaps even deodorizing it, and prettily packaging it. And the end result's most valuable use will probably be the same -- land fill.
(2) "Know your data." There is a continual danger, particularly when sophisticated information systems interpose several layers of processing between the raw data and the eventual user, of becoming almost completely insulated from the true meaning and content of the raw data, and therefore falling into the trap of drawing nonsensical conclusions from the results of its processing. The best way to develop a true feeling for the raw data and the interpretation of conclusions drawn from it is to manipulate a portion of it by hand, going through the same processes as the clerks or computers are being told to go through to arrive at results. It may at times be even more important, particularly where others have generated the data, to trace through step by step the procedures used to generate or collect the raw data. It is only by understanding where data comes from and what has been done to it that we can develop realistic ideas of the limits to which it

can be pushed, particularly with regard to its interpretation. There are few things more disheartening than to arrive at a grand and important conclusion upon which the evaluation of the necessity or effectiveness of a program hinges, only to find upon closer inspection that the raw data do not really support the conclusion.

### (2) Input: Means of Conveyance

There are a variety of means of placing data into an information system: paper, punched cards, magnetic tapes, etc. The means of conveying or receiving these data into an information system depend upon the amount of data, its condition or format in its raw state, and the nature of the information system itself. Some type of intermediate processing is often in order to transform the raw data into a more convenient format for reception, storage, and retrieval within the information system.

The data in its stored format is often referred to as a data base.

The advantages and disadvantages of the more common modes of data storage, and the intermediate processing involved, will be discussed later.

## 2. Software

Software, loosely defined, is simply the instructions provided to the information system as to what to do with the input in order to produce output. Software thus contributes to both the "process" and "control" portions of our simple depiction of an information system.

Suppose our information system were three clerks with desk calculators processing limited amounts of hand-gathered-and-written data. Our own verbal or written instructions to the clerks as to which data to select, what calculations to make, and in what format to write down the results could be thought of as the "software" of our information system.

If, on the other hand, we have a computer as part of our information system, then "software" takes on a more specific connotation. We are still talking about the instructions given to the computer as to which data to select, what calculations to make, and in what format to "write" the results. In addition, we may be involved with software which aids the computer in digesting and understanding our instructions.

### (1) Programs and Languages

Our instructions to the computer are written down in the form of one or more programs. A program is defined as one sequential set of instructions which, when stored in the computer's memory, give it the means to perform one specific data processing task. Software may then be defined as the supporting logical network or programs which make any given program easier to write and perfect, and allow it to be executed more efficiently and economically.

Programs are written in languages designed for various purposes:

(1) machine language
(2) assembly language
(3) problem-oriented languages
- COBOL
- FORTRAN
- PL/1

Later we will define and discuss each of these different languages.

### (2) Operating Systems

Another aspect of software, in addition to programs and the languages in which they are written, is what are known as operating systems. An operating

system is made up of programs called executive routines or executive monitors which "supervise" the way in which individual programs are processed on the computer. Among the different types of operating systems are:

(1) batch processing system
(2) Multi-programming system
(3) time sharing system

By far the most common operating system is the batch processing system. We will discuss all of these operating systems, variations on them, and the relative advantages and disadvantages of each.

## 3. Hardware

The term hardware refers to the machinery, or physical components, of an information system. In our earlier example of an information system consisting of three clerks punching desk calculators, the hardware is, of course, the desk calculators.

In computerized information systems, hardware takes on a wide variety of configurations. We will list some of the more common hardware types, and briefly define them.

Among the hundreds of different types and sub-types of computer hardware, the more important are:

(1) the central processor -- what we have called the "computer" up to this point. The central processor consists of memory units and logical units that enable the computer to execute a particular type of processing assignment, usually involving arithmetic or other logical manipulations.

(2) memory extension units -- these units are extensions of the memory units of the central processor, but are not necessarily of the same form. Among the various types are:
- magnetic tape -- similar to audio tape, but of much higher quality
- magnetic disks -- similar to a phonograph record, but used with magnetic heads like a tape recorder
- magnetic drums -- a large cylindrical drum, also used with magnetic heads.

(3) input devices -- used to prepare and deliver input to the central processor. Examples include:
- punch devices -- punched cards, key-punch machines, card readers, and card punches associated with the central processor
- tape devices -- card-to-tape processors and key-tape machines, as well as tape transports themselves
- mark sensing devices -- the kind used on many standard aptitude tests
- optical scanning devices -- devices which can scan and "read" documents prepared in one of a number of special type styles. The most common example is the reading of pre-printed checks by automatic accounting machines.

(4) output devices -- devoted to the display of the results of processing in forms that can be easily interpreted by users, or that can be resubmitted for further processing. Examples include:
- punches -- produce punched cards
- tape transports -- "write" on tapes
- printers -- produce tabular materials
- plotters -- devices which draw graphs or pictures using a moving pen.

(5) terminals -- devices which display input and output and allow the user to interact directly with the computer. Examples include:

- typewriters -- which type an output automatically, then wait for the next input; often used in time-sharing systems.
- cathode-ray terminals (CRT) -- display is by a television-like tube, input is by typewriter or by "light pen."

All of the hardware just discussed falls under the general heading of "peripheral" equipment, with the exception of the central processor, to which, of course, everything else is peripheral.

## 4. People

People form an all-pervading and essential component in any information system. It is people who collect the data used as input, who provide the instructions (in the form of programs or otherwise) for its processing, and who use and interpret the output.

We can think in terms of three basic types of people who would be involved with an information system. In some cases, any two or even all three of these types may be represented in a single person. The three types are:

(1) the user -- the person who specifies what he wants from the information system, and who interprets its output. He may also be involved in providing input.

(2) the system programmer -- the person who generates a detailed design of the information system, including hardware and software, and executes that design by obtaining or developing the required programs and hardware, finally tying everything together into an integrated operating information system. The "system programmer" may be several people, of course, who may have various titles: (computer) programmer, (computer) systems analyst, etc.

(3) the system operator -- the person who performs the mechanical procedures necessary to operate the information system after it is developed. His duties may include the preparation of input (but not the collection), the selection of appropriate programs for running to produce requested results, the actual operation of the computer and peripheral equipment, and the spot-checking of output to ascertain correct program operation.

Of these three people, the user will normally be the City Manager, some other member of the City staff, or agency employee. The system programmer may be a City employee (usually, but not necessarily, a member of the data processing unit or of a special UIS unit), but may also be an outside vendor or consultant. The system operator should be a City employee, usually a member of the data processing unit, unless data processing for the information system is contracted out.

One word of caution: there is often a tendency on the part of the non-technically-oriented person to regard the computer programmer with a certain awe, sometimes bordering on fearful worship. But computer programmers are not demi-gods -- they are just people, sometimes a little more intelligent (or a little weirder) than the average, sometimes not. Like most of us, they may sometimes be slow to grasp a concept or a way of doing things other than that with which they are familiar, and may prefer to "muddle through" a problem in a familiar but not too well suited way rather than try a new technique. He has at least one unique asset, however: he knows the language of the computer, which the manager may not. In dealing with computer programmers, the City Manager would be well advised to act as he would if he were dealing with anyone else who spoke a different language (in addition to which, hopefully, a little English): learn as much of the language as possible, try to get the programmer to speak in English, hire a good interpreter, if necessary, but above all don't consumate a bargain until you are satisfied that both you and the programmer understand it, and how much it will cost. We will discuss the topic of dealing with programmers in the specification and design of information systems.

## 5. Output

The output of an information system can be as varied as the input; in fact, it can and possibly should be more varied, in terms of informational content. Again, as with input, we can distinguish between the information conveyed via output and the means of conveyance (the output mode and format).

### (1) Output: Information Conveyed

We have already mentioned some of the wide variety of output which can be obtained from both an MIS and a UIS, if properly and appropriately designed.

Generally speaking, in addition to any specially designed reports, an MIS should be capable of delivering any requested item of information to a user which would influence a management decision. It should also be capable of performing relatively simple analyses and other operations, such as contract cost estimating, profit and loss generation, sales or inventory or production forecasting, etc., given appropriate software and data.

A UIS may not necessarily be designed to provide the immediate response of an MIS, but should be capable of providing more complex analyses of data, including:

- data tabulation, averaging, and other routine summarization such as frequency tables
- data matching by common location
- automatic data aggregation and disaggregation at different geographic unit levels
- generation of frequency distribution graphic displays
- data mapping of various types
- ranking and grouping of significantly different sets of data
- correlation and regression analyses, both simple and multiple
- factor analyses
- analyses of variance and co-variance
- time series analyses.

The fifth item mentioned above, data mapping, is particularly important if the UIS is to effectively provide information in a form which City decision-makers can understand and assimilate rapidly. A UIS can produce "tab runs" -- listings and tables of data and analytical results -- by the mile, and they will be of interest, perhaps, to the Systems Analyst and others trained in their interpretation. The average City decision-maker -- be he mayor, councilman, agency or department head, will not take (and probably does not have) the time to pore over reams of computer printout. Summary reports must be prepared, and at times it is even difficult to get these read by busy executives. But a map -- particularly one drawn by a computer -- has an almost universal appeal, and will be studied at length by almost anyone who resides in the area. It is also a convenient and concise means of presenting summary information. Data maps are also an excellent tool for presenting information to the layman and the citizen -- including members of citizen review committees. The maximum use of computer graphics, particularly in the form of mapping of data and analytical results, is to be strongly encouraged in any UIS designed totally or partially for city evaluation purposes.

Once again, a caveat similar to the one voiced earlier: computer output is not holy writ. Just as some people will believe anything they see in print, some people who should know better will accept without question anything printed out by a computer. With our earlier dictum of "garbage in, garbage out" in mind

we should also note that the programmer's logic, accuracy, and "de-bugging" ability are also on display in every computer output. So, if something doesn't look right -- question it. Work it through, or ask your programmer to lead you through it -- and if an error is discovered, or bad data, you may have saved a wrong decision based on the output. If nothing is wrong, then your decision will be that much more confidently made.

(2) Output: Means of Conveyance

Almost all of the input modes mentioned earlier can also be used as output modes -- most often for interim storage of intermediate processing results. In addition, of course, there is the familiar "computer printout" -- the product of a wide variety of printers. Printers are capable of more than simple tabular production. They can be used to generate graphs, maps, scattergrams, and histograms, for example.

Other modes of output include plotters, such as the Cal-Comp, which draw diagrams, or maps, etc. using a moving pen, and CRT displays, which can be photographed or copies by other processes to produce "hard" copy.

# III. DETERMINE SYSTEM OBJECTIVES

## 1. The Determination Process

The first step in the creation of an effective information system is the determination of the objectives of the system. In order to do this, the potential users of the system must be identified and their needs for information examined. At this stage of the process, these objectives should be specified in a somewhat general way by each potential user agency. For example, a system objective for Model Cities is to provide "sufficient" information in a "timely" manner on the status of and changes in conditions within Model Neighborhoods and other areas of the city so as to allow reliable and accurate evaluation of specific individual projects, as well as the overall CDA program and other city programs. At this point in time, it is neither necessary, nor appropriate, to determine what amount of information is "sufficient" or how "timely" the information must be.

Inter-agency discussions to determine information system objectives will also produce ideas relating to: (1) general system goals, (2) system constraints arising from legal, organizational, or other factors, and (3) existing systems and procedures with which the information system should be compatible.

The various system objectives, goals, and constraints should then be consolidated into a single document, a short memorandum will usually suffice, to serve as a set of guidelines during the system development process. While this set of guidelines might have many names such as "design criteria", "design guidelines", or "system goals", we will use "system objectives" and refer to the product of step 1 as the System Objectives Document (SOD).

