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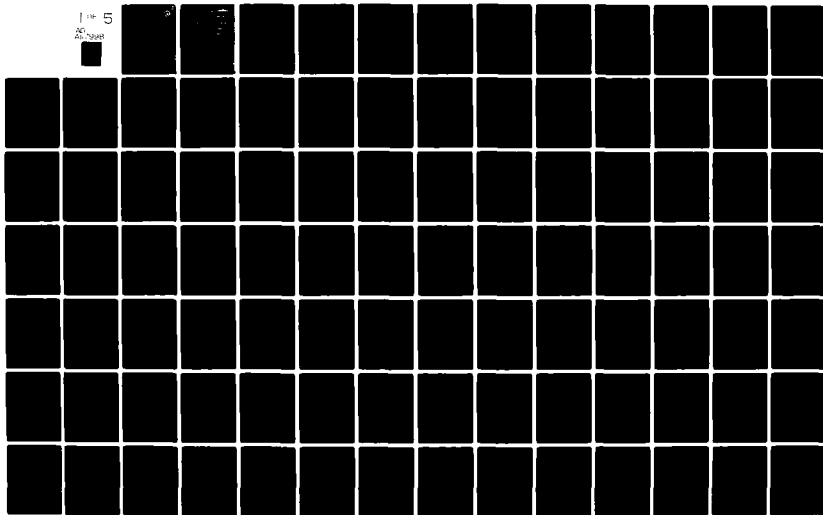
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RESULTS OF A SURVEY SOFTWARE DEVELOPMENT PROJECT MANAGEMENT IN --ETC(U)  
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18 December 1979



RESULTS OF A SURVEY:  
SOFTWARE DEVELOPMENT PROJECT MANAGEMENT  
IN THE U.S. AEROSPACE INDUSTRY

Volume II

PROJECT MANAGEMENT TECHNIQUES, PROCEDURES AND TOOLS

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ABSTRACT

RESULTS OF A SURVEY ON MANAGEMENT TECHNIQUES AND PROCEDURES  
USED IN SOFTWARE DEVELOPMENT PROJECTS BY THE US AEROSPACE INDUSTRY  
BY

Richard H. Thayer and John H. Lehman

This report contains the results of a survey conducted in 1977 and 1978 on how the US Aerospace Industry manages its software development projects. The sample of the US Aerospace Industry surveyed was those companies who had a membership in the AIAA Technical Committee on Computer Systems. These committee members represented 47 major corporations or major corporate subdivisions and occupied top positions in software management within their firms.

The survey used a questionnaire containing 225 numbered questions on project management. By using "multiple choice-multiple answer" questions, approximately 1,328 separate responses were possible. The survey was divided into three parts. Part One dealt with defining the organization, management structure, and philosophy of the firm. This part was intended to be answered by top management to provide the backdrop against which the individual projects would be viewed. Part Two concerned individual software development projects and was intended to be completed by the project manager. Part Three was designed to obtain the opinions and perceptions of software development project managers on major issues and major problems of software engineering project management.

This paper reports the results from Part Two; that portion of the questionnaire dealing with actual projects. Parts One and Three, the portions dealing with the company environment and software development problems, are reported on in Volumes I and III.

The answers from the surveyees were abbreviated or coded and tabulated in this report. In addition, a portion of the narrative answers to the survey were also reported. To protect the participants, all references to individuals or their companies have been eradicated. This report does not attempt to analyze or come to conclusions about the data only to report it as clearly as possible.



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## SECTION 1

## RESULTS

BACKGROUND

The survey in the title of this paper was a survey of the US Aerospace Industry to determine what management techniques and procedures are used by the aerospace industry in their software development projects.

This survey was designed, written, tested, and implemented by the authors in the spring and summer of 1977. This survey was accomplished to collect data for the preparation of a paper on software engineering project management which was presented at the American Institute of Aeronautics and Astronautics (AIAA) Conference, Computers in Aerospace, 31 Oct - 2 Nov 1977.

That portion (or sample) of the US Aerospace Industry that was surveyed were those companies who had a membership in the AIAA Technical Committee on Computer Systems (who were the host to the conference on Computers in Aerospace). These committee members represented 47 major aerospace corporations or major corporate subdivisions and occupied top positions in software management within their firms. These committee members were in an ideal position to report on how the US Aerospace Industry manages its software development projects.

