MANAGEMENT INFORMATION SYSTEMS FOR MICROENTERPRISE DEVELOPMENT PROGRAMS

Tools for Microenterprise Programs: Nonfinancial Assistance Section

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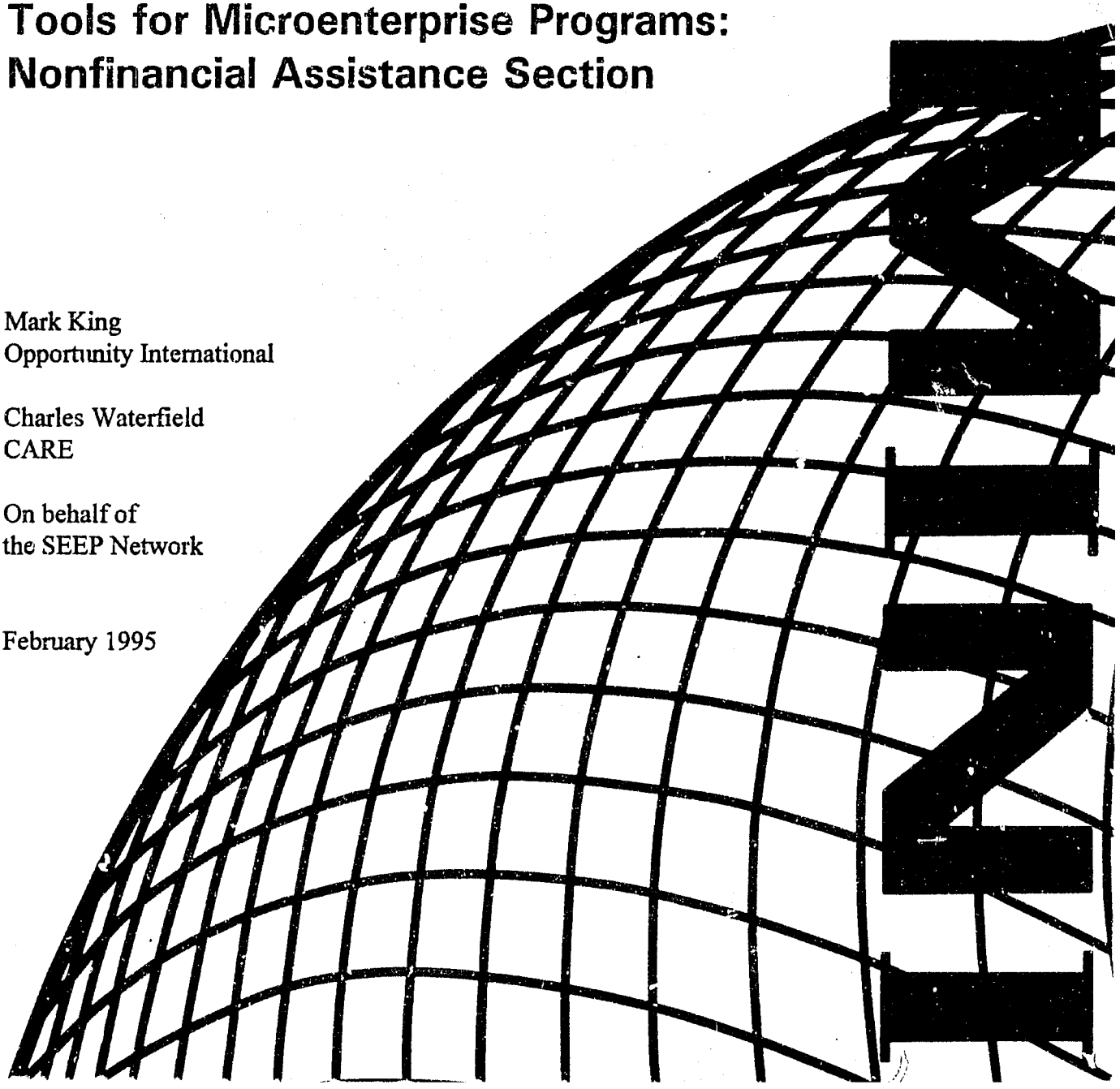

PREFACE

The goal of this technical note is to provide the user with a process for creating or refining an information system for a microenterprise development project. It does *not* seek to prescribe the perfect system. Each organization and project has its own peculiarities and needs. Projects and systems come forth from the goals, personalities, prejudices, and work styles of the people who operate them. This reference guide seeks to help organizations work through the system process.

This guide draws on a variety of information found in management information system literature and the microenterprise community. In many ways, it merges the two and presents nothing new. But just remember, computers are not perfect, and programmers never return phone calls!

Special thanks go to Elaine Edgcomb, who kept our feet to the fire, and to Mike Ukropiana, who provided valuable research and an excellent sounding board.

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SECTION ONE: BACKGROUND

THE BASICS

Getting the Big Picture: Introduction to Information Systems

"Management information systems? Our computer people handle that."

"There's so much going on around here that nobody knows what anybody else is doing."

"I get all these numbers every month, but I have no idea what they actually mean."

"If only I'd known that six months ago."

Information. Too much? Not enough? The wrong kind? Such problems plague almost all organizations, whether they are vast or tiny, wealthy, or making it on a shoestring. In response, people have become increasingly reliant on complex information systems.

What exactly is a management information system (MIS)? Many definitions exist, but for the purpose of this guide the term will describe the series of processes and actions involved in capturing raw data, processing the data into usable information, and disseminating the data to users in the form needed. This involves more than computers calculating figures. It is first and foremost people communicating with one another about events that affect the work of the organization.

An MIS is first and foremost people communicating with one another about events that affect the work of the organization.

Why are MISs important to microenterprise development agencies? Can you imagine running a printing press without knowing how much paper and ink you had, or if the gears were well oiled, or if customers were paying for their orders? That is what running a lending program is like without good information systems. Credit operations require tracking just like any business process. Budgets and cash flows must be projected to ensure adequate resources. Delinquency risk must be monitored to protect the productive asset (money) from wear and tear. Approval processes must be observed to gauge productivity and customer service. Repayments must be recorded to determine whether customers are paying

for their purchases. Defaulting loan recipients simply do not introduce themselves as such to loan officers, and unproductive staff rarely announce their laziness at weekly staff meetings.

If an organization makes a long-term commitment to serving its target beneficiaries, it must monitor its financial and program health through quality information systems. Similarly, when resources are limited but needs are immense, wise stewardship requires quality information systems. In microenterprise development, success and failure, risk and opportunity can be seen only through the careful collection, processing, distribution, and analysis of information.

Focusing on Needs: Defining Information Subsystems

To make it more understandable, the mass of information flowing through an organization can be divided into four subsystems:

- Strategic
- Management
- Operational
- External

Internal groups use information differently and thus require different types and forms of information.

The first three subsystems correspond to internal groups of information users (see Figure 1). Each subsystem uses information differently and thus requires (or tolerates) different types and forms of information. Strategic users consist of the board of directors and a chief executive officer (CEO). They require information that answers the question: "Is our organization accomplishing its ultimate vision?" Management users include the CEO, chief financial officer, and senior department heads. Their role as managers is to ensure that resources are allocated and controlled in a way that accomplishes the organization's short- and long-range goals. Operational users are the people responsible for the everyday activities of the organization. They must disburse loans, collect payments, pay bills, carry out training programs, and the like. They require immediate information to carry out their responsibilities and make short-term decisions.

