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NASA PC SOFTWARE EVALUATION PROJECT

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I. INTRODUCTION

The USL NASA PC software evaluation project is intended to provide a structured framework for facilitating the development of quality NASA PC software products. The project will assist NASA PC development staff to understand the characteristics and functions of NASA PC software products. Based on the results of the project's evaluations and recommendations, users can judge the reliability, usability, acceptability, maintainability and customizability of all the PC software products.

The objective of this report is to provide initial, high-level specifications and guidelines for NASA PC software evaluation. The primary tasks to be addressed in this project are as follows:

(1) To gain a strong understanding of what software evaluation entails and how to organize a structured software evaluation process.

(2) To define a structured methodology for conducting the software evaluation process.

(3) To develop a set of PC sofware evaluation criteria and evaluation rating scales.

(4) To conduct PC software evaluations in accordance with the identified methodology.

This report presents a method for evaluating NASA PC software products. Chapter II introduces the categorization of the NASA PC software. Chapter III discusses the evaluation criteria to be used for NASA PC software. The Appendices to this report provide detailed comparison charts for each category of NASA PC software. The evaluation process is presented in Chapter IV.

II. NASA PC SOFTWARE CATEGORIZATION

In this evaluation project, the NASA PC software products are basically divided into ten categories. They are:

** Database/File Managemet Systems
** Operating Systems
** Programming Languages
** Statistical Data Analysis
** Document Processing
** Communication Packages
** Network System Software
** Graphics Support Software
** Environment Management Packages
** Project Management Systems
** General Utilities

III. EVALUATION CRITERIA FOR NASA PROJECT SOFTWARE

3.1 Common Evaluation Criteria for NASA Project Software

To evaluate product within the software categories mentioned in Chapter II, selected measures of performance (criteria) were developed. Various criteria are applicable to all categories of NASA project software, for example:

** Ease of Use
** User Friendliness
** Documentation
** Vendor Support/Update
** Machine Compatibility

3.1.1 Ease of Use

Ease of use is one of the most important characteristics of any widely accepted software product. The evaluators should consider the following subcriteria:

** Menu-Driven System -- Menu refers to a list of choices from which to chooce an action that the program will perform. A good menu-driven software enables the user to have easy

control over the way the program proceeds.

** "Help" Facility -- Good software should have "help" capabilities to assist users to understand the functions of various commands.

** On-line Tutorial -- This facility teaches users how to use the software.

** Keyboard Functions -- With this facility, users can perform various functions by simply pressing the corresponding keys.

3.1.2 User Friendliness

There are many subcriteria to be considered for evaluating the user friendliness of software:

** "Help" Facility -- This capability assists users to know how to use the software system.

** Interactive Dialogue -- This capability interacts with the user via questions, warning, comments, etc.

** Error Messages -- This capability displays error messages if errorous commands are entered.

** Protection -- A good program will not allow the user to delete or modify data accidentally.

3.1.3 Documentation

Documentation is very important to enable productive use of software products. The following subcriteria should be considered [DataPro, 83]:

** Index -- all important terms should be listed in an index.

** Illustrations -- Drawings or photographs should be provided to help the user to understand the concepts presented.

** Examples -- it is necessary to provide examples to explain certain functions.

** Glossary of Terms -- These should be provided as a reference source.

** Quick Reference Guide -- This can be any size of pocket card containing enough information to enable the user to use the software without referring to the full reference manual.

3.1.4 Vendor Support/Update

Subcriteria include [DataPro, 83]:

** Updates of Product -- Vendors should provide free upgrades and product enhancement when they are avaliable.

** On-line Tutorials -- These are usually provided on separate diskette to help users understand and use the program.

** Newsletters -- Vendors should offer newsletters to help the

user to use the product more efficiently.

3.1.5 Machine Compatability

There are four types of IBM microcomputer configurations in the USL NASA PC R&D environment. Evaluators must check whether the software product being evaluated is compatible with the following machines:

** IBM PC

** IBM XT

** IBM AT

** IBM 3270/G

3.2 Specific Evaluation Criteria for each NASA Software

There are certain specific criteria that are dictated by individual application. For example, security may be a basic and fundamental criterion in a database management system, but word processing may be irrelevant in such an environment. Therefore, different software products categories should be evaluated seperately [DataPro, 85]. The sets of criteria for each software product category are listed in the comparison charts in the appendices to this report.

3.3 Quantitative Judgement

In order to have an objective judgement, a standardized and quantitative evaluation scale should be defined. A criterion was judged to be quantitative if, for example, a definite answer of "yes" or "no" could be given without subjective judgement or if a numeric value could be objectively derived [Edmonds, et. al., 84].

IV. EVALUATION PROCESS

The NASA PC software evaluation process is as follows:

(1) Understand the characteristics and functions of the software product to be evaluated. This information can be obtained from the following sources:

** Documents and manuals from vendors

** Evaluation reports, such as DataPro Research Reports and Auerbach Dataworld Series.

** Interactive testing -- Interactive testing of the software product.

** Survey of other users' experiences.

(2) Evaluate the software product according to each criterion in the comparison chart. Quantitative evaluation results should be entered into the chart.

(3) Highlight the evaluation result of each entry in the comparison chart, if necessary, by providing information in

the remarks columns.

(4) Weight and rate the software product. For each product to be evaluated, first assign a set of weight percentages to each corresponding criterion to reflect its relative importance. Then assign a score for each criterion which reflects how well the product satisfies the criterion.