Initial contact was made in May 1977 to determine which members of the committee would be interested, willing, and able to participate. Forty-five members, representing 35 companies, agreed to respond. The initial draft of the survey was completed in June 1977 and was critiqued by approximately 25% of the total committee membership. The results of this critique, along with other corrections, were incorporated into the final survey. The survey was mailed 10 August 1977. On 6 September 1977, with 29 of the completed surveys on hand, the authors wrote the first report for the proceedings of the Computers in Aerospace conference. This paper can be found in the conference proceedings, A Collection of Technical Papers. By the time the presentation was given on 1 November 1977, 55 projects were reported on, representing 33 companies or 70% returns. The companies surveyed were predominantly aerospace firms, with government contracts, reporting on large to very large projects. The presentation

given by author Richard H. Thayer at the conference (called Report Nr 2, AIAA Project Management Survey) used the more complete data and a different approach.

However, the survey did not end there. More completed forms still trickled in until by the spring of 1978, 62 projects had been reported on, representing 37 firms for a 76% return rate. This later increased to 66 by the end of the summer 1978 for 86% return rate (see Appendix A for a list of participants). Because of this extensive participation, a decision was made by the AIAA Technical Committee on Computer Systems to make further use of the data by writing an assessment paper on the state-of-the-art in software development project management. Mr. Gene F. Walters, General Electric Company, Command and Information Systems, and Mr. Jack E. Bloodworth, Boeing Aerospace Company, were given primary responsibility for this paper.

In order to meet these goals, the Rome Air Development Center, the Sacramento Air Logistics Center, and The Boeing Aerospace Company offered their services, and in some cases the services of their company's data processing capability, to reduce and analyze the data.

The remaining problem was to reduce the data into a form useable by a computer. This involved "coding" the narrative portions and free form answers of the survey, verifying that the answers were consistent, and abbreviating all "fill in the blank" answers. This was accomplished by one of the architects of the survey, Richard H. Thayer.

#### PURPOSE OF SURVEY

The purpose of this survey was to view a sample of the US Aerospace Industry through the use of a questionnaire to determine how this industry managed their software development projects. Specifically, the questions the survey attempted to answer were as follows:

1. What are the current practices in Software Engineering Project Management today?
2. Are the new developments in management, i.e., "modern" management techniques or project management techniques, being used?
3. What are the trends in the Software Engineering Project Management??

4. What are the relationships between Software Engineering Project Management techniques and successful delivery of software?
5. What are the relationships between various elements of Software Engineering Project Management as a system?
6. What are the relationships between "modern" Software Engineering techniques and Software Engineering Project Management?

### THE SURVEY

The approach taken in answering the questions was first to design a model of software engineering project management as a system, define the elements of that model, and hypothesize relationships between those elements. Second, was to form a questionnaire around this model using the various elements or variables of the model as questions and possible answers (see Appendix B for a copy of the questionnaire). The survey used a rather lengthy questionnaire containing 225 numbered questions. Beyond that, by using "multiple choice-multiple answer" questions approximately 1,328 separate responses were possible.

The 72 page survey was divided into 3 parts. Part One dealt with defining the total organization, management structure, and philosophy of the firm. This part was intended to be answered by top management to provide the backdrop against which the individual projects would be viewed. Part Two concerned individual projects and was intended to be completed by the project manager. Part Three consisted of general questions, not project specific, calling for evaluation, opinions, and suggestions on the major problems of software engineering project management. Part Three was also intended to be completed by a project manager.

### PURPOSE OF THIS REPORT

This report was prepared as a means of (1) reducing the answers to Part Two and Questions 1, 2, 3, 4, and 25 of Part Three of the questionnaire in "raw form" so that they could be computerized, and (2) providing the answers to the questionnaire to satisfy the many requests from the computer community for access to the data collected as a result of this survey. (The answers to Part One and the remainder of Part Three are provided in Volumes I and III.) Because of the restrictions placed by the participants on the use of their submissions, the survey forms with the complete answers cannot be distributed. This report was selected as a means of capturing and documenting as much of the raw data as possible without revealing the source of the information. In essence, this report does not contain "raw data," but reduced data in abbreviated and coded form which will effectively disguise the participant but still allow interested computer scientists to

use the data for their own requirements.

This report does not attempt to analyze or come to conclusions about the data, only to report it as clearly as possible. Only minimum interpretation was made to enable the answers to be tabulated for eventual analysis. Although 66 projects were reported, the authors removed six projects that did not seem to fit the norm, leaving a set of 60 projects.