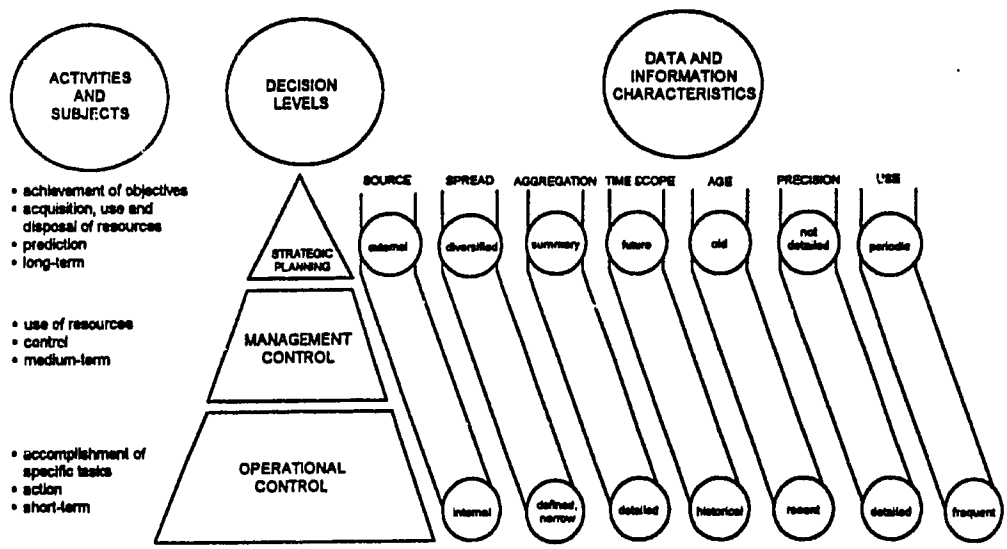
The fourth information subsystem incorporates the organization's need to communicate with people and firms outside the organization. For a nongovernmental organization (NGO) this may include foundations, governments, beneficiaries, international organizations, and other NGOs.

Some external information users will use only one of the other three subsystems (for example, banks process transactions [involving the operational subsystem] and do not concern themselves with strategic impact). Others may desire information that is a hybrid of the three systems (for instance, an external foundation may require assessment of community impact [strategic subsystem] as well as a delinquency report [management subsystem]).

Breaking down an organization into functional units more sharply defines needs and goals. To serve these needs and goals, each subsystem requires information with different characteristics, as Figure 1 shows. Despite these differences, all subsystems are constructed in the same way: they must collect, process, store, and distribute information.

FIGURE 1

ANTHONY'S FRAMEWORK AND THE BASIC CHARACTERISTICS OF THE ORGANIZATIONAL PYRAMID



ORGANIZATIONAL TRIANGLE (ANTHONY'S FRAMEWORK)

Taken from Managing Information Systems: Concepts and Tools by Rolland Hurtubise. Kumarian Press, 1984.

Focusing on Process: Components of a System

Although a subsystem represents a specific way of thinking about the very different needs and uses of information within an organization, all subsystems include similar components. All use or entail raw data, filtering and collection devices, processing, and distribution and storage.

Raw Data. Random individual actions, external events, carefully considered decisions, and even the simple passage of time constitute raw data that an organization must process.

Filtering and Collection Devices. First, data must be filtered to remove the unimportant. Desired data must then be collected in an accurate and timely way. If collection is handled poorly, all subsequent components become pointless. Thus the saying, "garbage in...garbage out."

Processing. Once the relevant data have been collected, the system must process and/or manipulate that data into the desired form. Processing tasks range from transferring a segment of unaltered data to the appropriate report to performing complex mathematical manipulation and analysis.

Distribution and Storage. Processed information is then distributed to the appropriate user and stored. Some information remains unchanged in storage forever, some requires updating, and some is discarded immediately.

The system filters and interprets the data and sends the data to other parties as desired or needed.

Figure 2 shows the parallels between the natural information system of the human brain and the information systems that organizations need. Like the brain's system of taking in and processing information, an organization's information system detects and channels data through the system. The system filters and interprets the data and sends the data to other parties as desired or needed.

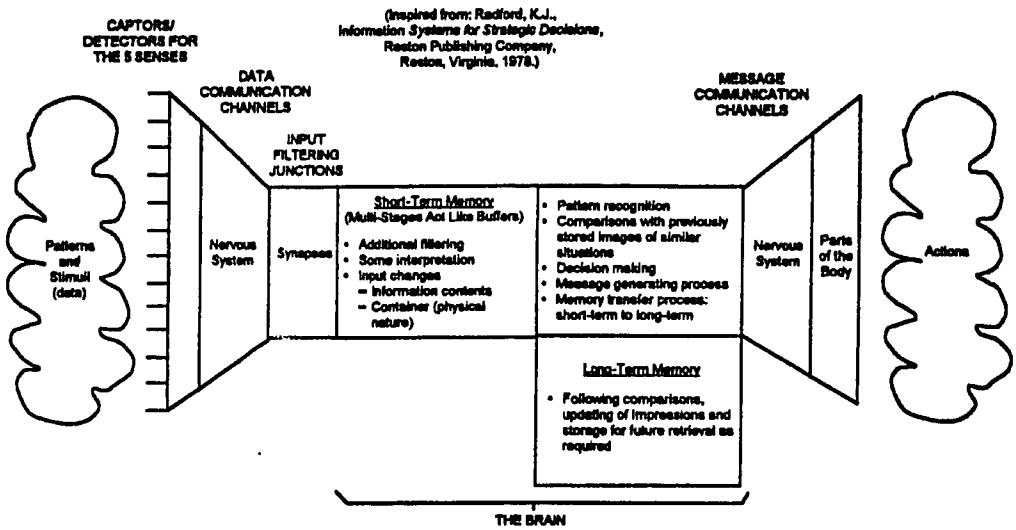
THE PROCESS

Getting Started

This document provides guidelines for undertaking the process of creating or refining an MIS, as well as guidance related to the needs of microenterprise development organizations. Before embarking on this

FIGURE 2

THE HUMAN INFORMATION SYSTEM



Taken from Hurtubise, op. cit., pg. 35

process, an individual manager and/or project team must keep two things in mind: be flexible and be realistic.

Be Flexible. For an organization to seize new opportunities and be responsive to change, its information systems must be flexible and adaptive. Because it is critical to bring conclusion to system development and avoid the quicksand of never-ending revisions, organizations should view systems as foundations that can be built on as new needs arise. If the job is done well, the systems will meet the evolving needs of existing users and adapt to meet the needs of new users.

To avoid the quicksand of never-ending revisions, organizations should view systems as foundations that can be built on as new needs arise.

Be Realistic. System design or review usually occurs during the formation of an organization or when an information crisis arises. In an ideal world, systems would be created in a logical, sequential way. In the real world, deadlines, budgets, and personalities dictate how the process

takes place. The level of effort in and timing of each stage will vary. Despite this variance, the organization *must* be aware that these stages exist and that they must be addressed; if not, problems will occur.