## 2. System Objectives for an Urban Information System (UIS)

It is not appropriate here to conjecture about the system objectives for individual using agencies. However, some pertinent general objectives for an urban information system might be noted.

(1) The system must be envisioned as a permanent entity within City government; it must be continually updated and maintained by City employees.

(2) The system must relate to citizen needs, not simply to City departments.

(3) The system must provide City officials and administrators with objective information to aid in decision making.

(4) The system should provide input to the City's annual budgeting cycles.

(5) To effectively maintain an up-to-date data base, the system should utilize existing, continually-updated City operating files as its primary data source.

(6) The system should provide input to all planning activities for the City, Model Cities, and District Planning Organizations.

(7) The system should incorporate monitoring, evaluation, and feedback capability to permit, for example, growth, improvement in city programs based on Neighborhood evaluations, and adjustment in methods of operating agencies.

(8) The system should produce output on both a regular basis and in response to special queries by using agencies. The output must be so structured that it can be readily comprehended by officials from the using agencies.

(9) The system should include provision for obtaining information directly from citizens involved in individual City, Model Cities or Neighborhood projects and programs.

### 3. The Manager's Role in Determining System Objectives

As is true in many projects, management's role is crucial during the initial phases of the creation of an information system. He should encourage the participation of all potential using agencies in the determination of system objectives. The manager should do everything possible to ensure that system objectives are established to meet the legitimate needs of all using agencies. At the same time he should ensure that existing constraints are properly recognized so that realistic, as well as useful, system objectives are defined. Finally, it is the Manager's responsibility to oversee the preparation of the System Objectives Document and initiate the second step required to create an effective information system.

## IV. Prepare Preliminary Plan

### 1. In-house or Outside System Development?

Once the system objectives have been established, a key decision must be made as to who will create the desired information system. Only in rare instances will an organization have qualified personnel available on their present staff to develop the information system. Thus, it will be necessary either to staff up for the effort or to hire outside consultants to perform the development.

In selecting between these alternatives, the manager must remember that the development of the information system requires specialized skills applied over a fixed, relatively short period of time. While it is to be hoped that the system will be utilized over a much longer period different skills will be required for the utilization than for the development. This creates a problem for the manager electing to staff up for systems development; namely, what do you do with these developmental personnel following the development of the system? Even when a manager decides to staff up and ignore this problem for now, he may encounter some difficulty in obtaining experienced staff. Experience over the years indicates that relatively young, inexperienced personnel might be attracted to such an in-house development team; the more experienced person, who may have done 2 or 3 such systems, will not generally be attracted to such a position because of the limited horizon beyond the completion of system development. In spite of these drawbacks, many managers might prefer in-house development to ensure greater project control and enhance system utilization because of the greater continuity of personnel in the transition from system development to system use.

### 2. Preparing the Preliminary Plan

The form of the preparation of the preliminary plan depends upon the key management decision as to who will develop the system. If the manager opts for in-house development, then staff members should be assigned to prepare the Preliminary Development Plan (PDP). This plan should include such items as:

-- Planned sequence and description of development tasks

-- Estimated schedules of task completions

-- Man-loading requirements for each task

-- Staffing plans to increase staff as required

-- Preliminary budget estimates

-- Facilities requirements for development staff.

The PDP should be prepared and submitted to appropriate authorities for go-ahead approval.

If the decision is made to use outside consultants to develop the proposed information system, then, instead of a PDP, the staff must prepare a Statement of Work (SOW) for inclusion in either a Request for Proposal (RFP) or contract. The SOW will describe the proposed system in terms of the system objectives established during the first step. Using the usual contract procurement procedures, the City or agency charged with developing the system will select a consultant to perform the work. The contract should be detailed enough to serve the PDP for this effort.

3. Clerks or Computers?

In the preceding sections, the procedural aspects of preparing the PDP have been addressed but little mention has been made of the character of the proposed system. While the nature of the system cannot, of course, be precisely delineated at this stage in the proceedings, some concepts must be available as to the system's form and structure to permit intelligent projections of schedule, manning requirements, and budgetary matters. For simplicity three levels of system complexity may be identified:

-- Manual system
-- Computerized system utilizing existing operating files within various city agencies
-- Fully integrated computerized system with a centralized, dynamically maintained data base

Clearly, the manual system is the least complex. Its development would involve functional analyses of the data requirements and data-handling techniques of the participating agencies. The resulting system might comprise a set of recommendations for standardizing report forms, eliminating redundant activities, and streamlining inter-agency communications.

At the second level of complexity, the same agency functional analyses will lead to the design of a centralized system facility to improve the quality of the useful information extracted from the various agency operating files. Since maintaining and updating these files will remain the function of the respective agencies and the resulting data base will be provided to the information system for processing, the development costs for the manipulation and analysis programs making up the centralized system may be rather modest.

If, however, we opt for a fully integrated, centralized system to provide maximum possible information to all participating agencies in conjunction with a dynamically updated, centrally maintained basic data base, the system can become gargantuan. Even if technically feasible, the cost may be economically beyond reason.

A properly conceived information system must strike a proper balance between the provision of true benefit to using agencies through improved information flow and the maintaining of proper perspective as to the level of sophistication and complexity really necessary to meet these needs. The strong temptation to rush headlong into a computerized system must be resisted, and this decision carefully weighed.

4. Budget Considerations

A properly conceived information system, in the sense just described, can be fully justified as a useful expenditure of public funds. We all recognize the difficulty, however, in obtaining funding allocations for projects such as this due to many factors such as distrust of technology, lack of political appeal, and the indirect nature of the pay off to the community. The problems involved in obtaining such funding are really a subject in itself and will not be pursued further here.

It is appropriate, however, to mention the allocation of City funding to assist in information system development as a quite proper avenue to the improvement of the planning, management and evaluation of projects. Among other factors, the amount of money which should be budgeted for information system purposes depends upon:

-- amount of management or administrative budget which can be devoted to information system activities
-- present state of development, and funding base, for any City-wide UIS
-- number and extent of any special data items which must be collected (not presently included in the City UIS)

5. The Manager's Role in PDP Preparation

At this stage of information system development, the manager's role is crucial. In addition to providing strong personal backing for the overall project, the manager has some important personal roles:

-- The decision as to in-house vs. outside development must be made
-- The proper balance between meeting agency needs and reasonable costs must be maintained
-- Support in obtaining a sound funding base is essential

While this step by no means concludes the manager's interest in or support for the information system development effort, it is at this point that his dynamic leadership can provide the necessary sound foundation for a successful development project.

# V. Specify System Requirements

## 1. The Nature of Information System Requirements

The first step in the creation of an information system defined the objectives of the system in the SOD. These objectives tell in a general way what the system is to accomplish. The purpose of system requirement specification is two-fold:

- -- Delineate with greater precision what the system must do
- -- Determine in a general sense how the system will accomplish these tasks.

These analyses will lead to the specification of system requirements in five separate areas:

- -- System output requirements - What information must the system provide? What will be the form of the information? How frequently must it be available?
- -- Data input requirements - What data must be available to the system? What is its source, form, accuracy, currency?
- -- Software requirements - What kinds of computer programs or new operating procedures must be developed and what quantitative or qualitative requirements must they meet?
- -- Hardware requirements - What types of computers, calculators, or other physical equipment must be purchased, leased, or made available for the system?
- -- People requirements - How many people will be required to utilize the completed system? What skills and skill-levels must be represented?

The requirements generated in these 5 areas will be summarized in a System Requirements Specification (SRS) which will serve as the basis of the remainder of the system development process. The next sections discuss the character of the system specifications in each of the 5 areas mentioned above.

## 2. System Output Requirements

The system objectives presented in the SOD provide the basis for defining the outputs required of the system to meet the needs of participating agencies. Certainly the system must be capable of preparing reports on a regular scheduled basis to meet the periodic requirements of participating agencies. One of the key output requirement decisions is the determination of how flexible the system must be in preparing non-scheduled, special reports for using agencies. Requirements must be delineated as to what kinds of reports can be prepared on a non-recurring basis, what formats might be available, and what sort of response time might be expected.

Another key decision in the output requirements area is the determination of the output conveyance methods which should be made available such as plotters, mapping devices, television, CRT, and various computer graphics display mechanisms. Of course, standard hard-copy print out would undoubtedly be available in a computerized system. In a manual system the choice might be among such mechanisms as microfiche, microfilm, and hard copy. In general, emphasis should be placed upon the more graphic forms of system output.

In addition to the two key output requirement decisions, the needs of the participating agencies must be converted into composite estimates of report requirements. These estimates will include such parameters as:

-- Number of reports
-- Report format
-- Report length
-- Frequency of report preparation
-- Sensitivity to time delays

The final determination of system output requirements is a feedback process. Agencies can determine what they would really like to have in the form of output. These needs can then be analyzed in terms of the raw data required to prepare the information, the necessary processing to derive it, and the output mechanism needed to present it. This analysis may conclude that certain output requirements are not feasible because of lack of data, complexity of the required processing mechanism, or cost of data gathering, processing, and/or outputing information. These analyses lead to modification of the preliminary output requirements into a feasible, useful set of system output requirements.

3. Data Input Requirements

The output information required by the using agencies determines the raw data input requirements into the system. These r4quirements, in addition to identifying the necessary data elements, must address the various data characteristics for each such data element. Some of these data characteristics are:

-- Accuracy

-- Currency (frequency of update)

-- Reliability

In addition to the characteristics of the data itself, the analysis of input requirements must be concerned with such factors as:

-- Source of data

-- Mechanism for storing data

-- Format of data

--Updating procedures and responsibilities

We have already observed that literally thousand of variables may be available for inclusion in the data base of an urban information system. The selection of a relatively small set of these variables can present something of a bewildering choice. With obvious allowance for the important exception, we can list in descending order of desirability the most preferable sources of data:

-- city operating files presently in a UIS

-- other automated city operating files

-- previously collected and automated special survey data

-- unautomated city operating files

-- new special survey data.

We should recognize that the term "city operating file" as used here applies to any operating file that "covers" the city, regardless of which geographical or political unit may actually maintain the file. Thus, for example, files maintained by a county or by some special district may be appropriate for consideration for inclusion in a UIS.

Some of the data required for the system may already be available from the operating files of participating agencies. Data not already available may be obtainable by expanding these operating files to include additional data items, by creating new files containing the data items, or by resort to special survey data.

Based upon the experience of the Los Angeles Community Analysis Bureau in the development of their UIS, the most important files are:

(1) land use records - assessors files, building permits, land size (parcel level)

(2) business tax permits - aids in determing tax base

(3) personal safety - police crime files, arrest files, fire incident and cause files, false alarm files, traffic accident files

(4) census - used as a special survey type file

(5) education - school populations, classroom densities, dropout statistics, achievement test scores, teacher work loads

(6) industrial/commercial - the Dun & Bradstreet files on location, gross sales, number of employees, etc. of commercial and industrial businesses.

(7) basic demography - permanent files (as opposed to census)

(8) housing - vacancies, market prices, rental prices, housing quality, condition, etc.

(9) health - communicable disease records, mental illnesses records, infant mortality records

(10) transportation - public transportation records, traffic studies, street improvement records, etc.

## 4. Software Requirements

In determining the software requirements for utilization in a UIS, management will be most concerned with the type of analyses to be conducted using the UIS data base. Almost certainly, most of the software requirements can be met by existing programs, with perhaps some minor modification, but with little or no new program development.

The first decision in specifying system software requirements is to determine which system functions should be manual and which automated. Specifications for manual functions might consist of guidelines controlling the efficacy of proposed communications procedures e.g. timing or accuracy controls or of requirements indicating the frequency of file update procedures.