Each criterion may be further divided into criteria of a lower level, which can still be further divided. In such cases, the weight percentages and scores for the lowest criteria categories are entered and computed first. By totaling the weighted scores for the lower level criteria within the same category, the score for the corresponding higher level criterion can be obtained. The weighted score for each higher level criterion can then be obtained by multiplying its weight percentage by its score. The process is repeated until the final (highest level) total weighted score is obtained [DataPro, 85; Edmonds, et. al., 84].

(5) Write the final evaluation report. The evaluators summarize each evaluation product after the above steps are completed. The final report should be an analytical discussion of the product and how it compares to comparable products in the

NASA PC R&D software environment.

Based on the above evaluation process, a very detailed analysis and productive recommendation can be generated. This will assist NASA PC development staff to understand the charateristics and functions of supportive NASA PC software products. This will also provide users with a basis to judge the reliability, usability, acceptability and maintainbility of the evaluated NASA PC software products.

V. REFERENCES

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[DataPro, 83]. DataPro Reports on Microcomputers, Vol 2, "All about Microcomputer Word Processing Software," Delran, NJ, December, 1983.

[DataPro, 84]. DataPro Reports on Microcomputers, Vol 2, "All about Database Management Systems," DataPro Research Corporation, Delran, NJ, December, 1983.

[DataPro, 85]. DataPro Reports on Microcomputers, Vol 3, "General Software Testing Procedures," DataPro Research Corporation, Delran, NJ, 1985.

[Edmonds, et. al., 84]. L. S. Edmonds and J. E. Urban, "A Method for Evaluating Front-End Life Cycle Tools," Proceeding of Beijin Engineering Int. Conf. on Computers and Applications, June 1984.

APPENDICES:

The Comparison Charts that perform the side-by-side comparison of all NASA PC software within a particular software category are presented in the appendices to this report. A set of evaluation criteria are listed on one axis, and the names of the evaluated software products are listed on the other axis. Evaluators should quantitatively assign the result of the evaluation to each criterion.

APPENDIX A. DATABASE MANAGEMENT SYSTEM COMPARISON CHART

Product Name	Informix - SQL	R:base 5000	Oracle	
Manufacturer	Relational Database Management System	MicroRim Inc.	Oracle Corporation	Remarks
System Characteristics				
Minimum Memory Required				
Memory Required Program after Loading				
Machine Compatibility				
IBM PC				
IBM XT				
IBM AT				
IBM 3270/G				
Program Characteristics				
Multi-User				
Type of Database Structure				
Access Language				
Automatic Update and Integrity				
File Characteristics				
No. of Fields per Record				
No. of Char. per Fields				
No. of Records per File				
No. of Files Concurrently Opened				

No. of Fields per Index Key				
No. of Characters per Index Key				
No. of Index Keys per File				
File Structure				
Modification				
Add Field Values				
Add Records				
Delete Field Values				
Delete Records				
Modify Field Values				
Modify Records				
Types of Fields				
Numeric				
Character				
Sorting/Indexing				
Ascending				
Descending				
Based on a Single Field				
Indexing Based on Multiple Fields				
File Compatibility				
ASCII				
DIF				

DBF (dBase II)				
Security				
User Passwords				
Levels of Security				
Write Protection				
Data Encryption				
Documentation				
Index				
Illustrations				
Examples				
Glossary				
Pocket Guide				
Full Reference Manual				
Vendor Support				
Updates				
On-Line Tutorials				
Newsletters				
User Friendliness				
Interactive Dialogue				
Error Messages				
Protection				
"Help" Facilities				
Ease of Use				
Menu-Driven System				

On-line Tutorials				
"Help" Facilities				
Keyboard Functions				
Data Installation				
First Installation Date				
Number Installed to Date				

NAME OF EVALUATOR _____ DATE _____

APPENDIX B. OPERATING SYSTEMS COMPARISON CHARTS

APPENDIX C. PROGRAMMING LANGUAGES COMPARISON CHARTS

APPENDIX D. STATISTICAL DATA ANALYSIS COMPARISON CHARTS

APPENDIX E. DOCUMENT PROCESSING COMPARISON CHARTS

APPENDIX F. COMMUNICATION PACKAGES COMPARISON CHARTS

APPENDIX G. NETWORK SYSTEM SOFTWARE COMPARISON CHARTS

APPENDIX H. GRAPHICS SUPPORT SOFTWARE COMPARISON CHARTS

APPENDIX I. ENVIRONMENT MANAGEMENT COMPARISON CHARTS

APPENDIX J. GENERAL UTILITIES COMPARISON CHART

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15. Supplementary Notes

16. Abstract

The USL NASA PC software evaluation project is intended to provide a structured framework for facilitating the development of quality NASA PC software products. The project will assist NASA PC development staff to understand the characteristics and functions of NASA PC software products. Based on the results of the project teams' evaluations and recommendations, users can judge the reliability, usability, acceptability, maintainability and customizability of all the PC software products. The objective of this report is to provide initial, high-level specifications and guidelines for NASA PC software evaluation. The primary tasks to be addressed in this project are as follows: to gain a strong understanding of what software evaluation entails and how to organize a structured software evaluation process; to define a structured methodology for conducting the software evaluation process; to develop a set of PC software evaluation criteria and evaluation rating scales; and to conduct PC software evaluations in accordance with the identified methodology. The categories of PC software to be evaluated within the scope of this project are as follows: Database/File Management Systems, Operating Systems, Programming Languages, Statistical Data Analysis Systems, Document Processing Systems, Communication Packages, Network System Software, Graphics Support Software, Environment Management Software, General Utilities.

This report represents one of the 72 attachment reports to the University of Southwestern Louisiana's Final Report on NASA Grant NGT-19-010-900. Accordingly, appropriate care should be taken in using this report out of the context of the full Final Report.

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