Dividing the Process into Stages

Even the smallest organizations face a gigantic task when creating or refining an MIS. This task comprises five critical stages:

- Definition
- Research
- Design
- Development
- Integration

These stages apply to creating an entirely new system or fine-tuning an existing program's system. The tools and methods they entail can be used independently or together.

The goal is a system that meets everyone's needs.

Stage 1: Definition. The people involved in the process must agree on the purpose of creating or refining an MIS. Because different users have different needs, perceptions about the goal of the process also vary. Some participants view information as a means of power and control; others see it as a nuisance; many see only specific issues related to the information based on their particular needs. At a minimum, people must be aware that the goal is a system that meets everyone's needs. At best, people will achieve maximum productivity because the system they helped create suits the task at hand.

Stage 2: Research. People often overlook the most crucial step in the process of creating or refining an MIS, but it is actually the simplest step: ask people what information they need. Go to staff, board members, beneficiaries, donors, business associates, and other information users and ask if they are receiving useful information from the organization. Many of the tools presented in this guide will help direct this research into a useful form for making systems decisions.

Stage 3: Design. After researching the organization's needs, someone must link the needs with the required data to be collected, the processing needed, and the distribution format and timing desired. This requires consolidating the needs of everyone into standard procedures, definitions, and reports. At the end of this phase, the organization should understand what information is gathered, how it is processed, and when and in what form it is distributed.

Stage 4: Development. Once the logical framework for the system has been completed, the task of developing the system's actual components begins. Various staff must create forms, organize schedules, write computer programs, purchase and install hardware, reorganize filing systems, and so on. The annex to this guide provides some sample forms to use in organizing an information system.

Stage 5: Integration. All of this research, design, and development must result in new work behavior. For some people, only minimal change occurs; for others, radical restructuring takes place. Such change inevitably causes friction. Clear definition of tasks and responsibilities, staff training, and evaluation of system quality help smooth this process. Managing change is an art, not a science, but a few guiding principles for successful integration will be presented as a conclusion to this reference guide.

SECTION TWO: THE PROCESS

STAGE 1: DEFINITION

Definition Stage Goals

The process of designing, creating, and maintaining an MIS is not easy. It requires considerable work and often involves many people who have conflicting goals and desires. For the process to be successful, the goals for the system and the process for creating or refining the system must be established. Otherwise, the organization risks developing a flawed system that no one can use, or a good system that no one is willing to use. The goal of the definition stage, then, is to think through and plan the who, what, when, and why of the system creation process.

Definition Stage Action Steps and Tools

Management must take responsibility for defining the development process, not the system itself.

Management must take responsibility for defining the development process, not the system itself. The process will define the system given the organization's needs for and uses of information. The four steps below are consolidated in Form 1, "Information System Definition Sheet" (see the annex). The form is designed to define the system development process.

Step 1: Establish a Goal. The organization must remind itself of its vision, goals, and purpose. Information systems are tools for accomplishing a vision. If the organization uses improper tools, progress toward its goal slows and may even stop.

Step 2: Allocate Resources. Management staff must allocate financial and human resources to create the system. These should be clearly allocated earlier rather than later in the process. Financial resources often dictate the scope and complexity of the system, but the investment of staff time determines its quality. Priorities must be clearly communicated to all involved from the very initial stages.

Step 3: Set Deadlines. No one likes deadlines, but without them the process becomes endless. Management staff must determine interim and final completion target dates. These must remain flexible so that quality is not compromised for speed.

Step 4: Define Subsystems. Moving from policy level definition to actual development of the information system requires getting a more detailed picture of the way the organization uses information. Mapping the organization's information subsystems, as described in Section One, helps accomplish this task. The firm's organizational chart can be converted into a subsystem map by placing each cluster of users into one of the three categories mentioned in Section One: strategic, management, and operational. (External users require their own subsystem.)

As groups are put into the subsystems, their needs will become clearer. For example, the Executive Director, Senior Loan Officer, and Senior Trainer may belong in the management subsystem, but each will require certain operational information. Loan officers, clerks, and trainers need operational information, but, as part of performance evaluation, they may use strategic information.

All of these defining steps help to concentrate the organization's focus on the system creation process and how it will work. The next phase involves researching the very specific information requirements of each part of the organization.

STAGE 2: RESEARCH

Research Stage Goals

Researching information needs means asking people what pieces of information they use to accomplish their responsibilities.

Research brings to mind images of white-coated scientists in sterile laboratories, and long hours in the library digging for obscure facts. Researching information needs means asking people what pieces of information they use to accomplish their responsibilities. This may involve discussing with the board of directors what they see as critical indicators of success, checking with staff about the usefulness of existing reports, reading the reporting requirements of institutional donors, or responding to auditors' recommendations.

At the end of this phase, an organization should have a clear understanding of who uses what information to fulfill what responsibilities and when they use it. To that end, three steps must be taken: map the existing information users; identify and prioritize the needs of those users; and overlay needs, timing, and volume onto the subsystem user map.

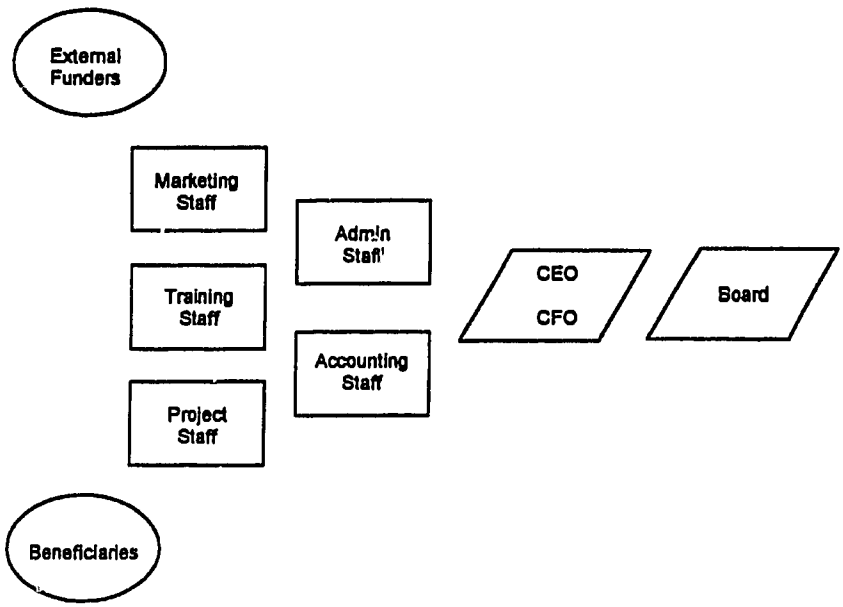
Research Stage Action Steps and Tools

Step 1: Map Existing Users. As mentioned previously, the vast volume of information in an organization can be broken down into several subsystems. The most intuitive way to segment these subsystems is to map the major clusters of information users.

Figure 3 illustrates how an information map of a health clinic and its information-using components might look. In some cases, different departments will provide the basis for logical divisions. In others, it may be more appropriate to divide users into groups based on the people they work with (such as funding sources, beneficiaries, and government officials) or the decision-making and task responsibilities people have (such as loan approval, auditing, and training).

FIGURE 3

TYPICAL MICROENTERPRISE DEVELOPMENT AGENCY INFORMATION MAP



In mapping the organization, avoid having too few or too many components. Information uses must be consolidated since no system can meet each individual's desires. If systems become too general, however, the information lacks relevance to any particular group. Six to 12 is an appropriate range for the number of user clusters.

