

Information systems maintenance

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Abstract

Experience has shown that the everyday use of information systems creates reasons for systems changes and improvements (systems maintenance). The paper refers to the systems development phases, to systems maintainability and to maintenance in general, to systems sections maintenance, and systems operation. It defines the presuppositions for successful systems maintenance, and proposes the steps to be followed for its implementation.

1 Introduction

The project for the development of one System should be divided in clearly defined phases.

These phases are valid for the development of every information system and are the following:

- Systems Analysis.
 - Study the existing system.
 - Requirements Definition (RD) of the new system.
- Systems Design.
 - External.
 - Internal.
- Programs Development.
- Systems Test.

“The outputs of each phase will be produced by the performance of tasks such as following:

- fact finding
- system selection
- data analysis
- system analysis
- scenario design

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- project planning”.

There are also two “desirable” presuppositions that should be met before the system development starts:

- The Systems Selection (the selection of the systems which must be developed).
- The Systems Planning (the planning of the systems that will be developed from the selected ones. Systems Planning is the process of formulating a systematic approach for dealing with a problem. It is not a detailed master plan, as is a systems design. Rather, it is a general framework which will direct the design of a system”.)

As these two presuppositions are concerned, it should be noted that many successful information systems have been developed without them but, also that many others’ failure is due to their “absence”.

Finally, the development phases of an Information System (Fig.1) are followed by two phases, -the first one is self-explanatory-:

- Systems Installation, and the second, is usually wrongly omitted:
- Systems Evaluation.

Following the development of these phases, the Systems Operation phase comes.

The Systems Operation will probably create (mainly it creates) the need for improvements and changes starting thus, the Systems Maintenance.

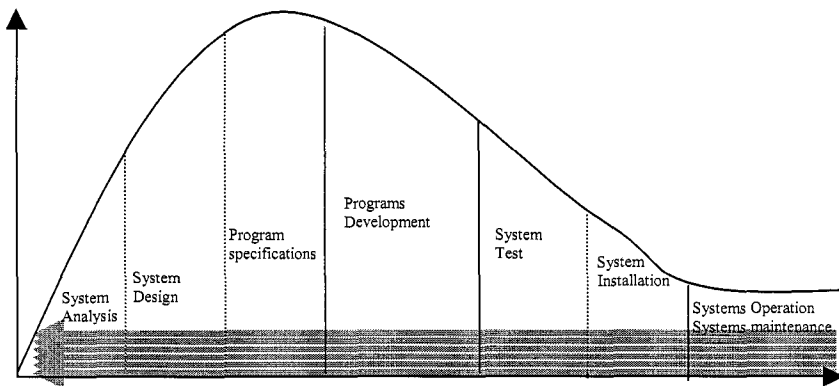


Figure 1: Development Phases of Information Systems

The three major works for the operation of an information system are:

- Feeding,
- Processing, and
- dispatching.

In detail, the works for the systems operation (mainly of the batch systems) are:

- The collection of the input data, the data entry and the data control and validity.

- The processing of these data by the programs of the information system, which are registered in programs libraries and are “called” by the user through the JCL. (Job Control Language is a part of the processing control program that is taking care of the computer’s starting operation, defines the input-output units and performs the necessary command for the transition from one work/program to another) for the performance of the specific program/ programs, and
- The dispatching of the results (output) to systems users.

2 Systems maintenance and maintainability

It is almost a rule the fact that, right after the successful installation of the information system, the analyst will be tempted to “relax” and forget it in view of the new systems that he will be asked to develop.

Unfortunately, experience has shown that the everyday use of the system creates reasons for system changes and improvements (systems maintenance).

It is often the case in Data Base/ Date Communication Systems in which, the user is in direct communication with the system through a terminal. The work of computer operating in real time takes a different emphasis. This difference can be readily appreciated when a system or equipment error occurs. Through their terminals, users will frequently experience problems before they become apparent to the computer room. Thus, the user understands immediately the system defaults and the potentialities of the computer to support him in his everyday activities.