#### CONTENTS OF THIS REPORT

As already stated, the purpose of this report is not to analyze the data from the AIAA Project Management Survey, but to report it as simply and accurately as possible, and, to keep within the original ground rules of maintaining anonymity of the participants. Section 2 contains the questions and answers to this survey and Section 3 contains cited references. The participants in the survey are listed in Appendix A.

Because of its length a duplicate copy of the questionnaire is in Appendix B. The purpose of this duplicate set is to allow the reader to quickly peruse the questions and possible answers in order that he can determine what type of material is covered.

Appendix C contains the abbreviations used in reporting the narrative portions of this survey as well as comments on the answers themselves. These comments pertain primarily to such things as accuracy of the answer, relationship between questions, and procedures used in contriving missing answers. Since the reduction of comments to code destroyed some of the richness of prose, the authors felt it worthwhile to include the actual written answer to certain specific questions. These answers are reproduced in Appendix D. To maintain the concept of protecting the participants identity, the narrative answers cannot be tied to any particular participant in Section 2.

#### THE FUTURE

This survey is, as far as the authors can determine, the first attempt to query industry on such a large scale on how software engineering projects are managed. A look at the list of contributors in Appendix A will attest to the importance of this base of answers. The tremendous volume of questions answered and the excellence of the responses dictate

that this data be utilized either in whole or part as a reference for other papers, reports, possible texts, and other technical publications for the benefit of the US Aerospace Industry and the data processing community. The AIAA Technical Committee on Computer Systems is anticipating the preparation of an assessment paper on how industry manages its software engineering projects. This committee welcomes suggestions from the computing and aerospace communities on how to best use this data for the benefit of all. All suggestions should be sent to either:

Mr. Gene F. Walters  
Mgr, Software Technologies  
Information Systems Programs  
General Electric Company  
450 Persian Drive  
Sunnyvale, CA 94086  
(408) 734-4980

Mr. Jack E. Bloodworth  
Mgr, ALCM Software  
The Boeing Aerospace Company  
MS-45-70  
P.O. Box 3999  
Seattle, WA 98124  
(206) 655-6718

The Rome Air Development Center (RADC) has contracted with ITT Research Institute (IITRI) to establish and operate a software information analysis center. The center has been named the Data and Analysis Center for Software (DACS). One of the functions of DACS is to acquire and analyze data gathered during the various phases of the software development process with the purpose of identifying and quantifying those factors which contribute to the production of quality software. The data from this survey has been contributed to DACS and is available for analysis by any member of the AIAA Technical Committee on Computer Systems as well as the general computer community. Personnel interested in receiving copies of this data, or requesting analysis of this data should contact:

Ms. Lorraine Duvalle  
Data & Analysis Center for Software  
RADC/ISI  
Griffiss AFB, NY 13441  
(315) 336-0937

## ACKNOWLEDGEMENTS

In addition to the contributors listed in Appendix A, the authors wish to acknowledge the support and dedication of the following people.

### From the Sacramento Air Logistics Center

The Data Automation Branch provided programmers, analysts, typing support, computer processing, and integration of the final report.

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The Boeing Company's integrated logistic and systems maintenance unit, consisting of Mr. D. H. Wilson, Mr. G. R. Herrold, and Mr. W. B. Dalrymple, provided support in the areas of data reduction, data base structure, and file updating and verification. Dr. Kenneth A. Hales, 1977 president of the AIAA Technical Committee on Computer Systems, provided the support of his committee in testing and completion of the questionnaires.

### From the General Electric Company, Space Division

The Information Systems Program in Sunnyvale provided technical consultant support, proofreading, printing and encouragement through the services of Mr. Gene F. Walters and his technical group.

### From the Rome Air Development Center

RADC has offered to perform analysis of the data for the benefit of the US Air Force, the AIAA Technical Committee on Computer Systems, and the computing community. Personnel responsible for this are Mr. Donald Roberts and Mr. Alan R. Barnum. Ms. Lorraine Duval, ITT Research Institute, who is general manager of the RADC Data and Analysis Center for Software (DACS), became the repository of the data from this survey and provided much of the reduction and statistical correlation.