For automated functions, the software requirements specification is more complex. Software requirements are of two types: functional and quantitative. Functional software requirements specify what the software should do while quantitative requirements allude to how well the functions should be performed e.g. how accurately a computation should be made or how quickly a particular report should be prepared.

Functional requirements can vary greatly in complexity. For simple systems, the total functional software requirement might be no more than a list of system software functions and one sentence definitions of the functions. For example, one might have:

| Function | Description |
|---|---|
| Address Matching | Matches addresses in different files existing in various formats |

Quantitative software requirements might further delineate this function by specifying what formats might be considered or imposing a speed requirement.

For more complex systems, the functional software requirement generation becomes a significant analysis task in itself. Basically the task is to break down a single system function into an organized sequence of subfunctions. The interactions of these subfunctions are expressed in terms of logical flow diagrams which are frequently called Functional Block Diagrams (FBD's) although other terms are also used. An FBD somewhat resembles a flow chart of a computer program. It differs, however, in that each "box" in the FBD defines a subfunction to be performed by the system i.e. what the system is to do; it does not indicate how the system is to perform this subfunction. For example, a box in an FBD might say "Calculate the average income for each area within City". Functionally, this describes precisely what must be done. There is still ample room for the system designer to determine alternative ways of how the task might be performed. Some of the questions the designer must address to convert the "what" into a "how" are:

- How are "areas within the City" defined?
- How is income data correlated with City area?
- What types of income should or should not be considered?

- What algorithm do we use to calculate the average?
- When does data extraction from files occur? Do we extract that for one area, perform calculations, and then consider the next area, or should we extract all needed data prior to performing any computations?

Once the functional requirements have been completely defined in terms of system subfunctions, quantitative system requirements can be generated. Quantitative requirements, as already noted, relate to how well the system can perform the system subfunctions determined during the functional software requirements analysis. Since the nature of the quantitative requirements depend on the particular type of software being considered, we will discuss the quantitative requirements for each software type. This will also provide an opportunity for us to review the kinds of software we might encounter in an information system.

The types of software that make up an automated information system can be conveniently categorized into five groups:

- Control Software
- Manipulative Software
- Display Software
- Analysis Software
- Modeling Software

## 4.1 Control Software

Like any integrated software system, an information system must have control software designed to ensure the smooth and efficient operation of the system. Control software is concerned with such functions as:

- Regulating the sequential performance of the tasks confronting the information system
- Balancing the use of input/output devices, and
- Controlling the system's use of computer memory.

Many control functions are built into the operating system software associated with an individual computer. However, certain specialized control features peculiar to the system will have to be designed into any information system. Proper design of these control programs not only ensures efficient system operation but also lays the groundwork for effective growth of the system. The control mechanism must be sufficiently flexible to permit inclusion of new features in the system, e.g. added display capabilities, or modification of existing system segments without destroying the whole character of the system or requiring extensive reworking of existing program segments. Requiring "flexible control programs" that permit a "modular system structure" usually is the non-numeric "quantitative" system requirement for the control program.

## 4.2 Manipulative Software

Even the most rudimentary automated information system will perform data manipulation tasks even if extensive data analyses are not attempted. These data manipulation tasks would relate to extracting, rearranging, and modifying raw input data to provide effective information to participating agencies. Some of the specific functions performed by manipulative software:

File maintenance routines (to initialize and update data files)
Data retrieval/extraction routines
Sort/Merge routines (to rearrange/reorder/resequence data files).

The quantitative system requirements relating to the manipulative software are of three basic types:

Volume requirements controlling the number of data items which can be manipulated.
Speed requirements specifying the rapidity with which certain processing (extracting, sorting, etc.) must occur.
Flexibility guidelines. For example, the system might be required to extract certain land use data from specified census tracts. Since the land use data may be keyed to census tract this might be relatively easy. If, on the other hand, the system was required to extract land use data for all families in the tract with incomes greater than $8,000 per year a far more complex problem is presented since income data is, most likely, not part of the land-use file.

## 4.3 Display Software

Possibly the key software in any information system is the display software, which provides the mechanism for presenting information to using agencies using preferred data formats and optimal display devices. The basic function of the display software is to convert the raw data system input or the results of analysis or modeling software into formats acceptable to the selected display devices which in turn provide the presentation to using agencies. The complexity of the conversion depends primarily upon the display device selected. If printed output using a standard computer printer is selected, nearly all the necessary processing is performed by the manipulative software and the display software does no more than describe the desired output format to the printer. More graphic displays such as CRT or plotter output require more extensive display software development since the file format must be converted to a form compatible with the selected display mechanism.

The quantitative software requirements for display hardware are comparable to those for manipulative software:

Volume requirements which specify the amount of information which can be presented in a selected display mode.
Speed requirements which limit the time permitted to prepare displays.
Flexibility requirements which define the number of display devices which can be selected for each proposed type of display and the scope and accuracy of the resulting displays.

## 4.4 Analysis Software

The analysis software in an information system derives useful information from the raw data using more sophisticated techniques than the simple rearranging and resequencing accomplished by manipulative software. Most analysis software will be statistical analysis programs of some sort. The types of programs which might be useful include:

Regression Analysis
Time Series Analysis
Analysis of Variance
Confidence Intervals
Spectral Analysis

For specialized use within the system, other generalized mathematical analysis programs such as numerical integration, solution of differential equations, and numerical differentiation may be useful. Program packages to perform such statistical and mathematical functions are generally available so that they may not need to be specially developed for use within the information system. A limited number of special analysis programs may have to be developed as part of the information system design and development effort.

Whether already developed programs are used in the system or special programs are to be designed, quantitative software requirements for each analysis function must be specified. In addition to volume, speed, and flexibility requirements similar to those for manipulative and display software, accuracy requirements must be imposed upon analysis software.

## 4.5 Modeling Software

Modeling software is the most sophisticated type which can occur in information systems. Most existing modeling programs are not integrated within an information system but operate as separate entities even though they may use some of the data contained in the information system's data base. The purpose of the modeling software is to derive more extensive useful information from the basic data base than that obtainable through rearrangements or primary statistical analyses as represented by the Manipulative and Analysis software. To accomplish this goal more sophisticated mathematical techniques must be applied such as simulation, linear programming, queueing models, and dynamic programming.

It may be considered desirable to attempt to make simulation modelling a part of the information system's capabilities. For example, models in any or all of the following categories might be attempted:

1. Political models -- tax revenue, bonding, city expenditures, capita-improvements, city services, and voter response.
2. Physical models -- housing status, retail-commercial status, and transportation.
3. Social models -- education, health care, job skills, recreation.
4. Demographic models -- birth/death rates, migration estimation, and population projection.
5. Economic models -- labor force, industry/commerce activity, employment, tax revenue, income, and multiplier.
6. Ecological models -- noise pollution, water quality, solid wastes, air quality, and thermal pollution.

Much developmental work, some successful, has been done on a wide variety of models of these types. Generally, however, they are designed for special purposes and situations, rather than being general-purpose models. Their adaptation to The City or other purposes could, and most likely would, be an expensive proposition.

5. Hardware Requirements

The hardware requirements for an information system specify the physical equipment which must be obtained through purchase, lease, or rental for effective system operation. The most interesting case, and the only one we will discuss in any detail, is for an automated system where computer selection is involved.

Management may be presented with a choice of available hardware options for its utilization of a UIS. Its choice should be based on the most reasonable combination of:

low operating cost
operating speed consistent with user turnaround requirements
minimal re-programming or adaptation of existing available software
minimal data conversion or re-formatting problems
maximum graphic output capability

This expected load will influence the decision as to whether a computer should be purchased or leased by the City, batch process computer time purchased from a time broker, time-sharing, etc. We will not pursue the economics of this type of decision here. The hardware requirements must also specify what peripheral devices will be required for the system and what device capabilities are essential e.g. printer speed, or card reader speed. Computer memory requirements must also be specified.

It is not envisioned that any information system will lead to hardware requirements for special-purpose computers or even peripheral devices designed and developed especially for the system. This fact in no way relieves us from precise specification of hardware requirements to aid in selecting the computer system from those available. It is, of course, recognized that other factors may lead to selection of a less-than-ideal hardware configuration. For example, a computer may already be available; other City requirements may influence or dominate computer selection; avoidance of reprogramming of existing software may limit selection as may the desire to minimize into reformatting and conversion.

6. People Requirements

People requirements constitute the portion of the System Requirements Specification which relates to the manpower needs to operate the completed information system. It does not relate in any direct way to the manpower requirements for the process of creating the information system as described in the PDP. The people requirements must specify:

Nubmer of personnel required
Type of skills needed
Skill-level requirements

The types of skills most likely to be required for an automated system are:

Computer operators to perform the necessary operation of the system on the computer
Computer programmers to perform maintenance and modification of system software
Analysts to evaluate the system displays, initiate system growth requirements, and insure proper application of system output to meet agency needs.
Clerical personnel to assist in data handling and information dissemination activities as well as performing manual portions of the system operation.
Keypunch operators to prepare cards for input

**7. The Manager's Role in Specifying System Requirements**

In theory, the manager's role in the creation of a new information system should diminish at this stage. His strong support and guidance through the statement of system objectives and the preparation of the preliminary development plan has, hopefully, provided a solid foundation upon which the system can be built. In practice life is not so sublime. To ensure success of the project, management encouragement and support are imperative during this crucial stage of the development. Some of the specific steps which should be taken at this time are:

- Motivate full participation and support from all using agencies to ensure maximum utilization of the system
- Assist in the coordination of system requirements among participating agencies.
- Inhibit the generation of grandiose plans designed more to satisfy the esthetic needs of system designers than to fulfill real needs of the participating agencies.

If the first two steps of the creation process provide the foundation upon which the system is built, the third step of specifying system requirements provides the framework of the building. If this framework is not sound the structure may collapse.

# VI. Designing an Information System

## 1. The System Design Activity.

The goal of the system design activity is to convert the system requirements generated in the System Requirements Specification into a comprehensive, detailed system which will meet these requirements. In simple terms, the system requirements identify what the system must do; the system design specifies how the system will meet these needs. For a manual system, this design consists of specifying forms to be utilized by participating agencies, standard operating procedures for communicating data, and guidelines delineating the nature, frequency, and methods of data update.

For automated systems, the design procedure is more complex. Precise input formats, reporting procedures, and timing requirements must be generated to ensure the proper flow of data into the system. At the other end, report formats, content of graphical displays, and report generation frequencies must be generated to ensure the proper flow of useful information to all participating agencies. The heart of the design effort is devoted to the detailed description of the software functions outlined in the System Requirements Specification. This software design activity is where the skills of the system development staff are brought strongly into play. The whole project must sink or swim on the basis of these skills. A sloppily designed system can create a mishmash of computer programs that don't do what you want, take too long to do it, and give lousy answers when they are done. A properly designed system will provide for the smooth flow of raw data into the system and the timely flow of useful, accurate information from the system. The technical details of this design process are beyond the scope of this discussion and will not be pursued further here.

## 2. Designing vs. Selection

Once the basic requirements for an information system have been specified, a basic choice almost always exists, at least as regards the development of portions of the system. The choice is that between designing (and developing) the information system (or portions of it) one's self (or hiring it done), or searching for and obtaining an already operating system which, with some minor modification, perhaps, will fulfill the requirements.

There is much to be said in favor of designing one's own information more or less "from scratch." It will be, if properly done, exactly the information system one wants -- it will meet all of one's requirements, have some potential for future expansion, and not have any superflous capabilities.

However, there is also much to be said against "designing your own, "especially if alternatives are available. It is usually a much more expensive proposition than adapting already-existing operating systems. It takes more time. It is more likely to meet with unforeseen difficulties or even failure.