In mapping, six to 12 is an appropriate range for the number of user clusters.

Clusters of users are linked by multiple pieces of information. To be useful, information is gathered into printed reports, meeting agendas, or other groupings. Not all information needs to be paper based. A manager may want certain key indicators reported verbally in a weekly staff

meeting. Regardless of the form — printed, computer based, meeting agenda — for simplicity, this guide will use the term "reports" to refer to groupings of information that link users. The next step in the research process involves finding out what reports or individual pieces of information people use.

Step 2: Identify and Prioritize User Needs. Once the organization has been divided into clusters, the specific needs of each user group must be identified. This involves collection and consolidation of information. Collection may involve conducting interviews or surveys, or accessing secondary sources (such as reporting requirements or evaluations). The tabular entry below (excerpted from Annex Form 2) provides a sample of a user information needs form. It may be used as a survey or a record of information gathered through interviews.

Part A of the form lists the specific information items currently used by each person. Each item is listed with desired changes in the item, the present format of the item, and the frequency with which it is received. The user may desire substantial changes (such as consolidating the report to half its size), or simple alterations (format changes). A project officer might make the following entry:

Currently Use	Desired Changes	Format	Frequency
Arrears report	I would like to have the names listed in alphabetical order for easier use, rather than by loan account number	Computer printout	Weekly

Below this is a section for people to list items they do not currently receive, but would like to have:

Additional Information Desired	Format	Frequency
A list of projects by geographic region so I can plan my travel more effectively	Computer printout	Monthly

Part B of the form lists the information each person supplies for someone else in the organization. This information provides a way to double-check people's perceptions about their sources of information.

Beneficiaries play such a critical role as information producers and users that one form, Form 3, "Client Information Needs Sheet" (see the annex), addresses them specifically. Data are gathered and given to beneficiaries at three stages: before loan approval, during repayment, and after final payment. Form 3 should be used to list the information required from beneficiaries at each stage. Such a listing helps avoid the problem of burdening the client with extensive forms or neglecting a critical piece of information. Table 1 shows an example of what Form 3 could include.

Although the lending process has a great deal of information to manage, it can easily be divided into before, during, and after segments. Certain information is needed before approval. Different information becomes relevant during the repayment period; after repayment new information becomes important. Other aspects of microenterprise development, such as training and group organizing, cannot be so easily broken down. Organizations that engage in activities other than lending must carefully identify what information flows to and from participants and when it flows.

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TABLE 1

SAMPLE CLIENT INFORMATION NEEDS SHEET

What information is requested of the client (forms or specific items)?

During application process:

1	Family size
2	Number of employees
3	Current income

During follow-up visits:

11	Number of employees
12	Condition of housing
13	Sales of business, etc.

At the end of the loan:

21	Number of employees
22	Sales of business
23	Check against original projections

STAGE 3: DESIGN

Design Stage Goals

Once needs have been researched and documented, the system must be designed on paper. Laying out the details of the system on paper, before any computer programming, ensures consistency and cohesiveness. The forms provided in this guide should help an organization move from broad needs to consolidated requirements, report designs, line-item definitions, and input requirements..

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The design process can be thought of as zooming in closer and closer to the details of the map drawn in the research phase. The system designer must look closely at each part of the map. By magnifying the clusters of users on the map, the designer finds detailed lists of information needs. Zooming in on the links between users (reports) gives the designer the groupings needed. Then the designer must look at the reports and find what line items belong in each report and how each line item is defined. The input requirements needed to calculate the line items are the smallest detail on the map.

Design Stage Action Steps and Tools

Step 1: Consolidate and Prioritize User Needs. The research phase should generate a large list of existing and desired information uses. These needs must be filtered. Form 4, "Information Needs Consolidation and Prioritization Sheet" (see the annex), categorizes the needs as essential, useful, and luxury, and provides space for listing information in these three categories.

Essential. Certain indicators of program activity and impact, and financial condition *must* be collected by any microenterprise program. In addition, organizations will have their own needs. Some will be operational and managerial that are specific to the style and structure of the organization; others will be strategic and relate to the organization's unique vision and goals. In addition, funding sources almost always have required reporting.

Useful. A large amount of information falls into the useful category. Such information helps people within the organization do their jobs more effectively, but the existence of the organization does

not depend on the availability of that information. The distinction between essential and useful lies in the nature and importance of the decisions and actions that the particular piece of information is used for.

Luxury. Some information appears to be very interesting, but carries little importance. Organizations can always create long lists of information. The desire for additional information, however, often can lead to mountains of paper. Priorities must be established that prevent the system from being a burden rather than a help.

Form 4 allows the user to list each item of information needed along with how frequently it is needed and the report in which the item will appear. (The report column will be used to doublecheck completeness during the next step.) Table 2 shows a sample of some of the entries in Form 4.

TABLE 2

SAMPLE NEEDS PRIORITIZATION SHEET

Information Needs Consolidation and Prioritization Sheet

From the data on the user input forms, categorized each input into one of three categories:

Essential: Outputs that must be included in the system (e.g., loan repayments)

Useful: Outputs that are very helpful, but non-essential, and will be included if not costly or cumbersome (e.g., family size of loan recipients)

Luxury: Outputs that while interesting are not included unless very low cost (e.g., purchasing behavior of loan recipients)

A - Essential Information Outputs			
#	Output Name	Report	Frequency
1			
2			
3			

Useful: Outputs that are very helpful, but non-essential, and will be included if not costly or cumbersome (e.g., family size of loan recipients)

B - Useful Information Outputs			
#	Output Name	Report	Frequency
1			
2			
3			

Luxury: Outputs that while interesting are not included unless very low cost (e.g., purchasing behavior of loan recipients)

C. Luxury Information Outputs			
#	Output Name	Report	Frequency
1			
2			
3			

Step 2: Design the Report. The next step involves taking the prioritized needs and placing them into report form. Reports have a variety of formats; this step entails designing the content of the report to ensure completeness. The selection of a printed report versus a meeting agenda requires the organization to determine the most effective mode for transmitting the report's contents. While printed reports are common, some organizations may find verbal briefings more useful. This is especially true when dialogue about the contents is critical.

Form 5, "Report Design Sheet" (see the annex), includes space for the report number and title (Table 3 shows one part of Form 5). In addition, it includes lines on which to note the frequency of the report's issuance, who will be responsible for preparing it, and who the primary and secondary users will be.

TABLE 3

SAMPLE REPORT DESIGN SHEET

Report Demo.Sheet

Report #_____

Suggested Name

Frequency Daily Weekly Monthly Quarterly Annually

Prepared by:

Primary Users

Secondary Users

Items caused on report

1		16	
2		17	
3		18	
4		10	
5		20	

The most critical component of Form 5 is the list of items included on the report. These items come from the consolidation and prioritization sheet, Form 4. Anytime an item is included on a report, it should be noted on Form 4. This acts as a double check to ensure completeness. Although items may appear on more than one report if they are used for different functions, repetition should be minimized.

Step 3: Define the Report Items. Once a report has been designed, the items on the report must be defined. For narrative or text-based reports, this involves establishing guidelines for staff who will write the reports. Clear definitions ensure that all staff report on the same facts in the same way.