## ATTACHMENT 1 TO SECTION 1

RELATIONSHIPS BETWEEN REPORTS

The survey was comprised of three parts: Part One, Part Two, and Part Three. Each dealt with a separate facet of software engineering project management. Part One dealt with the firm and the environment in which the project was done. Part Two devoted itself to specific software engineering projects accomplished within the firm. Part Three asked the project managers their opinions about project management. Each of these parts can, and does, stand alone. Part One (results reported in Volume I) reports on the financial status, organization, management policies, staffing techniques and project controls of the companies that report on the projects in Part Two.

Part Two (results reported in Volume II) reports on a series of independent projects which could be considered case studies on how the aerospace industry is managing projects today. Part Three (results reported in Volume III) concerns ideas and perceptions about software engineering project management and does not relate to a given project or company.

At the same time, there is a relationship between these reports. For instance, you might be interested in knowing about the company environment that produced the project. In that case, you would want to know which company reported on which projects. You might be interested in knowing the background and project environment which created the ideas and assumptions made in answering Part Three. In that case, you would want to know the relationship between the man who reported the perceptions, ideas and problems associated with software engineering project management and the project he worked on. To this aim Table 1 tells the relationships between Volumes I, II and III of this report.

Each survey answer was given a number for tracking purposes. Within this number, of course, is a Part One, Part Two, and Part Three. Since one Part One might cover a number of Part Two's, and the Part Three may or may not be answered by the same person that answered Part Two, the relationship between these is contained in the table. Each company was given a two-digit identifier, each project was given a three-digit

identifier, and each answer to Part Three was given a three-digit identifier. To determine the common company relationship between projects, look up the common company identifier in Table 1. To determine whether or not the same person answered Part Two and Part Three, look under the column that identifies Part Three. If the entry is "yes", the same man wrote Part Two and Part Three. If the entry is "no", a different individual answered each part.

Projects 301 through 306 have been deleted for this report due to size or incompleteness.

TABLE 1

(ATTACHMENT 1 TO SECTION 1)  
 RELATIONSHIPS OF PROJECTS REPORTED IN AIAA  
 PROJECT MANAGEMENT SURVEY  
 VOLUMES I, II and III

Survey Identification Nr (1)	VOL I (Part One) (2)	VOL II (Part Two) (3)	VOL III (Part Three) (4)
101	30	101	Yes
102	30	102	Yes
103	30	103	Yes
104	31	104	Yes
105	33 (8)	105	Yes
106	34 (8)	106	Yes
107	35	107	Yes
108	35	108	Yes
109	35	109	Yes
110	36	110	Yes
111	36	111	Yes
112	39 (9)	112	Yes
113	40 (9)	113	Yes
114	41	114	Yes
115	69	115	No
116	42	116	None
117	43	117	Yes
118	45	118	Yes
119	45	119	Yes
120	51	120	Yes
121	66 (5)	121	Yes
122	51	122	Yes
123	51	123	Yes
124	51	124	Yes
125	52	125	Yes
126	55	126	Yes
127	None	127	Yes
128	59	128	No
129	None	129	Yes
130	31	130	Yes
201	67	201	None

(1) Survey Identification Nr	(2) VOL I (Part One)	(3) VOL II (Part Two)	(4) VOL III (Part Three)
202	27 (7)	202	Yes
203	28 (7)	203	Yes
204	29	204	Yes
205	32	205	Yes
206	37	206	Yes
207	37	207	Yes
208	38	208	Yes
209	43	209	Yes
210	44	210	Yes
211	46 (10)	211	Yes
212	47 (10)	212	Yes
213	49	213	Yes
214	49	214	Yes
215	49	215	Yes
216	49	216	Yes
217	50	217	Yes
218	53 (11)	218	Yes
219	54 (11)	219	Yes
220	56	220	Yes
221	57	221	Yes
222	60	222	Yes
223	60	223	Yes
224	58	224	Yes
225	58	225	Yes
226	58	226	Yes
227	61	227	Yes
228	61	228	Yes
229	64	229	Yes
230	68	230	Yes
301	26 (6)	301	Yes
302	48 (10)	None	None
303	25 (5)	None	None
304	68	304 (12)	None
305	62	None	None
306	63 (7)	None	Yes

FOOTNOTES FOR TABLE 1

(1) Column 1 - This column lists the returned surveys according to a randomly assigned identification number.