On the other hand, the adaptation or even wholesale adoption of already-existing systems or programs is not without difficulties of its own. Differences in format of input and output, as well as of hardware requirements, between different "standard" programs must often be overcome. Available hardware may not match well with available software, necessitating software modification. Proprietary software costs money -- although usually not as much as developing it one's self.

In balance, and particularly for city applications where there is little time for system design and development the best approach is probably one of adopting or adapting existing software whenever it matches with the more essential information system requirements, and doing original design and development of software only when absolutely necessary, primarily to provide the necessary linkages between software packages. Hardware design and development should, almost without exception, never be attempted.

### 3. Functional Design

Whether or not one adapts existing software, the first step in the design process should be carried out for the entire system. This first step is the functional design of each piece or module of the system and the system as a whole. In essence, the functional design process answers the question, "What should the pieces of the system do, and how should they be tied together into a single system?" Once the functional design is completed, then decisions can be reached on a module-by-module basis as to which modules will be adapted and which will be designed and build from scratch.

The accomplishment of a functional design will be greatly aided by the use of system flow charts. A flow chart is simply a graphic way of representing with lines and different types of boxes the logical framework of the system in terms of a series of events. A flow chart is just a block diagram of the complete system. System flow charts should be detailed down to the level of individual programs and, perhaps, sub-routines.

### 4. Detailed Design

Once the functional design is completed, detailed design is initiated for those modules which are not being adapted from already-existing software.

Whereas functional design saw the user working with the progammer to produce a functional design, detailed design is more or less the exclusive domain of the programmer. He will develop the necessary algorithms (formulas) and prepare detailed program flow charts for each module of the system. The detailed design effort is aimed at determining just how each piece of the system is to do its job.

### 5. The Manager's Role

The primary concern of the Manager during the design phase of information system development should be to make sure that the system's functional design satisfies his requirements as specified earlier. In addition, he should ascertain that the general information system criteria are met.

The Manager should certainly make sure that he understands the general system flow chart, and the role that each module of the system will play. He usually need not be concerned with detailed design or individual program flow charts if he has done a proper job in the functional design stage.

Now is the time for the skilled technicians to arrive on the scene and do their thing. The manager's primary role now is now more that of a leader than a manager. Thus, he should display interest in the design, motivate the participants, and refrain from nitpicking detailed aspects of the design. The manager must, of course, participate in the design vs. selection decision. He may also be called upon to resolve conflicts between idealized goals of the system requirements and feasible attainments by the system designers. While being attentive

to the attainment of the system objectives, he should recognize the limitations of the state of the design art and when necessary relax unreasonable system requirements. In this context, he plays the role of the moderator between the inherent desires of using agencies for the maximum of capability and the realistic limitations (economic or otherwise) of meeting these desires. In short, the manager devotes his energies to keeping the design activity on track to obtain the maximum possible system within the constraints of the real world.

# VII. Developing an Information System

## 1. The System Development Activity

We are using the phrase "system development" in a quite narrow and special sense here. We are referring to the steps necessary to convert the established system design into an operable information system. For a manual system, this might involve no more than printing new forms or disseminating memos defining new standard operating procedures. For an automated system, system development involves the actual coding of programs, their production and debugging. Adapted programs will be modified as necessary, run on the selected hardware, and debugged as necessary. All programs will be integrated into the total system, with appropriate interface soft-ware debugged.

Necessary hardware procurement will be effected. Equipment will be installed and test operations conducted.

Data base development will proceed at a level at least sufficient to provide sample data for each use of the system. The sample data will be used for system check-out prior to delivery.

Successful testing of the complete system, while necessary, should not justify complete acceptance of the system. This will not occur until all required system documentation is delivered, and necessary training of city user personnel accomplished, usually early in the implementation phase.

## 2. The Manager's Role

The Manager's role in information system development, per se, is probably limited to monitoring progress via periodic reviews of system status. Delays in schedule should be carefully examined in terms of their likely impact upon the evaluation schedule and/or budget.

The Manager will particularly want to monitor the final system testing, especially in terms of output produced and turn around times.

# VIII. Implementing an Information System

## 1. The System Implementation Activity

At the completion of the system development activity, we have an operating system which follows the system design created in step 4 to meet the system requirements generated during the third step. In order to operate the system effectively one final step is necessary. The analysts and other personnel in the using agencies must be instructed in the use of the system. There are two avenues for reaching this goal:

Training seminars
System documentation

Some form of training seminar will undoubtedly be helpful to familiarize participating agencies with the operation and capabilities of the system. However, the key to system implementation is the preparation of complete, effective system documentation. This is even more crucial if one must provide for the smooth transition from a consultant design team to an in-house team of users and operators. Effective system documentation should include such documents as:

General System Description - concise (10 - 20 page) description of system use, structure, input, and output.
Operators Manual - detailed description of how to operate the system from the viewpoint of interactions with the computer.
Detailed System Description - this volume or volumes contain complete input formats, output formats, and detailed discussion of the algorithms used in the system software.
System Flow Charts
Glossary of Symbols Used

System documentation is a continuing process. The system design effort may have led to a system design specification which can, with modification, serve as a portion of the Detailed System Description. Flow charts and glossary are prepared, in part, as a natural consequence of the design and development activities. General system descriptions may be generated prior to beginning system development to serve as a selling device. As the System evolves, these descriptions, too, will change. System changes (see the next section) should be appropriately reflected in document updating.

## 2. Vertical vs. Horizontal Implementation

Once the system is "up and running," the City can begin to use it to evaluate project and program impact and effectiveness. This will, of course, be a continuing process. However, there are generally two ways in which one can go about the implementation process:

) vertical analysis -- analysis of the contents of a single file to a considerable level of depth;
) horizontal analysis -- analysis of the contents of several files, with interrelationships being investigated, but not necessarily to the depth of a vertical analysis.

Vertical analysis may be very important to determining the impact of a particular project within the context of its own narrower goals. For example, a project designed to raise the reading ability of primary school children could be evaluated almost totally by reference to an education file.

However, horizontal analysis is necessary to determine the impact of projects upon each other and upon related indicators of community status. Horizontal analysis is also necessary to the study of total program impact and effectiveness. For example, a program designed to provide employment by training in special skills could be evaluated, in the vertical sense, simply by looking at the total number of people trained and employed as the total market for those skills and would probably involve the use of an employment or industrial/commercial file. If the project were really successful, however, it would also impact upon housing, transportation, health, and perhaps other items, since the increased income would allow the purchase of better housing, transportation, and health services. To determine impacts on related items such as these, horizontal analysis is necessary.

### 3. Training

An important feature of the early stages of information system implementation is the training of both system operators and users. This should be accomplised, to the extent allowed by data base status, in an actual operating environment of day-to-day solution of the problems the information system was designed to handle, using actual data. Seminars and other formal training programs have their place, of course, and will be necessary.

### 4. Documentation

An essential to training as well as to total system acceptance is adequate documentation of the system. This documentation should include:

- complete system descriptions, including detailed flow charts for each module
- complete operating instructions, perhaps in the form of training manuals
- a catalogue or inventory of the data base

The most important aspect of system documentation is that it be user oriented where appropriate. Documentation which cannot be understood by the intended used of the system, at least enough so that he can prepare input and interpret output properly, is not adequate.

### 5. The Manager's Role in System Implementation

The principal function of the manager in the system implementation phase is to ensure that ample system documentation is indeed created. Two factors tend to confound the documentation activity. In the first place, computer programmers and, to a lesser extent, design analysis frequently have an aversion to the documentation task. This stems not only from a lack of interest in writing per se' but frequently from a desire to move on to new and challenging tasks now that this job is "done". The second problem is a time and money one. In too many cases, all available funds are spent getting the system going and nothing is left for the documentation effort. A manager's primary goal at this time is to ensure that these difficulties are overcome and that effective documentation is made available.

# IX. Maintaining an Information System

## 1. Maintaining a Living Information System

In using any complex computer system, analysts are constantly uncovering small modifications which might be appropriate for improvement of the system. These modifications may involve minor adjustments in input or output formats, small changes in computational methods, or possible simply the correction of obscure errors encountered during use. In simple terms, any useful system is a changing and improving system. A portion of the manpower allocated to system utilization is scheduled to perform this maintanance activity. Maintenance in the more classical sense will also be performed on the hardware of the system.

## 2. Data Base Update

The most important aspect of system maintenance from the user's point of view will be maintaining the currence of the data base. If the data base consists primarily of operating files, the problem becomes one primarily of making sure that the latest available copies of files are acquired. As was pointed out earlier, the only way of keeping special survey data current is to re-run the survey.

## 3. System Growth

Growth of the information system will occur in two ways:

- expansion of the data base to include new data items;
- increasing the capability of the system by adding new analytical modules.

The adding of new modules should be accomplished via the same procedures we have just discussed.

The expansion of the data base will occur as a natural consequence of the analytical process. As the system is used, it will become evident that other data items not originally included in the data base may have important bearing on results. Also, new information may become available from special surveys or by the establishment of new operating files or the automation of old ones.

## 4. The Manager's Role

The Manager should be alert for new sources of data, in terms of both opportunity and need. He should make sure that system growth is orderly, well-planned, timely, and within his budget. He should not allow haphazard growth or change of the system to meet the expedient of a single short-term problem without thought being given to longer term consequences.

B. Information Systems of Other Cities and Regions:

Since initial research has been done with material published by the governments involved and since most information systems are reasonably young, it is not possible to evaluate their success in overall results at this time. It is possible to study their trials, errors, and procedural successes; and to use these as we begin to design our own system to meet our own needs.

The systems reviewed have used various approaches to the problems and also reflect a wide variation in population sizes. Since these factors prohibit comparison between their systems, this report will merely note highlights of their efforts and what might have significance for further study in relation to our system's development.

The first eight systems are from reports obtained individually from our own research, and all except two pertain to housing information only. The second group were included in a HUD report of case studies of urban and regional information systems.

Group One:

I. Rock Island, Illinois, Total Housing Information System
II. Twin Cities (Minnesota) Metropolitan Council
III. Philadelphia Housing Data System
IV. Puget Sound (Seattle) Housing Information System
V. Fall River, Massachusetts, Interagency Residential Structure Survey
VI. Omaha's Metropolitan Census Data Use Consortium
VII. Chattanooga Human Service Management Information System
VIII. The Dayton Plan (Miami Valley Region, Ohio)

Group Two:

I. Alameda County, California
II. Alexandria, Virginia
III. Bay Area (California) Transportation Study Commission
IV. Delaware Valley Regional Planning Commission
V. City of Los Angeles
VI. Lehigh-Northampton (Pennsylvania) Joint Planning Commission

Group One:

I. Rock Island, Illinois, Total Housing Inventory System - (T.H.I.S.)

A. Team of City and HUD
B. Use of 701 money for design

Group One (continued)

C. 13 person staff, full or part time, for 16 months
D. Started with a Housing Inventory System from which other sub systems emerged. Hope to eventually develop total Urban Information System.

E. Uses - (a) Real Estate Tax Billing Master File, (b) Land base maps (overlap for census tract, block number, transportation and zone numbers, planning areas and neighborhoods)

F. Uses 1970 Census (ACG/DIME) system as a reliability check. *Proved too expensive and really incompatible with local real property files. Went to water meter records - reader visits every 3 months. Meter reader actually fills out a survey form.

G. Use all building and demo records

H. Random sampling single family - 10% in each neighborhood
Multi - 25 to 100% sample

I. Quality checked by City inspection division

J. Occupancy - vacancy data determined by random sampling includes vacancy for rental units

NOTE: Very interesting and should be looked into further

II. Twin Cities Metropolitan Area

A. Policies adopted by Council - General policies

B. Have set up a Council Review procedure for all Federal program housing (only projects above Environmental Impact threshold limits.)