Just as an architect that designed a building is the most appropriate person to design any changes and extensions in it, in the same way, the analyst who designed the system is the right person to design its improvements. That means that the analyst should communicate with the Users and the Computer Operations Division of the Information Systems Department and to remain in charge in order to test the operation, the modifications and the enhancements of the system (systems maintenance). That is always valid only in small Information Systems Departments or only during the first period of the system operation. In general terms, it depends on the organization type of the company’s Information Systems Department. Certainly, the Analyst cannot possibly be present (in the company) and be in charge for the system in all of his life cycle. It is therefore crucial, during the systems design, that there be the necessary presupposition of its fluent maintenance in the future.

“Effective executions of maintenance faces three serious problems:

1. It is considered by most professionals to be dull and noncreative as it involves working on systems created by someone else.
2. In actuality, for older systems, it is very complex, requiring competent professionals to safely perform necessary changes.
3. Accounting procedures do not recognize that software is an asset of that over time it trends to age, making eventual conversion vastly more complex and in extreme cases putting the entire organization at risk as it struggles to free itself from both obsolete hardware and software.

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From the above it can be concluded that the systems maintainability is based on:

- the simplicity of its design,
- the adoption and application of standards during the systems development for the formulation of the systems documentation, and
- evaluation of the system during its development (rolling evaluation) as well as the post implementation evaluation.

Following the installation and at the beginning of its operation, the new system is running its infant age and therefore users and analysts who developed it should take care of it. Certain defects in the system design can be observed right after, or even after the system installation and evaluation, certain cases that were not included in the systems requirements during their definition, and certain defects of the programs of the system. All the aforementioned and mainly the fact that the companies' environment is dynamic and the users' needs are in constant change, impose corresponding improvements and/ or changes of the system.

Ongoing design, construction, and implementation, activities on existing services are labeled maintenance. When action is desired on a steadily growing need, normally caused by an outside change or user desire, it requires some technical support. The word maintenance is a complete misnomer because it implies an element of deferability, which does not exist. It could be better labeled modernization. Much of maintenance stems from real-world changes, such as new offices or unit mergers, business changes, such as new-product line creation or elimination, new technology etc. It can be as simple as changing a number in a data of depreciation rates or as complex as rewriting the tax portion of the payroll.

Generally, Systems Maintenance is the systems modification in order to correct errors, to add meaningful elements and cover deficiencies, to change certain points so that the system will be adapted to the environment needs and finally, enhance the system for any reason.

"Regardless of how well designed, constructed and tested a system or application may be, errors or bugs will inevitably occur. Some bugs will be caused by miscommunication of requirements. Design flaws will cause others. Others will be caused by situations that were not anticipated and, therefore, not tested. And finally, bugs may be caused by unanticipated misuse of the programs. In all these situations, corrective action must be taken. This is called corrective action system maintenance.

The systems maintenance starts right after the systems development and goes on for as long as the system operates. The systems life cycle is estimated to be 5 years. Already in that system, there are so many modifications that it has nothing in common with its original form and will be disdained ("systems entropy"). It is a dull activity and all analysts and programmers prefer to be occupied with the systems and programs development and not with their maintenance. A solution to this "administrative" problem is given by the "organization" of the Implementation of Systems Department of the Company.

The systems maintenance in many companies could occupy up to 60% of the analysts' and programmers' work and has a very high cost. Sometimes, this cost

can be even higher than the cost needed for the development of a new system. Certainly, the company should have made the decision to develop a new system before the existing one comes to such a situation.

3 Maintenance presuppositions

A main presupposition for the successful systems maintenance is the existence of the complete and clearly defined systems documentation.

The complete and clearly defined systems documentation is achieved as long as the Information Systems Department meets the necessary standards and the necessary procedures for the development and the maintenance of information systems.

The advantages of standards and procedures, that is the standardized manner to implement a computerized work, are obvious, easily denominated, most important of them being:

- They consist the basis for documentation (or consist the documentation itself) of the information system right after its development.
- Better and faster communication among employees for the development of the system and the absence of possible misapprehensions or doubts during the work phases.
- Eliminating the possibility to repeat a work that has already been performed.
- The Information Systems Department and the Company in general, do not depend on persons.
- Freedom to test the work of analysts- programmers and evaluation of their work separately.
- Freedom to price the works and draw up the budget.
- As it is obvious, all the aforementioned result in cost reduction.