(2) Column 2 - The company identification number is listed in column 2 and is used in Vol I to describe the company and environment for the project reported in Vol II. Projects with the same company number are from the same company and/or major subdivision and were completed by a single member of the company. In other cases, the same company was reported on by two or more individuals. This was caused by two or more project managers, who reported on different projects within the same company. Most of the time these "double" reports were the same. Comments along these lines are contained in foot notes (5) through (12).

(3) Column 3 - This column lists the project numbers reported in Vol II.

(4) Column 4 - Vol III reports on data from Part Three. This column indicates whether or not the same person reported/wrote Part Two and Part Three of the survey. This is done so that the reader can know if there is any relationship between the project reported on in Part Two and the surveyee's opinions on the major problems of software development management. Source of this information is personal knowledge of the author, comparison of handwriting, color of marker, and correspondence with the surveyee.

(5) Company 25 and 66 are the same.

(6) Very small company.

(7) Company 27, 28 and 63 are the same. Answers reported under company 28 looked to be the most accurate and complete.

(8) Company 33 and 34 are the same. Answers reported under company 33 looked to be the most accurate and complete.

(9) Company 39 and 40 are the same and have identical answers.

(10) Company 46, 47 and 48 are the same. Answers reported under company 46 are considered to be the official answers by the surveyee.

(11) Company 53 and 54 are the same. Answers reported under company 54 looked to be the most accurate and complete.

(12) Project reported under project 304 was too large to be included.

## SECTION 2

## THE DATA

INTRODUCTION

This section reports on the actual data submitted by the participants on sixty aerospace projects. It is reported in tabulated, abbreviated and coded form and cannot be used completely without Appendix C. Every effort was made to disguise the contributor, including the deletion of some revealing data.

The questionnaire contained many different styles of questions: true or false, multi-choice answers, multi-part questions, fill-in-the-blanks, and narrative. Despite this multitude of styles, a common method of reducing and reporting the answers was developed (see Appendixes B and C). Multi-part questions were broken into separate questions through the use of part numbers (i.e., 01, 02, 03, etc.) and sub-part designator (a, b, c, d, etc., and 001, 002, 003, etc.).

Each question is handled separately and reported as an array. The horizontal indices of the array refer to anonymous project identification numbers (see Section 1 for further explanation). The vertical indices refer to the question, part, and subpart number. Every narrative answer has been coded or abbreviated by a three-character alphanumeric (see Appendix C for further explanation of codes).

Generally speaking, the printing of a three-character alphanumeric opposite the subpart of a question indicates that the participant answered "yes" or "true" as it applies to that part of the question. If a given question has a "blank" for an answer this indicates the surveyee answered "no" or "false" as pertains to that part of the question. With the exception of "none" or "missing" the alphanumeric is a code or abbreviation of a text answer that modifies the "yes" answer. The interpretation or meaning of the codes can be found in Appendix C. The authors made every attempt to use codes that were easy to recognize (mnemonic).

The questionnaire as printed in this report is a modified version of the questionnaire as originally answered (see INTRODUCTION TO APPENDIX B, Questionnaire for explanation).

WHAT WAS/IS YOUR POSITION IN RELATION TO THE PROJECT YOU ARE REPORTING

**A. PROJECT MANAGER**

**SOFTWARE PROJECT MANAGER**

C. PROJECT MANAGER'S SUPERVISOR (PROGRAM MANAGER)

**E. PROJECT INDIVIDUAL**

## 6. CUSTOMER

## 2. ОИМЕН

101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
PART/SUB

C02 C02 C02 C02 C02

203 203 203

202

**C02 C02**

C02 C02 C02 C02

203 203

**C02 C03**

203

202

01 E

202

PART/SUR 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230

203 203

202

018

203 02

203

102

01 c

202

010

202

203

011

202

202

203

QUESTION 2

IN WHAT APPLICATIONS/FUNCTIONAL AREAS DID THIS (SOFTWARE) PROJECT FALL? (ADDED)