C. Have report giving distribution and types of subsidized housing (an inventory)

D. Report in Housing Quality (used census reports which were found inadequate)

E. Developed a profile of Municipal housing (taken from first count summary tapes of 1970 census and supplementary housing information, "It is hoped that providing such information in an accessible and efficient form will increase local knowledge and awareness of a range of housing conditions and problems and stimulate actions to correct problems where they exist."

F. Review of Housing Legislation - to see what results the laws may bring

G. Have developed an interim housing allocation plan

H. Publish periodic "Data Log" reports

(1) Housing Unit Characteristics-1970 Census
(2) Residential Starts (local records)
(3) Construction in the Twin Cities Area in 1971 (local records) "In general, we collect and use data as it is necessary and useful to furthering policy concerns. We do not collect data to have a comprehensive housing information system."

III. Philadelphia Housing Data System

A. Work from a committee and subcommittee structure

B. Decided not to use consultant to design "system"

C. Developed individual subsystems to meet specific agency needs

(1) Faster
(2) Whole system does not have to be changed if one subsystem needs modification

D. Essential characteristics of system

(1) It should be location based, that is all information should be recorded for specific "addressable parcels."

(2) It should contain some indicator of housing quality or condition of structure

(3) It should ideally be able to maintain a current property inventory

(4) It should be understood by its users

E. Attempts are made to adopt existing procedures into systems and to make them usable for other purposes

F. Using the Department of Licenses and Inspections data they have developed an inventory and condition system and code enforcement system

G. Side benefits of Committee System

(1) Exposed some of the limitations of using operating agencies as a raw data source

(2) Value of representative and participation by agency staff

G. (continued)

(3) Merely the act of systemizing data is of great value to everyone

H. Have developed a Housing Production Monitoring System

I. Have developed a Vacant Property System designed to identify, classify, describe and inventory vacant houses, lots and non-residential structures on a city-wide basis

IV. Puget Sound (Seattle) Housing Information System (HIS)

A. Work of Puget Sound Governmental Conference (COG) in 1970-71

B. Envisioned use of consultants for design of Housing Information System.

C. To assure maximum participation and quick response to changing housing conditions, regularly held seminars of experts are planned.

D. Administration functions and all reports to be handled by "processor."

E. Looked at a four-phase development

1. Development of library including computer data files and seminar system.

2. Sophistication of Phase 1 capabilities - including a computerized referencing system)

3. Expansion to capacity to design and conduct surveys, to organize subcomponents of information distribution and information analysis.

4. Expansion to handle "on-demand" requests

NOTE: Preliminary investigation indicates that this system has bogged down and that the seminars are the only ongoing function.

V. Fall River, Massachusetts, Interagency Residential Structure Survey

A. Development of housing condition and rehabilitation cost form

B. Used random sample technique (10%)

C. Computerized results

D. Up-date and check by periodic sample

V. (continued)

E. Contains a very detailed survey form, which should be revised; on conditions (exterior,interior) and a means of costing out needed repairs.

VI. Omaha - Metropolitan Census Data Use Consortium

A. A lot step in the development of a metropolitan information system

B. Used to solicit metro cooperation

C. Used to facilitate the use of all census data (DIME,SYMAP, GRIDS)

D. Article describes structure, consortium members, function of each member, etc.

E. Of interest, the "Center for Urban Affairs" at the University of Nebraska plays an important role in advising and coordinating.

VII. Chattanooga Human Services Management Information System

A. Coordination of information to and from agencies providing services to the poor to make possible the best service in the most efficient manner.

B. System consolidates support services of (1) outreach and recruitment, (2) intake and assessment, (3) referral and follow up, and (4) transportation.

C. Each service agency has IBM 2260 terminal with access to central electronic file. Can determine information about the client, services provided by other agencies and comments from counselors in other agencies which might be helpful in arranging additional services to the individual.

D. Allows better evaluation of agencies by management and also includes factor for client evaluation of agency service

NOTE: Worth looking at further in terms of Human Resources Bureau and Revenue Sharing

VIII. The Dayton Plan (Miami Valley Region, Ohio)

A. First year all pertinent information on housing in region was compiled and used to determine the region's housing problems, to provide technical assistance, and to raise the level of community awareness about these problems

B. Then a regional Housing Dispersal Plan, based on this data was developed to allow fair distribution of lower income housing throughout the region

C. It was planned that data would be updated and recalculations made when 1970 Census information became available

D. This Plan has had success in convincing public officials to accept their area's share, but there is a greater problem in convincing the general public

Group Two:

I. Alameda County - Oakland California (fairly typical data services center)

A. Two special services - Central Index which services Welfare, Health, Probation and Medical Institutions; PIN (police information network) serves all law enforcement agencies throughout the San Francisco Bay area. Users access through remote terminals. Both are on real time systems.

B. Data Processing Center is a service organization for other county departments

C. System Design is function of DPC - fifty systems analysts and programmers

D. Goal is total unified information system

E. 1968 Center Budget $2.3 million

F. DPC put out user manuals and periodically publishes a DPC newsletter

G. System has been termed successful although very little use of the DPC has been in the support of county planning

II. City of Alexandria - Virginia

A. In addition to day-to-day municipal data processing, a Data Bank is maintained

B. Purpose of Data Bank is to provide management information not just the automation of clerical functions

C. Provide data primarily related to land parcels, street sections and street intersections

D. Parcel file contains 60 data items for each parcel of land in the city

E. Most data items were available from various sources.

F. Field data collected by off-duty firemen

G. Systems updated quarterly, but not automatically, by assigned departments. Great variance in actual practice.

H. Although quarterly update provisions were included in original design (updated by individual city departments) the maintaining of the data files has proven to be one of the most serious difficulties encountered. Because of this many say that a data bank should arise from or in conjunction with,an active program of municipal data processing.

I. Because of problems systems not used too much. Most used by the planning department, the assessor, and the city manager.

III. Bay Area Transportation Study Commission (BATSC) (covers nine counties)

A. Created by the California State Legislature in 1963 and was charged specifically with the conduct of a comprehensive transportation study and the preparation of a master regional transportation plan.

B. Objectives (1) Closer interaction between analyst and his data, (2) provide for the systematic management of a growing data base, (3) to facilitate the release of data to other agencies.

C. Two years from formation of commission to an operational stage.

D. Initial budget for three year study - $3,465,000 majority from State Highway Funds.($850,000 from HUD) Other contributing agencies: Association of Bay Area Governments (COG) and Bay Area Rapid Transit District.

E. Actual cost $4,425,000 - This figure is actually very close to the transportation planning rule-of-thumb of $1.00 per capita in the study area. ($50,000 to Systems Design Corporation for system design)

F. Examples of data (1) Highway inventory, (2) Home interview survey, (3) Parking surveys, (4) Land use inventory, (5) Employment inventory, (6) Census tract street index

G. Home interview survey (5% sample) collected 10,000 items of information at a cost of $1.5 million, but no updating had been done at time of this report.

NOTE: This system should be given further study

IV. Delaware Valley Regional Planning Commission

A. Bi-state metro region including Philadelphia, Camden and Trenton

B. Direct successor to the Penn-Jersey Transportation Study

C. Structure - the Division of Transportation and Planning, the Data and Mapping Services Division, the Review and Comment Unit and the Planning Task Forces Unit

D. Two million spent over two years on the development of the data base. Extensive field data collection on traffic patterns and land use. Other data obtained from census, school districts, insurance and employment records, etc.

E. Problems of data maintenance have come up since this is very complex system had adequate personnel or budget.

F. Lessons learned: (1) Files must be maintained in flexible and accessible form, (2) a computer configuration should be selected at earliest possible time, (3) multiple computer configurations should be discouraged, (4) equipment selection should be governed by considerations of turn-around-time and availability of applications-oriented software.

NOTE: Deserves more study

V. City of Los Angeles

Majority of information in 1968 was associated with day-to-day municipal operations. The Community Analysis Program was instituted in 1968. (The remainder of this review will be devoted to this program, as reported in two separate papers provided the Information Coordination subcommittee).

A. Funded though HUD Community Renewal Program Grant

B. Steps taken in Systems Development

1. Development of Community Analysis System Specification

2. Data Base and Software Development

3. Planning and Management Philosophy Development - The following subject areas were selected; personal safety, health, education, home/community environment, economic satisfaction, recreation and accessibility

4. Initiation of work program

5. Development and the Scientific Urban Matrix

6. Development and Implementation of Project Management Systems

7. Assessment of Urban Threats and Requirements

8. Survey of Ongoing Programs and Fiscal Base for Renewal from All Sources

9. Identification of Integrated Programming Requirements

10. Production of State of the City Document Series

11. Initiation of Project Evaluation Feedback

NOTE: This system appears to be well thought out and should be studied extensively

VI. Lehigh - Northampton Point Planning Commission Allentown, Pennsylvania (covers two counties)

A. Uses a triennial school census adapted to include adults, a land use survey and a building condition survey, building permits, tax assessor's records, etc.

B. Developed to provide support to planners and to develop data acquisition systems tied directly into existing governmental operations

C. Hardware and software provided by GE at their Missile and Space Division

D. Cost of implementation and development about $200,000 ($100,000 from HUD 701 funds)

E. System includes information on land use, building conditions, building inventory, social data, etc.

F. Updated through normal government operations.

All of the last six summaries, except that of Los Angeles' system, were made from case studies published by HUD in 1968. In September 1968 HUD established the Federal Urban Information Systems Inter-Agency Committee (USAC), which has representatives of nine Federal departments, bureaus, and offices. USAC's purpose is to institute research efforts to assist in the development of information systems. Its defined objectives are:

(1) Urban Information system and subsystem prototypes should undergo research, development, testing, evaluation, and documentation.

(2) The resultant prototypes should be available for transfer to other municipalities with only minor modification.

(3) Systems developed should contain a high degree of commonly defined, readily comparable elements of data.

(4) The research program adopted should provide a favorable cost/benefit trade-off for the urban information system research and development process.

In July, 1969 a Request for Proposals (RFP) was distributed by HUD to municipalities for research and development of a computer-based, comprehensive, integrated municipal information systems or subsystems. The primary objective was to create a capability for combining greatly increased human, material, and financial resources together with the latest level of technological development of computer-based information systems. An overriding concern was to develop standardized prototypes which will obviate expensive duplicate efforts by many cities. Solutions to problems of horizontal integration, economics, and sensitivity of information were to be sought.

Knowledge of this RFP was received too late for staff research into the status of the project.

## V. Recommendations of the Working Committee

Regarding an Urban Information System:

1. That the City initiate research and planning to achieve a regional Urban Information System.

2. That the first subsystem be a Housing Information System, and that the first efforts to accomplish this be limited to the city of Portland in scope.

3. That Vacancy Data needs of the Portland Development Commission and other dislocating agencies within the City be a prime priority in the Housing Information System.

4. That the eventual Urban Information System include two separate divisions:

   (1) a broad-based system for planning data (social, physical, and protective).

   (2) a day-to-day management operational system, including the discrete needs of city agencies.

Regarding further research:

5. That the City continue its research on Information Coordination and that it be done by people with information expertise.

6. That a Request for Proposals (RFP) be distributed for a data audit of operating agencies and representatives of the housing delivery system, social services, and information agencies.

7. That this data audit be jointly supported by the Housing Task Force (in the Planning Commission), the Portland Development Commission, Model Cities, and possibly other major suppliers/users of an Information System.

8. That the library of housing planning resources in the Portland City Planning Commission be augmented with new periodicals, new books, a catalog of local data which will be a product of the data audit, and a computer run of 1970 Census tapes on housing; and that this be started with some of the available 701 funds.

9. That in order to benefit from the lessons learned in other localities, research should continue on results from HUD's project on Municipal Information Systems.