Right after the development and installation of the system, the analyst must create (based on the standards and procedures used in the company) the manuals for the:

- Systems analysis – design.
- Programs of the System (per program).
- Systems Operation.
- User's.

3.1 Analysis and design manual

This manual should include the following:

1. Project Objectives Document.
2. Description of the existing system (user task diagram).
3. Description of the new system's functions (user task diagram).
4. Definition of input – output.
5. Systematic data ranking (business terms):
 - a. Defining data elements.

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- b. Defining entities.
6. Entity model.
7. Systems requirements definition.
8. Systems flow chart.
9. User task description.
10. Data modeling.
11. Path analysis (Association of the model with the Systems Requirements).
12. Input- Output design.
13. Dialog flow.
14. Data Communication (DC) Environment definition.
15. Transactions design.
16. Final Data Bases design.
17. Creation a systems environment of data bases/ data interchange.
18. Programs preparation.
19. General programs specifications (per program).
20. Detailed programs specifications (per program).
21. Protection of the systems operation.
22. Preparation of the systems operation.
23. Systems Test:
 - a. Preparation of systems test.
 - b. Systems test.
24. Testing procedure of the systems performance.
25. Final system test.

3.2 Programs Manual

This manual (per program) should include:

1. Program's general specifications.
2. Program's detailed specifications which should include:
 - a. Tables & Arrays.
 - b. Detailed description of all input/ output fields and how they are processed.
 - c. Detailed description of special calculations and techniques to be used.
 - d. Description of "PF- Function Keys" (if it is about a real time program).
 - e. Description of the data of the "Control Card" (if its about a batch program).
 - f. Detailed description of "Error Messages" and "Help Messages" (if it is about a real time program).
3. Modifications of the program specifications.
4. Program development (Block Diagram, Coding, Compilation, Programs interface).
5. Copies of program's monitors.
6. Copies of program's print-outs.
7. Creation of program's test data.
8. Program's test.

3.3 Systems operation manual

This manual should be divided in two sections; the first one will refer to General Guidelines and the second to “Off-Line” System’s Works.

General Guidelines.

1. Short description.
2. Working hours daily (on-line).
3. Back-up (frequency, time, generations, copies number).
4. Reorganization.
5. Special Systems Demands by the “Master Terminal Operator”, for example certain messages to him.
6. Demands in Peripheral Units:
 - a. Tape unit and corresponding volumes.
 - b. Disc unit and corresponding spaces.
 - c. Print, reading units etc.

“Off-Line” Works

1. Systems Run Chart.
2. Proc Name (Procedure Name).
3. Steps (Total and S/N, for example 9 steps: STEP1, STEP2 etc.).
4. Procedure’s JCL.
5. Control Cards (for various steps and if they are necessary).
6. Frequency, duration, Procedure’s performance time.
7. Each step’s input- output files.
8. Instructions for “Errors/ Abends” cases.
9. Other special instructions.
10. Messages to the Operator and replies.
11. Reports such as special forms or form types, copies number, special report number.

3.4 User manual

This manual should include the following:

1. Systems general description.
2. Sign on/ Sign off.
3. Option’s table (initial transaction).
4. Per monitor:
 - a. Fields description.
 - b. Completion manner.
 - c. Function keys.
 - d. Messages.
 - e. Model.

4 Maintenance steps

The systems maintenance steps should be as following:

- a. Study and evaluation of the problem that imposes the system's modification.
- b. Trace down the system points which should be modified and/or be further developed.
- c. Location of the programs that should be modified and definition of the (new) programs that should be developed.
- d. Realization of the works:
 - i. Modification of the Systems Requirements Definition.
 - ii. Modification of Systems Design.
 - iii. Writing Programs Specification in order to develop new and modify existing programs of the system.
 - iv. Development of new and modification of existing programs. Documentation of the new programs and update of the documentation of existing programs of the system.
 - v. Updating the Information System's Documentation.

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