Statistical report items should be defined by their formula (see Table 4). This is critical when developing computer-based programs. Formulas should be clearly defined so that readers understand how the report's numbers are generated and what they mean.

TABLE 4

SAMPLE REPORT ITEM DEFINITION

Item # _____

Name _____

Reports this information appears on:

_____ _____ _____

_____ _____ _____

_____ _____ _____

Definition, description or formula for this information:

_____

_____

_____

Form 6, "Information Definitions and Formulas," provides an outline for defining the line items listed on Form 5 (see Table 3 and the annex). Each item receives a name and number and is cross-referenced to the specific reports in which the item appears. While this part of the process focuses on somewhat mundane details, the definitions and formulas nevertheless should be clearly defined and agreed upon; otherwise, confusion will permanently hinder the system. Fixing a system involves far more work than creating it properly the first time.

From the definitions and formulas included on Form 6 will come a list of inputs needed to calculate and generate the specific items noted on Form 5. The next step is to itemize how these inputs will be collected.

Step 4: Determine Input Requirements. The final step in the design stage is to determine what data must be collected and how and when it will be collected. This step establishes the link between the desired reports and the collection activities the staff undertakes to compile the reports.

Each input should be listed with who (or what) generates the data, who collects/captures that data using what form or procedure, and how frequently the data are collected. Finally, the inputs are linked to the items in which they are used. Form 7 provides a useful outline for this procedure. Part of Form 7 appears in Table 5; the annex includes a full copy of the form.

TABLE 5

SAMPLE DATA INPUT LIST

Data Input List

Input	Raw Data			Reports Used In
	Generated By	Captured By	Frequency	

One of the most important decisions in designing an MIS is deciding how much information your program can afford to monitor and process. The decision will influence your software and hardware considerations, how many computers you will need, whether you need a computer network, and how many staff members will be required for keeping your MIS up-to-date. You must first estimate the expected scale of your program and then determine the volume of information that you will be processing. Take the following into consideration:

- Number of clients who have participated in the program
- Number of active clients
- Amount of baseline data to be collected for each client
- Number of loans disbursed per year
- Frequency of loan repayment data
- Other socioeconomic information that will be collected

These factors influence the size of the three main information files used in a typical MIS: the client information file, the loan baseline data file, and the loan repayment register. Table 6 shows how file size is influenced by scale of program and choice of credit procedures. Generally, with larger file sizes, faster computer systems are required.

TABLE 6

IMPACT OF PROGRAM SCALE AND METHODOLOGY ON VOLUME OF INFORMATION

Information File	Frequency of Information	New Records per Year per 1,000 Clients	
		Program with 12-month loan term and monthly payments	Program with 4-month loan term and weekly individual payments
Client information (name, ID number, etc.)	One record per client who has participated	1,000	1,000
Loan baseline information (loan size and conditions, socioeconomic data on the client tracked for impact)	One record per loan disbursed	1,500	4,000
Loan repayment register (loan disbursements, repayments, scheduled repayments, and delinquency information)	One record per loan disbursed	15,000	55,000

The example above illustrates the difference between repetitive data and one-time data. Lending programs have a great deal of repetitive data generated by loan repayments. Other programs, such as health or education, may have attendance information that becomes voluminous. Organizations must project data generated on a one-time basis and then on a continuing basis. The projection above illustrates how dramatically the volume of information can grow. Good designs must project volume, to ensure adequate collection, processing, and dissemination capacity.

Design Cautions

Establishing input requirements and procedures concludes the design stage. With the lists of needs, reports, definitions, and data needs described in this section, the organization can develop the computer- and paper-based systems it needs to implement its MIS design. Before this is done, however, two cautions must be mentioned.

A valuable technique for eliminating add-on reports is to demonstrate how the primary reports will provide the same information.

First, while the prioritization of needs should be based on their contribution to the accomplishment of the organization's mission, often personal desires will dominate. For example, accounting staff may insist on multiple indicators that act as procedural checks, or executive directors may have key statistics that only they want to observe. The unfortunate reality is that such luxury indicators may be classified as essential if the person requesting them has sufficient authority. These should be incorporated as well as possible without making the entire system overly burdensome. A valuable technique for eliminating such add-on reports or indicators is to demonstrate how the primary reports will provide the same information, albeit in a somewhat different format. Organization-wide participation should minimize such add-ons, but most often some will have to be included.

Second, the system often will incorporate specific personnel productivity indicators, such as number of project visits and amount of loan processing time, as well as organization-wide indicators. System designers must be careful to build in safeguards that will prevent personnel productivity information from being distributed more broadly than necessary. Each organization should establish policies that provide managers with needed information, but that prevent personnel information from becoming office gossip.

STAGE 4: DEVELOPMENT

Development Stage Goals

Development of the information system includes the creation (or purchase) of specific equipment, forms, procedures, and so forth that will translate the design into reality. This may include finding better adding machines, printing new forms, or purchasing filing cabinets. It may include buying or creating computer programs to collect, process, and distribute information.

This guide focuses on the computerization aspect of system development. Organizations need little guidance in the purchase of filing cabinets, but a vast array of issues arises related to computerization. Often this aspect overshadows the rest of the process because it is complex and time-consuming. If the preceding stages have been followed, the development of computer systems should go smoothly.

Key Development Decision

The costs and benefits of computers must be weighed against the costs and benefits of a manual-based system.

Organizations must first make a decision as to whether or not to computerize at all. This decision, like most, involves striking a balance between costs and benefits. The costs and benefits of computers must be weighed against the costs and benefits of a manual-based system. Cost structures for computers and labor vary from country to country. In some situations, large development programs operate with manual systems. In other contexts, even the smallest NGO needs to computerize. The table below will aid in this decision. It requires that the organization establish the level of benefit that is required from its information system and then compares the cost of a manual system with the cost of a computerized system.

In the case of information systems, benefits come in the form of accurate, timely, and relevant information. First, an organization must define what level of accuracy, timeliness, and relevance are required. For example, are weekly reports sufficient or do reports need to be daily? Must reports be available in multiple formats for different users or will one format be used by all? Expectations related to accuracy, timeliness, and relevance must be determined in order to project the cost of meeting those expectations.

Once expectations have been established, the costs of a manual system versus a computerized system can be determined. Table 7 provides a format for this. In the first column, the organization must list major expectations. These may be very specific or general. Then in column two, the organization must project the cost of people and equipment needed to meet these expectations with a manual system. In column three, the costs associated with computer-based system should be listed. This table will provide insight into the trade-off between extra staff and a computer system. Ultimately, the key factor to be determined is what level of staff productivity can be achieved at what cost, and is that sufficient. If it is not, the organization must make the move to computerization.

TABLE 7

COST COMPARISON FORM

Benefits Required	Manual System	Computerized System
Level of accuracy needed:	Staff cost: Number of staff Salary and benefit cost	Staff cost: Number of staff Salary and benefit cost
		Computer cost: Hardware cost Computers Printers Networking hardware Power supplies Software cost
	Office space cost:	Office space cost:
	Furniture and fixture cost:	
	Other equipment cost:	Other equipment cost:
	TOTAL COST:	TOTAL COST:

Development Stage Action Steps and Tools

Computerization has of three critical ingredients: software, hardware, and a programmer. Each requires that a number of issues be addressed. First, software must be chosen that best meets the needs of the organization. This is a choice between hiring a programmer to create a new program or purchasing an existing program off-the-shelf. Second, hardware must be purchased that can run the chosen software and allow for system expansion. Third, a programmer (and possibly hardware experts) must be engaged to create the new program or revise an existing one.