Regarding a Data Users Consortium:

10. That a Data Users Consortium be formed to include Information Specialists from many of the potential suppliers/users of the system.

11. That this Consortium involve both public and private agencies or organizations in the housing delivery system, social services, and information agencies.

12. That this Consortium be involved throughout the research, planning and design phases to ensure maximum compatibility of design, maximum benefits to all users, and continued agency interest and support of the long-term goal.

Regarding supervision of the initial phase:

13. That the initial Housing subsystem development and implementation be under the supervision of the Housing Expediter's Office with a staff person assigned to Information Coordination.

14. That if the Bureau of Community Development becomes operational, the supervision of the Urban Information System be included in this bureau.

15. That eventually there be a Bureau or Office of Community Analysis to coordinate all data needs of the city and to cooperate with the agencies responsible for regional, state, and federal information systems of the future.

Regarding possible funding:

16. That possible funding sources for research and development are:

    1) 701 planning funds from HUD
    2) Agency funds budgeted for information
    3) City funds budgeted for information
    4) Portland Development Commission has considerable S-1 funds, which HUD has indicated may be used for developing Relocation Data.
    5) Highway funds can cover land use planning, transportation planning, and population projections and the data needed to support them.
    6) Department of Transportation's Urban Mass Transit (UMTA) funds.

17. That a data purchasing mechanism to help cover operational costs be designed and that it include:

    1) appropriate levels of reciprocal agreements with suppliers and users of the system for general and discrete levels of information.
    2) a suggested cost plan for levels of data needs not covered by ability to reciprocate.
    3) options possible to district and neighborhood planning organizations and others who may have varying abilities to pay, but who are legitimate users of public domain information.

The utilization of a coordinated and comprehensive information system is a prerequisite to rational planning and decision-making in the 1970's. Especially will this be important when Federal revenue sharing comes into being. The "block" grants will permit local determination of allocations, but these decisions will need a solid data foundation.

An interesting way of looking at the urban crisis today is to view the city as in a battle for survival and the urban information system as a major weapon system. We have to define the threats, determine requirements to meet them, inventory the present programs and evaluate them, and study alternative programs and evaluate their impact before putting new money into the attack strategy. Once the strategy is operating, then there must be continual monitoring and evaluation to find and strengthen the weak points.

The compelling argument for a total urban information system is that the complexities of urban life today call for a comprehensive, total approach to solutions. We must know how programs for one need will affect other problem areas before we put them into practice. Improved performance is vital-especially with deepening budget problems. The City of Portland, in coming to grips with increasing levels of urban problems, must look to a systems approach for more efficient use of resources and for greater ease in planning solutions to our problems.

AGENCY: INTERVIEWEE:

## Present Data Collected / Used

## Methods of Collection / Storage

## Users of Data

## Decisions Made on Data Base

## Projected Needs for Data

## Other Pertinent Comments

| AGENCIES | SOURCES of DATA: GENERAL: Census | Assessor | Surveys | In-House | SPECIFIC: | HOUSING: | Inventory | Conditions | Values | Permits | Codes | Violations | Vacancies | Demolitions | Fire Data | OTHERS: | Land Use, Zoning | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REGULATORY: | | | | | | | | | | | | | | | | | | |
| Bur. of Bldgs. | × | × + | | | | | × + | × | | × | × | × | | × | | | × | × |
| Fire Marshall | | × | | | | | ×* | × | | | × | × | | ? | × + | | | |
| C-C. Health | | × + | | | | | | × + | | | | × | o | ? | | | | |
| County Assessor | | | | | | | | | | | | | | | | | | |
| HUD | × | × | | × | | | | o | | × | | × | o | | | | × | × |
| HOUSING PRODUCTION: | | | | | | | | | | | | | | | | | | |
| HAP | × | | × | × + | | | × | × + | × + | × | × | × | o | | | | | |
| Builders | | | | | | | | | | | | | | | | | | |
| Real Estate | | | | | | | | | | | | | | | | | | |
| Finance | | | | | | | | | | | | | | | | | | |
| PLANNERS: | | | | | | | | | | | | | | | | | | |
| Physical: | | | | | | | | | | | | | | | | | | |
| City Planning | × + | | × | | | | × + | × + | × | | | | | | | | × | |
| County Planning | × | × | × | × | | | × + | × + | × + | × | × | × + | | × | × | | × | |
| PDC | × | × | × | × | | | × + | × + | × + | × + | × | × | × + | × + | × | | × | |
| Port of Portland | | | | | | | | | | | | | | | | | | |
| Highway Dept. | | | | | | | | | | | | | | | | | | |
| Social: | | | | | | | | | | | | | | | | | | |
| PMSC (OEO) | × | × + | | | | | × + | × + | × | | | × | × + | | | | × | |
| PACT " | × + | × + | | | | | × + | × + | ● | | | | ● | | | | × | |
| MCCAA " | × + | × | × | | | | × | × | × | | | | o | | | | | |
| Tri-County Comm. C. | × + | | × | | | | o | o | | | | | | | | | | |
| Comprehensive: | | | | | | | | | | | | | | | | | | |
| Model Cities | × | | × | × | | | | × | | | | | o | | | | × | |
| District Plg. Orgs. | × + | × + | × + | | | | × + | × + | × + | × + | × + | × | o | × + | × + | | × + | |
| CRAG | × | | × | ? | | | × | × | | × | | | × | × | | | × | |
| OTHERS: | | | | | | | | | | | | | | | | | | |
| Ptld. Pub. Schools | | | | | | | | | | | | | | | | | | |
| R.W. Polk Co. | | | | | | | | | | | | | | | | | | |
| PGE Research | | | | | | | | | | | | | | | | | | |
| Water Bureau | | | | | | | | | | | | | | | | | | |
| Ch. of Commerce | | | | | | | | | | | | | | | | | | |
| State Housing Div. | | | | | | | | | | | | | | | | | | |
| Portland State U. | | | | | | | | | | | | | | | | | | |
| Daily Journal of Comm. | | | | | | | | | | | | | | | | | | |
| Tribunet, Etc. | | | | | | | | | | | | | | | | | | |

Note: This audit was not done in gre
double-checking. The informati
the value of this audit was to
tion system, and to point out t
audit as the first step toward

* multi-family over 4 units

Per
Di

# A PROPOSAL FOR A REGIONAL INFORMATION SYSTEM

# A PROPOSAL
# FOR A
# REGIONAL INFORMATION
# SYSTEM

## Introduction

### A. Reason for Proposal

This proposal is submitted at the request of the Portland Area Housing Task Force. It calls for the establishment of a regional information system to assist local jurisdictions and state and federal agencies in meeting their informational needs for planning and development activities and for federal grant application and review.

### B. Overview of Proposal

This proposal calls for the development of a regional information system which, by mid-1973 and on an annual basis thereafter, will produce estimates of the number of households and housing units and the characteristics of each, by census tract for the urbanizing portion of the CRAG Planning Area. The proposal also calls for work during 1972-73 on the development of the following systems components, or information packages: 1) Site Selection Criteria (formulas; etc. for inter-intrajurisdictional housing subsidy allocations); 2) Subsidy Program monitoring; 3) Subsidy

Program Impacts and local costs; 4) Housing Needs; 5) Housing Conditions; and 6) Social Indicators for monitoring the well-being of CRAG area residents. The Social Indicators Package will include estimates of family income and numbers of families below the poverty level.

During subsequent years additional information packages will be added covering land-use, the environment, taxation, transportation, and the economy.

C. Outline of Proposal Sections

This proposal is divided into 5 sections. Section I discusses the "information problem." Section II covers the need for a centralized information center. Section III answers the question, "Why CRAG". Section IV describes the system in general and information packages specifically, and Section V details costs.

## Section I

## The Information Problem

### A. Multiplicity of Agencies

Within the CRAG Planning Area many federal and state agencies and various departments within local jurisdictions are involved in diverse activities which one way or another affect housing - and each other - and CRAG's planning effort.

Agencies involved in housing are shown in the table overleaf by housing activity and primary function.

As shown, housing activities are fairly fragmented among agencies and departments, many of which have as their primary function something other than housing. Fragmentation exists not only between levels of government but also between departments at the same level of government. Further, it exists not only with regards to agency activities, but also with regard to the information generated as a result of these activities and/or collected in support of them.

## B. Volumes of Data

### 1. General

Volumes of data are generated by operating agencies in the form of record-keeping related to units inspected, loans processed, etc. and volumes are collected to support special functions via wind-shield and household surveys. However, little that is available is currently useful in providing a proper base for informed judgment about what is happening in housing. That is, it is not now possible to derive an overview, local or regional, of the total impact of the many separate agency activities because the data produced cannot be organized into a meaningful whole.

### 2. Double-Counting and Overlap

Today each agency in the CRAG area collects and/or generates its own data to its own specifications. There is little com-

## AGENCIES INVOLVED IN HOUSING

| Agency | Activity Affecting Housing | Primary Function |
|---|---|---|
| A. State & Federal | | |
| Highways | Housing appraisal & removal, household relocation | Highway Construction |
| Health | Migrant Farm Housing | Health |
| Employ-ment | Equal Opportunity & job training (opening the construction field to minorities) | Employment |
| Welfare | Shelter Allowances | Welfare |
| HUD | Housing insurance, loans, appraisals, subsidy allocations, market analyses | Housing |
| Farmers Home | Same | Agricultural & Rural Area Problems |
| Veterans | Same | Veteran's Programs |
| B. Local | | |
| PIA | Housing appraisal & removal | Airport Expansion |
| Model Cities | Rehabilitation involving resident labor & minority contractors | Inner City Improve-ment Programs |
| Urban Renewal | Housing appraisal, rehabilitation, removal, & construction, housing relocation | Urban Renewal |
| Housing Authorities | Construction, leasing, and manage-ment of units. Preparation of needs estimate. | Housing |
| Building Departments | Building codes, permits & construction. | Public Safety |
| Fire Departments | Fire inspections. | Public Safety |
| Health Departments | Housing codes, unit inspections, wind-shield surveys. | Health |
| Assessors' Offices | Appraisals and inspections. | Taxation |
| Planning Departments | Residential development, density, zoning, subdivision control. | Land-use Planning |

munication between them. Thus, much of the information produced, while useful to the agency which gathers it, is (1) frequently unusable or inaccessible to others, or, (2) its availability and accessibility are unknown to others. It is not uncommon for two or more agencies to collect much the same data; it is not uncommon for them to do so at much the same time; and it is not uncommon for them to do so in much the same area. Some areas are repeatedly surveyed and others not at all. The result is duplication and double-counting. and omission

### 3. Proliferation of Surveys

For the most part, there are only two fundamental ways to obtain data: one is from surveys and the other is from agency files. Often there is no practical alternative to the direct survey. The survey method is usually highly advantageous in that the data is obtained in a predefined and therefore highly useful form. On the other hand, direct surveys are generally disadvantageous from a cost standpoint; often so costly that updating by such means can seldom be justified. Nevertheless, surveys are frequently used in the CRAG area, usually for updating purposes.

Household surveys just completed, in process, or scheduled to begin in the City of Portland include: Model Cities (an extraordinarily long questionnaire); residents along I-80N (a mail questionnaire under the auspices of the Highway Division); Northwest Portland (an indepth household survey by a civic group in conjunction with I-505); and the entire city (a short questionnaire by the R. W. Polk Co.).

Surveys have not only increased in number, but in the length and complexity of the questionnaire involved. This means that households are not only being asked to respond more frequently but to do so on an increasingly personal basis. Furthermore, as stated above some areas are surveyed repeatedly, and others not at all making it impossible to draw large area composites from the results. The Model Cities and Southeast areas in Portland are cases in point. Residents in these areas are not only surveyed by public agencies but by students and others as well. A fairly high proportion of residents in these areas are also subjected to fairly vigorous interviews by health and welfare workers, code enforcement inspectors and the like.

While surveys may be expeditious as far as agencies are concerned, they may be becoming burdensome to the public. Repeated surveys may consitute a public nuisance (form of harassment) or invasion of privacy.

## Section II

## The Need for a Centralized Information Function

A centralized information function is needed to:

1) Assess information needs and produce timely data to meet those needs.

2) Coordinate existing data-gathering activities and reduce the fragmentation, duplication, overlap, and double counting which characterize existing information.

3) Determine which of the data routinely collected by some agencies could, and should, be made routinely available to others.

4) Develop area-wide data at the census tract level on a continuing basis

   a) to minimize the number of special-purpose surveys;

   b) to fill in the holes between the areas constantly surveyed and those which are not;

   c) to provide an area-wide overview against which to juxtapose study findings covering small areas.

5) Update Geographic Base Files[1] on a continuing basis to provide information, as needed, for any geographic configuration (the I-80N corridor, for example, or a school district, etc.)

6) Develop uniform definitions and promulgate high quality standards with regard to data gathering and usage.

7) Instigate regular information flows between agencies and levels of government.

---

[1] A computer system for retrieving, tabulating and/or mapping data identified by street address.

8) Provide a common basis for informed judgment in the A-95, A-98 review process, not only as this affects subdivision review but as it affects the review of other applications which in one way or another affect housing, however obliquely.

9) Promote the use of multi-purpose multi-jurisdictional surveys, when surveys are indicated.

10) Perform a survey surveillance function if this becomes necessary.

A centralized information system would help provide answers to such basic questions as the following:

1. How many substandard units are there?

2. How many persons are likely to be affected by dislocation? How many, more than once?

3. How many households are in need of public or other subsidized housing?

4. How many families are living at or below the poverty level?

5. What are the social, economic, and physical characteristics of deteriorating neighborhoods?

6. Are those in need of housing assistance getting it? What groups are not being helped?

7. Do the upwardly mobile households benefit to a disproportionate extent from the new subsidy programs?

8. Where should subsidized housing be located to maximize its relevance in terms of need and still achieve racial and economic integration?

9. What are the characteristics of families whose FHA, Section 235 mortgages have been foreclosed? How many foreclosures have there been?

10. What are the fiscal implications of subsidized housing? Does low income housing pay its way, result in overburdened underfinanced schools, increased police and other public service costs, etc.?

Another reason for centralization--

> A review of computer outputs from all levels of government in the CRAG area generally shows the lack of coordination which develops when independent entities seek individual solutions to operational problems. State, county, and city computer systems already exist in significant number and others are being planned. The programs of individual entities are moving toward fixed positions on data processing applications.
>
> In the absence of a centralized means to achieve timely coordination, independent systems standards will develop which may limit future information sharing or require costly modification in data organization, machine language, etc., to facilitate it.

In summary, a centralized information system is needed to pull together information from diverse sources and to organize it in such a fashion as to shed light on the physical, human, financial,

and physical aspects of the housing problem. Only in this way will it be possible to weigh agency activities affecting housing against regional and local goals for human resource development and area liveability.

## Section III

### Why CRAG?

1) CRAG is structured and functioning to effect inter-governmental coordination and concensus. Currently, these relate to land-use, utilities, transportation and human resource planning. A centralized information system

   a) is a logical extension of these activities

   b) will facilitate coordination and concensus, and

   c) is dependent upon them.

2) CRAG can achieve inter-governmental agreement on some defined level of standardization as regards formats, languages, definitions and other aspects of data processing necessary to the efficient and timely functioning of any information system.

3) Because of its regional overview, information developed by CRAG is less likely to be held suspect--i.e. the potential for bias, etc. is significantly reduced.

4) There are aspects of systems development and management functions (i.e. updating the DIME file)[1] which may not relate to any particular agency or level of government but which must be performed if the total system is to be productive and viable.

5) CRAG can effect the inter-governmental agreements necessary to:

   a) Protect data confidentiality in using agency files.

   b) Guard against systems failure.

   c) Cope with agency zeal to protect autonomy.

   d) Promote the uniformity prerequisite to quality control.

   e) Maintain funding during the system's design and implementation phases.

   f) Insure inter-agency assistance in ironing out the problems which may develop.

6) CRAG is already involved in developing housing information. It currently produces small area data which is widely used by local, state, and federal agencies.

7) CRAG has special knowledgeability in the area of housing and other socio-economic information. This knowledgeability covers, among other things, information sources, formats, timing, availability, ease of access, uses, limitations, and comparability with census and other data. It covers both published and unpublished data held in various federal, state, and local agency files.

---

[1] Part of CRAG's Geographic Base File System. See paragraph 5, page 7.

8) CRAG has experience in handling information on a systems basis. Its map-model system, which is fully operational, has been used by staff in engineering and land-use studies and by the Forest Service in its inventory function.

## SECTION IV

## THE PROPOSED SYSTEM

### A. Basic Premises

CRAG's proposed information system rests on the following premises:

1. Systems of the component type are most economical to build because:

   a. Systems development can be phased over time.

   b. Components, or information packages, can be run separately or interfaced, as funds permit.

   c. Individual components may be removed from the system without requiring a restructuring of the system.

2. Component structuring permits the most in system flexibility.

3. Component systems are easier and relatively less expensive to update on an annual basis than others.

4. Components, at least initially, should be based on readily available data.

5. Concensus can be achieved in setting priorities for the components to be developed.

6. The first year's program reflects such concensus.

B. Basic Assumptions

The system's design, including the selection of initial information packages, or components, is based on the following assumptions:

1. Information packages developed should serve as wide a variety of users as possible.

2. Data should be at the census tract level and cover at least the urbanizing area.

3. The system should produce outputs, in published form, the first year.

4. There is a commonality between information needs for certain classes of data.

C. Major Information Packages

The following table delineates the information packages proposed, their general coverage, potential users, and the proposed schedule for their development.

## INFORMATION PACKAGES

| Title | Contents | Users | Initiate | Completed |
|---|---|---|---|---|
| **HOUSEHOLD INFORMATION PACKAGE** | Population estimates, 1971, for census tracts, CRAG Area.<br><br>Households, number and characteristics, 1972, for census tracts, urbanizing area:<br><br>Sex of household head<br>Employment Status<br>Occupation<br>Retired Household Heads<br>Renter/Owner<br>Unemployed female household heads<br>Other heads<br>Mobility, annual movers-in and movers-out<br><br>Population Estimates, 1972, by Census Tract, urbanizing area. | Planning Departments,<br>School Districts,<br>CAP and other OEO funded groups,<br>UGN funded agencies,<br>Councils on Aging<br>Health & Welfare Agencies,<br>Transportation Agencies (for networks surveillance)<br>Housing Authorities,<br>Urban Renewal Agencies,<br>Health Planning Council,<br>Hospitals | 1972 | 1973 |
| **HOUSING UNIT INFORMATION PACKAGE** | Housing inventory, 1972, for census tracts, CRAG Area:<br><br>Total units, by structure type<br>New units, by structure type<br>Units removed by structure type<br><br>Housing inventory characteristics, 1972, for census tracts, urbanizing area:<br><br>Occupied, by structure type, and by owner or renter<br>Vacant by structure type<br>Vacancy rate by structure type | KHA (Market Analyses)<br>Planning Depts.<br>Housing Authorities<br>Non-Profit Housing corporations<br><br>Housing producers<br>Public Works Depts.<br>Lending Institutions<br>Urban Renewal Agencies<br>Health Planning Councils | 1972 | 1973 |

Information Packages (continued)

| Title | Contents | Users | Initiate | Complete |
|---|---|---|---|---|
| **NEIGHBORHOOD BLIGHT INFORMATION PACKAGE** | Census Tracts with high Indexes of Residential Blight (CRAG 1972 study) in urbanizing area<br><br>Analyses will cover percent:<br>Unemployed household heads<br>Unemployed female household heads, children present<br>Retired household heads<br>Household heads in low paying occupations<br>Renters in single family houses<br>Housing units built prior to 1940<br>Household turnover (mobility) | Urban Renewal Agencies, Neighborhood Improvement groups,<br><br>CAPs and other OEO funded agencies<br>UGN funded agencies<br>Health and Welfare Agencies<br>Health Planning Council<br>Criminal Justice Planning | 1972 | 1973 |
| **VACANCY CHARACTERISTICS INFORMATION PACKAGE** | Vacancy characteristics by Census Tract, 1972, urbanizing Area:<br>Structure type<br>Rent or Sale<br># of Bedrooms<br>Price range<br>Plumbing<br>Repairs needed | HUD<br>FHA Market Analyses<br>Housing Sponsors<br>Housing Producers<br>Highway Division<br>Urban Renewal Agencies<br>Welfare Dept. | 1972 | 1973 |

Information Packages (cont'd)

| Title | Contents | Users | Initiate | Complete |
|---|---|---|---|---|
| **SITE SELECTION CRITERIA INFORMATION PACKAGE** | Formulas for allocating subsidized housing, (inter-jurisdictional and intra-jurisdictional) based on fair share; ability to absorb (the higher the income in an area, the more units); over-under utilized school plant; proximity to jobs, buses, schools, etc. | Housing Sponsors<br>Builders<br>Local Jurisdictions<br>HUD<br>Planning Depts.<br>Citizen Groups<br>League of Women Voters | 1972 | 1974 |
| **SUBSIDY PROGRAM:** **MONITORING PACKAGE** | Units under subsidy by subsidy program<br>Location<br>Foreclosures<br>Integration<br>Prices<br>Waiting lists | HUD<br>Housing Authorities<br>Farmers Home<br>Housing Sponsors<br>Welfare Agencies | 1973 | 1974-5 |
| **IMPACTS PACKAGE** | Costs, if any, associated with subsidized housing (schools, police, fire, health, special services, other) | Local jurisidictions. | 1973 | 1974-5 |
| **HOUSING NEEDS INFORMATION PACKAGE** | Estimates of housing need by household type, size, income, location, housing cost/income ratios, etc. | HUD<br>Housing Authorities<br>Housing Sponsors<br>Housing Producers<br>CAP & other OEO funded groups | 1973 | 1974-5 |

Information Packages (continued)

| Title | Contents | Users | Initiate | Complete |
|---|---|---|---|---|
| **HOUSING CONDITIONS INFORMATION PACKAGE** | Estimates of the number and location of substandard units. An update, (using Agency data) of CRAG's Residential Blight Index, which was based on the 1970 Census. Agency data will include inspection forms, assessors' records, etc. | Urban Renewal Housing Sponsors | 1973 | 1974-5 |
| **SOCIAL INDICATORS INFORMATION PACKAGE** | Potential indicators may include:<br><br>Health<br>Infant mortality<br>Cycle cell anemia<br>V.D.<br><br>Welfare<br>ADC, old age assistance, emergency help<br><br>Crime -<br>Incidence of,<br>Juvenile delinquency<br><br>Education<br>School drop-outs<br><br>Income<br>Families below the poverty level | Health & Welfare Agencies<br>UGN funded Agencies<br>Human Resource Commissions<br>School Districts<br>Criminal Justice Planning Agencies<br>Health Planning Council<br>Housing Agencies | 1973 | 1974-5, etc. |

D. Other Information Packages

1. Assessor's Information Package

Value and location of improvements (where the rehabilitation dollars are going and what kind of increases in assessment result); tax assessment rates together with maps showing overlapping districts (water, sewer, fire, school and other special districts).

2. Transportation Information Package

Tabulations and maps showing traffic flows (congestion), accidents, and automobile ownership (location and number of households with one, two or more, or no cars); TRI-MET ridership from various stations at various times; etc.