Software Considerations

Spreadsheets. A small microenterprise agency that needs only basic information and that possesses a small budget and limited computer expertise can often meet its needs by developing a computer spreadsheet or series of spreadsheets using standard programs such as Lotus 1-2-3, Quattro Pro, or Excel. A computer spreadsheet can be structured like a "flat" database system and can be manipulated with many of the basic database tools (for example, numerical or alphabetical sorts). Quite sophisticated spreadsheets can be developed by writing macros, the spreadsheet equivalent of a programming language, as well as by linking different worksheets. Spreadsheets are limited, however, in their ability to verify the accuracy and completeness of data entered, as well as in their ability to consolidate data in a number of different report formats. For small agencies meeting the conditions stated above, spreadsheets should be considered as perhaps the most appropriate option available.

For small agencies, spreadsheets should be considered as perhaps the most appropriate option available.

Database Systems. Database systems are the most common form of computerized management information systems. Database systems predate modern desktop computers, but their popularity and widespread use have increased.

The most common database systems today are built around the Dbase III standard established in the mid-1980s. Many companies offer Dbase-compatible systems, sometimes called Xbase systems (for example, Dbase IV, FoxPro, Clipper, Alpha Four, and PC-File). Xbase systems have two advantages:

First, they use a nearly standardized programming language that many programmers understand. This broadens the pool for hiring multiple programmers to work on system development. It also increases future

chances of being able to request outside assistance for fixing or modifying programs.

Second, they use a standardized data storage format (files that end in the *.DBF extension). This standardized format provides accessibility to the data from many other programs, not only the database program for which the system was developed. In this way, data can be analyzed and modified directly from many standard spreadsheet programs. This means that the organization is not dependent on the programmer to analyze data. For example, in the case of an annual evaluation, staff can review the data for information not included in the standard report formats, such as "the number of loans under $300 received by women." Another advantage of the standardized *.DBF format is the existence of additional utility programs that can provide assistance, such as fixing a damaged database file. A limitation of the *.DBF format is that data are not compressed when stored, allowing files to take up very large amounts of disk space. This can be overcome, however, by using a background data compression package, such as the one included in DOS 6.

Some Xbase systems, such as Alpha Four and PC-File, allow the development of simple database applications without any knowledge of programming languages. These should be considered for small agencies as an intermediate option between spreadsheets and programmed database applications.

Few off-the-shelf options are available for microcredit agencies because off-the-shelf systems normally cannot meet the precise needs of a particular firm.

Custom-Designed versus Off-the-Shelf Applications. In purchasing database software, an organization can choose either a custom-designed system or a more general off-the-shelf application. An off-the-shelf application is one that has been fully developed and extensively tested and is currently in use in a large number of businesses. The advantages of off-the-shelf systems include this added degree of reliability, short development time, and typically much lower cost (because the developer has been able to recoup development costs by selling multiple copies of the program). Unfortunately, few off-the-shelf options are available for microcredit agencies because off-the-shelf systems normally cannot meet the precise needs of a particular firm. Methodologies, rules, and regulations vary among credit agencies, necessitating extensive — and expensive — changes and adaptations in MIS software. If an organization is willing and able to limit its informational needs, the possibility of working with an existing MIS application is greatly enhanced.

Linking an MIS to a Computerized Accounting Program. The *ideal* computer system integrates loan portfolio data with a full accounting

system. This requires that both modules — the portfolio data and the accounting data — be purchased from or designed by the same individual. Because accounting rules are much more standardized than credit program methodologies, however, the chances are much greater of finding a suitable off-the-shelf accounting program. Purchasing such a system normally saves the expense of developing a customized accounting package.

Pursuing the option of independent modules means that procedures must be developed and implemented for manually transferring summary information between the two modules and verifying account balances. This is not normally difficult, entailing little more, for example, than printing a daily summary statement of payments received from the loan portfolio MIS, preparing a voucher detailing this activity, and entering that voucher into the accounting system. Outstanding balances from the two systems can be periodically calculated and compared to ensure that the information has been entered accurately.

Hardware Recommendations

Deciding what computer software or hardware to buy difficult because the primary consideration is often money. Buying the best and fastest system you can afford has been validated by firms that have had to spend thousands of dollars to update an obsolete system that was originally chosen to save a few hundred dollars. The following recommendations are intended to offer ***minimum*** suggestions, useful, for example, if you currently have a computer you hope is adequate for running your new MIS. If your budget allows you to purchase a system above and beyond these minimum requirements, you will be happy you did so.

Buying the best and fastest system you can afford has been validated by firms that have had to spend thousands of dollars to update an obsolete system that was originally chosen to save a few hundred dollars.

Microprocessor. The microprocessor is the primary, but not the only, determinant of the operating speed of a system. If purchasing a new system, you should buy one with at least a 386DX, which is faster than a 386SX, but not as fast as the 486 microprocessor. Clock speed should be at least 25 Mhz.

RAM. The RAM memory of a system can be used by many programs to increase the processing speed of your spreadsheet or database. Up to 4 megabytes of RAM will normally result in noticeable improvements in system speed; after that, improvements will be negligible.

Hard Disk. The hard disk is typically the first element to present problems for your MIS, as it rapidly fills up with programs and data. If your budget allows, you should buy at least a 100-megabyte disk with a fast access time (under 19 milliseconds).

Monitor. Database programs almost never use graphical modes. Text is typically presented in the standard 25-row by 80-column display. Thus, any type of monitor is adequate, but a 14-inch monitor using a VGA graphics adaptor provides good support if other programs (such as word processors) will be run on the same computer. Color monitors usually cost an additional $200 and provide no essential functions to a database system.

Printer. Database systems are famous for their need to print out lengthy reports on 15-inch-wide paper. Therefore, a fast, wide-body, 24-pin dot-matrix printer is essential. The speed of the printer should be at least 300 cpi. A 24-pin printer (as opposed to an 8- or 9-pin printer) enables the user to produce good, letter-quality documents and reports. The printer should be IBM- and Epson-compatible to allow the software to send standardized printer controls. The printer should have good paper-handling capabilities and allow for easy change of paper size. If the printer will be used in a crowded office, printer noise should be a consideration as well. Many printers now feature special low-noise operation. Laser printers are more expensive and normally do not work effectively with database programs.

A UPS is essential to protect data; database systems are extremely susceptible to severe damage when power is lost during data entry or processing.

Power Supply Backups (Uninterruptible Power Supply, or UPS). In most developing countries, a UPS is essential to protect data integrity. Database systems are extremely susceptible to severe damage when power is lost during data entry or processing.

Notebook Computers. With their rapidly increasing capabilities and decreasing prices, notebook (portable) computers are a particularly appropriate choice for many developing countries. Their ability to run for hours on an internal battery frees the user from depending on the local supply of electricity. In addition, the units are sealed, protecting them from humidity and dust problems. Because an MIS generally requires substantial numerical data entry, an external keypad (which hooks into the notebook via a cable) should also be purchased.