3. Environmental Information Package

Maps covering water quality, land slide and seismic activity areas, flood plains, air pollution, precipitation, vector control, etc.

4, Updated Land-use Information Package

Maps and tabular summaries covering the whole CRAG area for one point in time, by broad land uses, with emphasis on vacant land

5. Place of Work, By Place of Residence, Information

Maps showing where residents live and where they travel to work.

E. Why Household and Housing Information Packages Are Given High Priority.

1. The Household Information Package is given high priority in this proposal because it is:

   a. needed for all types of housing planning and most social planning.

   b. widely used by land-use, mass transit, and public facilities planners.

   c. needed now for urban renewal planning[1].

2. The Housing Inventory Characteristics Package is given high priority because it is:

   a. needed to evaluate housing markets and construction trends.

   b. necessary for the continual monitoring of 1) the consumption of land for residential purposes and 2) urban sprawl.

   c. essential to assessing the potential of the existing stock to absorb households displaced by public action (a current issue of some significance)

   d. prerequisite to the annual surveillance of transportation networks.

   e. needed to provide an early warning signal on 1) potential overbuilding, or 2) neighborhood deterioration.

---

[1] Not just for the Portland Development Commission, but also for the Beaverton and Vancouver Urban Renewal Agencies.

## Section V

## The Proposal

### A. Introduction

#### 1. Utilization of R. W. Polk Data

Most of this proposal centers around the utilization of data gathered annually by the R. W. Polk Company. The data is gathered in the spring of each year on a door-to-door personal interview basis with telephone call-backs to reach persons not at home. It covers approximately 250,000 interviews (or households) in the Portland-Vancouver urbanizing area (147,000 of them in the City of Portland). This represents slightly more than 70% of the households in the CRAG Planning Area.[1]

#### 2. Information covered by R. W. Polk Surveys

The following information is collected for all households interviewed and all housing units canvassed in the Polk surveys

a. Households - number by:
   1. Size
      a. adults
      b. number of children
   2. Sex of household head
   3. Employment status, household head
      a. employed
      b. unemployed
      c. retired

[1] There are approximately 350,000 households in the CRAG Planning Area.

4. Occupation and place of work, household head

5. Renters or owners

b. Housing Units - number by:

1. Address
2. Structure Type
   a. single family
   b. multi-family

3. Occupied, by structure type

   a. owner
   b. renter

4. Vacant, by structure type

The Polk surveys do not cover personal type information on age, income, race, rent paid or value of occupied unit.

### 3. Value of the Polk Data

The primary value of the Polk data lies in:

a. Its sample size (250,000 households)

b. Its annual output.

c. Its detailed information by census tract

d. Its potential for additional informational coverage--i.e. such as number of bedrooms in housing units (or other non-personal questions of the type referred to above).

Other factors include:

a) Polk is the only source of detailed data on households occupying apartments (household size, including number of children). The Census publishes detail on renters and owners only. (Renters need not live in apartments. They may rent single family units.) Information on apartment occupants is needed by planners and others in assessing the impact of apartment complexes on local school districts, analyzing the market for additional multi-family units (subsidized and unsubsidized), etc.

b) Polk is the only source of current data on occupation, retired household heads, and unemployed female heads. These data (together with Census and wage and salary data) can be used as surrogates in determining estimates of family income and number of families below the poverty level (based on low-paying occupations, household size, and sex of head).

c) Polk is the only current source of data on place-of-work. This data can be used in transportation planning, and, in the case of the City of Portland, provide part of the information needed to evaluate the impact of the discussed payroll tax on city residents (as opposed to commuters).

d) Polk is the only current source of information on households mobility (movers-in and movers-out of neighborhoods).

e) Polk is the only complete source of data covering vacant units by address and structure type. Utility and telephone company "disconnect" data are both incomplete.

f) Polk is the only source of current data covering households, housing units, and business establishment characteristics[1] by address. This means that the Polk data may be printed out, by any characteristic for any geographic configuration. For example, using its Geographic Base File System to access the Polk material, CRAG could prinout and map the following kinds of special information:

1. Number and location of occupied and vacant housing units, number and location of business establishments, and vacant business space in and/or along alternative highway corridors.

2. Number and location of unemployed female heads of households, children present, in a hospital service area.

3. Number of households with household heads in low-paying occupations and number with retired household heads, in specific urban renewal areas.

4. Number of children in a school attendance area.

5. Number of businesses and houses along a freeway.

---

[1] The business establishment data tells whether the space is commercial or industrial and whether it is occupied or not.

## 4. Reliability of Polk Surveys

Polk directories are widely used in the business world. And, Polk printouts on household and housing unit characteristics are used by a wide variety of government agencies. The Census Bureau relied heavily on Polk in preparing its address lists for the 1970 census. Its reliability for census use, however, varied between areas. For this reason, CRAG will run checks on the Polk data to check its reliability. This will be accomplished by checking Polk's 1970 data against 1970 census information. Its data for 1972 will be checked against CRAG's building permit data.

## 5. Costs

Polk printouts for 1972 covering all the data items cited[1] (except place of work, address, and telephone information) are available for this area for $24,000. The 1972 printouts also cover 1971.

Polk printouts for previous years are available for this area for $19,200 (20% less than current issues). This $19,200 would buy the 1970 issue (needed for the reliability check against the 1970 Census) and would include complete data for 1969, as well.

After 1972, printouts are expected to be made available at no charge to local areas--i.e. the costs are expected to be underwritten by a consortium of federal agencies.

Polk computer tapes covering all the current year's data given in the printouts, plus those excluded items referred to above, are available for $6,200.

---

[1] In paragraph A-2, page 20.

B. CRAG's First Year Work Program, by Work Element

1. Preliminary Design ---------- $5,000

a. Coverage

The preliminary system design will establish long- and short-term objectives, identify future users and their needs, evaluate data sources in terms of availability and costs, and establish preliminary priorities for future work programs. In addition, it will explore computer availability, costs, accessibility, flexibility, compatibility with source agency computer based files, etc.

b. Costs

| | |
|---|---|
| Development costs - 3 man months | $4,200 |
| Printing costs | 100 |
| Meetings to assess design - 1/2 man month | 700 |
| Total Cost | $5,000 |

c. Completion Schedule

Development of the preliminary design will commence on August 1 and be completed by November 1, 1972.

2. Systems Development Groundwork----------$38,400

a. Polk - 1970 Census Comparison---------$23,400

1. Description

This work element calls for a comparison of

1970 Polk data with 1970 Census data. It is necessary to provide a basis for assessing the coverage and reliability of the Polk data.

Particular emphasis will be placed on comparisons involving household numbers, sizes, sex of household head, and occupation, and on housing unit numbers and vacancy status. The 1969-1970 Polk data and the 1970 census comparison will be made available to local jurisdictions, as described under Work Elements 3 and 5.

2. Costs

| | |
|---|---|
| Acquisition of 1970 Polk Printout (includes 1969 data) | $19,200 |
| Analyses of Polk coverage: | |
| Data assembly and routine calculations 3 man months | 1,200 |
| Analyses 3 man months | 3,000 |
| Total | $23,400 |

3. Time Frame

Work will begin on this work element August 1 and will be completed by November 1.

b. Work on Geographic Based Information System---------- $15,000

1. Description

This work element calls for maintenance and

updating of CRAG's Geographic Base File for address coding and computer mapping and for assuring its compatibility with the Polk address format and geographic coverage.

2. Costs Total

a. Updating & maintenance-------$12,000

Field work, mapping, adding new street names - 1 man year..$11,000

Machine time..... 1,000

b. Checking compatibility with Polk - 3 man months---------- 3,000

Total $15,000

3. Time Frame

Work would be initiated about November 1, 1972 and be completed by July 31, 1973.

3. Household Information----------$16,000

a. Description

This work element calls for reformatting, duplicating and distributing the household data from the Polk printouts for 1970 and 1972. Reformatting is required to combine into one publication the 4 Polk years involved (1969-1970 and 1971-1972) and the 1970 Census comparisons developed in conjunction with the Polk reliability check described under Work Element 2-a above. All Polk household characteristics already cited will be included.

b. Costs

| | |
|---|---|
| 1/2 Cost of obtaining Polk Printout[1] | $12,000 |
| 1/2 Reformatting cost - 3 man month | 1,400 |
| 1/2 cost of writeup of 1970 comparison (1-1½ man months)[1] | 1,000 |
| 1/2 Printing costs[1] | 1,000 |
| 1/2 Staff time in getting material printed[1] and distributed, ½ man month | 200 |
| Total | $16,000 |

c. Time Frame

Output from this work element could be made available by March 1, 1973. The 1972 Polk Directory will be out in September.

4. Neighborhood Blight Analysis----------$8,000

a. Description

This work element covers the development of Profiles of Blighted Areas. It will be based on the use of the Polk material, 1969-1972 and CRAG's Index of Residential Blight. Census material will also be used. The Profiles will focus on bad housing (as determined by the Index) and the social factors which lead to or may be factors in blight. Specifically, the Profiles will cover tracts with the following characteristics: high Index of Residential Blight, 1970; high vacancy rates; high proportion of renters in single-family units; high proportion of households with children present and

---

[1] The other half of the cost is subsumed under Work Element 5, Housing Inventory Information.

female heads either unemployed or employed in low-paying jobs; high household mobility rates; and high proportion of households with retired heads.

Each tract in the urbanizing area will be examined for the presence of these characteristics for the years 1969-72. Blight profiles will be drawn up for those tracts with two or more characteristics in two or more years. The output will be in report form, with maps.

b. Costs

| | |
|---|---|
| Data gathering and computations | |
| 4 man months | 2,000 |
| Analyses and tract selection | |
| 2 man months | 1,600 |
| Preparation of Profiles | |
| 4 man months | 3,000 |
| Mapping, 1 man month | 400 |
| Publication | 1,000 |
| Total | $8,000 |

b. Time Frame

This work element will be completed by July, 1973.

5. Housing Inventory Information----------$16,000

a. Description

This work element is identical to Work Element 3 (covering households) except that the output will cover housing units for the 4 Polk years and the 1970 census comparisons will be based on housing units counts and characteristics.

b. Costs

These are the same as for Work Element 3.

c. Time Frame

Same as for Work Element 3.

6. Vacancy Characteristics----------$20,300

a. Description

This work element calls for the development of detailed data on vacancies. This detail will cover availability for rent or sale, number of bedrooms, price, presence of plumbing, and condition.

The data will be published in tabular form by address[1] and by aggregation at the census tract level.

---

[1] This is needed for locating specific units, for checking results of the survey, and for comparison with the multiple-listing data used by the Highway Division.

The 1972 Polk tape is required for this Work Element. It has the required information on addresses of vacant units and phone numbers of occupants in adjacent units. The latter will be called to furnish information on the vacant unit and/or on the owner, who in turn will be called.

The questions to be asked, in likely order, will cover: 1) availability for rent or sale; 2) unit size (number of bedrooms); 3) sale or rental price; 4) owner's willingness to have unit inspected or owner's appraisal of whether or not the unit needs repair, can pass code inspections, etc.

The last question is expected to yield information on housing condition (standard or substandard). Field checks to ascertain the degree of subjectivity in responses to this question will be used.

b. Costs

| | |
|---|---|
| Acquisition of Polk tape | $6,200 |
| Program to retrieve[1] address of vacant units and telephone number of occupied adjacent ones 3 man-months | 4,200 |
| Computer time | 500 |
| Telephone survey 1 man year | 4,800 |
| Field checks 3 man months | 1,200 |

[1] This is a one time cost. Programs developed this year can be utilized annually thereafter (unless tape formats change).