Table 8 summarizes the minimum general hardware required for an MIS suitable for microenterprise applications. Remember that these are bare minimums. As computers rapidly advance and prices drop, you should seriously consider purchasing the best computer you can afford.

TABLE 8

BARE MINIMUM GENERAL HARDWARE CONSIDERATIONS

Component	Small Program (under 300 borrowers)	Medium Program (300-1,000 borrowers)	Large Program (more than 1,000 borrowers)
Microprocessor	286,20 MHz	386SX, 20 MHz	386DX, 33 MHz
RAM	1 megabyte	2 megabytes	4 megabytes
Hard Disk	20 megabytes	40 megabytes	80 megabytes

Related to the issue of the volume of information to be processed is the determination of whether a single-user system provides adequate computer time for data input, referral, analysis, and report generating, or whether a computer network is required. Networks are considerably more expensive and complex to operate than single-user systems, particularly in developing countries, where they can introduce an additional set of problems that may keep a system from functioning properly. Because of these dangers, the decision to use a network should be a decision of last resort, taken only when the agency's projected scale of activity leaves no recourse. With proper design, a single-user system can handle as many as 5,000 clients. Recommendations for extending the life of an existing single-user system include the following:

- Incorporating means of entering new data on various computers and transferring the data onto the main database by means of diskettes and a merge option on the program's main menu.

- Reserving one computer for data entry and copying data files periodically to other computers for general referral purposes, such as checking the loan status of a client.

- Scheduling computer time for various required activities during the week. Use can also be made of lunch and evening hours when necessary.

Networks are often considered necessary when cashiers need access to loan data to calculate repayments, interest, and penalties. An alternative, however, is to produce a weekly loan status printout for use by

the cashiers. A useful format is one line per active loan, with five columns (one for each day of the week) indicating how much interest and penalty would be required were the client to pay on that given day.

Agencies with multiple offices often run into complications when computerizing their portfolio. Some may choose to centralize information on one computer. Alternatively, each office can process its own information on its own computer, and files can periodically be merged into one master file. Although it is technologically possible to link computers in various offices through a telephone connection, most developing countries do not have reliable phone systems with phone lines of high enough quality to make this an appropriate option. Therefore, this level of complexity should normally be avoided.

Programmer Selection

Many of the bad experiences organizations have had in working with computer programmers can be avoided simply by following the design procedure outlined in Stage 3, Design. In other words, most misunderstandings result from inadequate communication of the expectations of what the MIS can do. Several other key recommendations can help avoid serious problems in choosing a programmer.

- Be aware that no program ever runs perfectly. Even the most widely distributed programs in the world continue to have problems. This is because of the nature and complexity of computer programming.

No correction or modification can ever be made to an MIS without having the source code; therefore, if you do not have that source code, the original programmer is the only person who can make corrections or modifications.

- Realize that you will be very dependent on the original programmer long after the program is installed. The reason for this is that most programmers do not normally sell clients the program's source code; they provide their clients only with a running copy of the program, called a compiled version. No correction or modification can ever be made to an MIS without having the source code; therefore, if you do not have that source code, the original programmer is the only person who can make corrections or modifications. Simply typing a period instead of a comma in the source code can bring the entire computer system to a standstill. Programs comprise many independent sections of code,

each of which runs only under specific conditions. A section of code that contains an error may be run only very rarely, bringing what seems to be a well-functioning system to a halt.

- Understand that the reason programmers protect their source code is because it represents their livelihood; other programmers could modify and sell the program, saving themselves hundreds or even thousands of hours of work were they to have access to their competitors' codes. However, sometimes a client can obtain rights to the source code. When purchased through an outside consultant, this normally results in a higher price and comes with contractual requirements that the client not distribute the source code to others. Because of the sometimes weak nature of contractual agreements and copyrights in developing countries, few programmers are willing to agree to this arrangement. A more likely means of obtaining the source code is to hire the programmer on staff. This is an economically viable option only for larger agencies whose computer needs may otherwise justify having a technical staff person available.

- Understand that even having access to the source code does not guarantee that other programmers will be able to correct or modify an MIS. The reason for this is that programs are composed of thousands of lines of programming code. The only person who really understands the programming logic is the person who actually spent hundreds of hours writing that code. Many times, even the original programmer may be unsure of how the more complicated sections of code work. If a poor programmer was originally contracted, sometimes the MIS will never work correctly and will have to be scrapped and replaced with a completely new system.

- In selecting a programmer or a company, always check with several previous clients. Are they satisfied with the software packages they purchased? Was the program developed on schedule? Does the programmer respond quickly to emergency calls?

Having your MIS built around the already functioning core of an existing MIS program greatly increases your probability of purchasing a well-functioning system.

- Whenever possible, purchase an MIS that is already in use in other institutions. You may request certain modifications and additions, but having your MIS built around the already functioning core of an existing MIS program greatly increases your probability of purchasing a well-functioning system. When purchasing a system already in use, be sure to spend adequate time reviewing the way the program works, as well as checking with other institutions about their level of satisfaction with the program.

- When determining the price of the system, be sure to discuss what future costs will be beyond the original purchase price. Future additions, modifications, and even corrections of errors in the original program are normally billed to the client at high hourly rates, significantly increasing the total cost of the software.

- Do not take everything a programmer says at face value. Computers are complicated, and the vocabulary surrounding them is intimidating to most. Also, there are no set answers for any given problem. Thus, advice a programmer gives is often influenced by his or her preferences rather than your actual needs. He or she may have a bias for a particular programming language or may recommend a networked system — resulting in a higher sales price for the programmer — when a single-user system may be adequate. Try to get several opinions, and if possible try to get expert advice from a disinterested party, one not involved in the actual bid for your MIS system.

Time and Expense Considerations

The most frequently asked questions about the development of a computer system are, "How much will it cost?" and "How long will it take?" In many ways these are the same question. The cost of a programmer is a function of how long the process takes. Several factors come into play: the size and complexity of the agency, the designation of the system for a network or a single user, the ability of the programmer, the number of revisions made mid-stream, and so on.

Broad guidelines for the amount of time required for the process are given in Table 9 for agencies of various sizes. **Note:** These are only broad guidelines; individual experience will vary greatly.

TABLE 9

GENERAL GUIDELINES FOR TIME REQUIRED TO ESTABLISH AN MIS SYSTEM

Size of Agency	Small Agency (Under 300 borrowers) Spreadsheet based	Medium Agency (300-1,000 borrowers) Database/ Single User	Large Agency (over 1,000 borrowers) Database/ Multi-user
Number of Months	1 month	2-3 months	2-4 months

One of the most significant variables in this process is the amount of historical data entered into the system. Many agencies develop wonderful systems in a reasonably short time, only to spend months (or even years) re-entering pre-system data. Three options exist for dealing with this potential roadblock:

- **Ignore historical data.** Some agencies choose to ignore history and simply begin tracking data from the time the system is installed. The downside of ignoring historical data is the potential loss of any historical comparisons.

- **Use limited historical data.** Some agencies enter data for a prior year or two rather than the entire agency's history.

- **Convert the data via computer.** If at all possible, the previous system's data should be converted to the database format of the new system. However, doing so requires considerable effort on the part of the programmer and can cause translation errors or compromises that hamper the new system.

STAGE 5: INTEGRATION

Integration Stage Goals

Integration never ends; it is a ceaseless process of ensuring that people and systems complement each other.

No system operates by itself. Information processing is essentially a human activity carried out by the staff of an organization. Data must be gathered, entered, interpreted, and used by people. Even if research, design, and development go perfectly, the system will fail if it is not integrated into the daily work habits of the people using it.

Integration never ends; it is a ceaseless process of ensuring that people and systems complement, rather than aggravate, each other. Many problems arise in this process. However, organizations can avoid many of them by giving attention to three areas: quality checks, employee job descriptions and responsibilities, and employee training.

Integration Stage Action Steps and Tools

Quality Checks. System-quality definitions vary depending on whom you ask to define quality. Regardless of the precise definition, two fundamental quality issues must be evaluated: efficiency and effectiveness.

Computer programs do only what they are programmed to do, and mistakes do *occur. Random testing of the system's accuracy ensures that numbers actually mean what they are supposed to mean.*

Efficiency measures the internal consistency and cohesiveness of the system. In other words, it tells you if the system adds two plus two and gets four every time. Computer programs do only what they are programmed to do, and mistakes *do* occur. Random testing of the system's accuracy ensures that numbers actually mean what they are supposed to mean. Organizations can audit their systems by manually checking a variety of accounts on a regular basis until calculation mistakes have been eliminated. Annual audits should then confirm system accuracy.

Effectiveness concerns the usefulness of the information. Highly effective systems provide information that increases the staff's ability to achieve the work of the organization. If unneeded information clogs the system or essential information is missing, effectiveness declines. Staff and system effectiveness must be gauged by results. At the organizational level, program monitoring and evaluation should indicate how effective the program is. At the individual staff level, supervisors must determine how an individual is performing and whether the system helps or hinders performance.

During the research, design, and development stages, the individual or team in charge of creating the system must check preliminary decisions with those most affected. Accounting system designs should be double-checked with accounting staff; program systems with program staff; senior management systems with managers. Time constraints often eliminate this simple and seemingly obvious step, but such quality checks save time.

Job Descriptions and Responsibilities. Nothing causes an employee greater frustration than not knowing what he or she should be doing. When new systems are installed, tasks and responsibilities usually change. Those responsible for integration must clearly communicate who is responsible for what and how they will be evaluated for that task. This includes rewriting job descriptions, goals, and work plans.

Employee Training. In almost any discussion of how to improve a development program, staff training arises as the most critical issue. With information systems, the mandate to train staff is renewed. In reality, systems are people and people are systems. Organizations must provide staff with training in three skill areas: familiarity with new policies and procedures, basic computer skills, and the skills needed by each person to work with the new system.

With information systems, the mandate to train staff is renewed; systems are people and people are systems.

Policies and procedures. New systems involve new ways of doing old tasks. Staff have input into the design of the systems and, subsequently, the policies and procedures for using and maintaining those systems. However, senior management must communicate all the implications of the changes to staff at every level, even to those employees who do not directly interact with the new system. Even the smallest organizations face transitional problems stemming from staff reluctance to change. Only open communication about expectations and clear direction for action can move organizations forward.

Basic computer skills. For firms installing computer systems, the expense of software and hardware may not be justified simply for an accounting or portfolio management system. Therefore, to increase the productivity gained from the investment, staff should be trained in word processing and the use of spreadsheets. This greatly enhances computer usage and overall staff productivity.

System-specific skills. During system design and development, a number of forms and reports are created to gather and distribute information. Staff members must receive an orientation to these documents. Definitions must be clarified, the timing of information specified, and guidance given on proper use. Each user group will require different training to suit its unique needs.

A variety of training methods can be used for information system users. In general, any training program should accomplish three basic tasks: provide a general overview of the system so that users understand their role in the big picture; train users in the specific skills needed to carry out their role; and refer users to resources for ongoing assistance with the system. Such resources may include additional mentoring or reference guides with specific directions.

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ANNEX

Form 1

Information System Definition Sheet

What is the vision for your program?

How does your current information system help or prevent you from achieving that vision?

What financial resources are available for creating the system?

Who will have responsibility for creating the system?

When does the system need to be in place?

Mapping The Big Picture: Defining the needed subsystems

Subsystem	STRATEGIC	MANAGEMENT	OPERATIONS
Subsystem Users			

User Information Needs Sheet

Form 2

Name _____ Title _____

Dept. _____

A - INFORMATION USE:

What information do you use in your position?

Currently Use	Desired Changes	Format	Frequency

Additional Information Desired	Format	Frequency

Additional comments regarding the information you need to do your job:

User Information Needs Sheet (Con't) Form 2

B - INFORMATION OUTPUT:

What information do you provide to other people?

Currently Provided Information	Desired Changes	Format	Frequency

Additional comments regarding the information you provide to other people:

Client Information Needs Sheet

Form 3

What information is requested of the client (forms or specific items)?

During application process:

1
2
3
4
5
6
7
8
9
10

During follow-up visits:

11
12
13
14
15
16
17
18
19
20

At the end of the loan:

21
22
23
24
25
26
27
28
29
30

Form 4

Information Needs Consolidation and Prioritization Sheet

From the data on the user input forms, categorized each input into one of three categories:

Essential: Outputs that must be included in the system (e.g., loan repayments)

Useful: Outputs that are very helpful, but non-essential, and will be included if not costly or cumbersome (e.g., family size of loan recipients)

Luxury: Outputs that while interesting are not included unless very low cost (e.g., purchasing behavior of loan recipients)

A - Essential Information Outputs			
#	Output Name	Report	Frequency
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Sheet #___

Form 4 (Continued)

Useful: Outputs that are very helpful, but non-essential, and will be included if not costly or cumbersome (e.g., family size of loan recipients)

B - Useful Information Outputs			
#	Output Name	Report	Frequency
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			

Form 4 (Continued)

Luxury: Outputs that while interesting are not included unless very low cost (e.g., purchasing behavior of loan recipients)

C. Luxury Information Outputs			
#	Output Name	Report	Frequency
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			
61			
62			
63			
64			
65			
67			
68			
69			
70			
71			
72			
73			
74			
75			

Form 5

Report Demo Sheet

Report #_____

Suggested Name

Frequency Daily Weekly Monthly Quarterly Annually

Prepared by:

Primary Users

Secondary Users

Items caused on report

1		16	
2		17	
3		18	
4		19	
5		20	
6		21	
7		22	
8		23	
9		24	
10		25	
11		26	
12		27	
13		28	
14		29	
15		30	

Sheet #

Information Definitions and Formulas

Form 6

Item # _____
Name _____

Reports this information appears on:

_____ _____ _____
_____ _____ _____
_____ _____ _____

Definition, description or formula for this information:

_____
_____
_____

Item # _____
Name _____

Reports this information appears on:

_____ _____ _____
_____ _____ _____
_____ _____ _____

Definition, description or formula for this information:

_____
_____
_____

Item # _____
Name _____

Reports this information appears on:

_____ _____ _____
_____ _____ _____
_____ _____ _____

Definition, description or formula for this information:

_____
_____
_____

Data Input List

Input	Raw Data			Reports used in
	Generated By	Captured By	Frequency	

Sheet #____

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