- A. COMMERCIAL/BUSINESS, SUCH AS INVENTORY CONTROL, PAYROLL, ACCOUNTING AND FINANCE, ETC.
- B. DATA ACQUISITION/RETRIEVAL
- C. SCIENTIFIC, SUCH AS ENGINEERING CALCULATIONS, DATA REDUCTIONS, ETC
- D. SIMULATION OR MODELING APPLICATIONS
- E. PROCESS CONTROL TO INCLUDE EMBEDDED COMPUTER SYSTEMS (MANLY, 1974)
- F. COMMAND AND CONTROL SYSTEMS
- G. MANAGEMENT INFORMATION SYSTEMS
- H. COMMUNICATION SYSTEMS, MESSAGE SWITCHING
- I. COMPUTER SYSTEMS, SUCH AS SOFTWARE MONITORS, COMPIERS, OPERATING SYSTEMS AND OTHER SYSTEMS SOFTWARE
- Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A			YES					YES										YES			YES		YES							YES
01 B																					YES	YES			YES					
01 C	YES						YES						YES				YES	YES					YES		YES					
01 D	YES																				YES		YES		YES					
01 E	YES					C03			YES				C03		YES	YES		C03		C03				C03		YES	C03			
01 F	YES	YES	YES					YES	YES		YES	YES		YES	YES		YES		YES		YES		YES		YES					
01 G																					YES									
01 H			YES														YES				YES		YES		YES					YES
01 I	YES		YES		YES		YES														YES	YES	YES	YES	YES	YES				

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A																											YES	YES		YES
01 B	YES					YES						YES					YES	YES			YES			YES						
01 C																		YES					YES						YES	
01 D									YES									YES		YES						YES			YES	
01 E			C03			YES	C03			YES	YES							YES											C03	
01 F	YES	YES		YES		YES	YES		YES	YES			YES	YES	YES	YES	YES	YES	YES	YES		YES		YES		YES				
01 H			YES					C03																						
01 I					C03				YES	YES	YES	YES					YES	YES	YES	YES	YES		YES							YES





QUESTION 4

IF THE PROJECT WAS A MAJOR MODIFICATION DID IT INVOLVE:  
 A. TRANSFERRING EXISTING SOFTWARE TO A DIFFERENT COMPUTER  
 B. REWRITING APPLICATION SOFTWARE  
 C. WRITING A NEW OPERATING SYSTEM  
 Y. PROJECT WAS NOT A MAJOR MODIFICATION TO AN EXISTING SYSTEM  
 Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130		
01 A																																
01 B				YES			YES									YES		YES		YES						YES						
01 C					YES							YES								YES												
01 Y						NON		NON	NON	NON	NON		NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230		
01 A												YES														YES						
01 B								YES					YES	YES	YES	YES								YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C																																
01 Y																																

QUESTION 5

THE SOFTWARE PRODUCT WAS DESIGNED FOR:  
 A. COMMERCIAL OFF-THE-SHELF COMPUTER HARDWARE  
 B. COMMERCIAL OFF-THE-SHELF OPERATING SYSTEM  
 C. MODIFIED COMMERCIAL OFF-THE-SHELF COMPUTER HARDWARE (ADDED)  
 D. MODIFIED COMMERCIAL OFF-THE-SHELF OPERATING SYSTEM  
 E. SPECIAL PURPOSE COMPUTER (HARDWARE) SYSTEM (ADDED)  
 F. SPECIAL PURPOSE OPERATING SYSTEM  
 Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A				YES	YES		YES	YES	YES	YES	YES		YES	YES			YES	YES	C04		YES	YES	C03	YES	C04	YES				YES
01 B				YES			YES	YES		YES											YES				C04					YES
01 D															YES					C02			YES					YES		
01 E			C03	YES	YES		YES					YES			YES	YES				YES						YES	YES	C01	YES	
01 F			C03		YES				YES			YES					YES						YES							

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A			YES		YES	YES	YES		YES			C04					YES	YES	YES	YES	YES	YES		YES	YES	YES	YES	C04	YES	YES
01 B									YES		YES		C04							YES						YES	YES			YES
01 C		YES	YES																											
01 D		YES	YES																					YES				YES		
01 E				YES	YES	C03			YES	YES	YES		C03	YES	YES	YES	YES		YES			YES	YES							
01 F		YES		YES					YES		YES	YES	YES				YES								YES	YES			YES	

QUESTION 6

IF THE SOFTWARE SYSTEM WAS BEING DEVELOPED FOR COMMERCIAL (COMPUTER) HARDWARE, WAS SELECTION AND DELIVERY OF THE COMMERCIAL HARDWARE PART OF THE OVERALL PROJECT? (ADDED)

A. YES

B. NO

C. NO, FURNISHED BY USER (ADDED)

Y. SYSTEM WAS NOT DEVELOPED FOR COMMERCIAL OFF-THE-SHELF COMPUTER HARDWARE

Z. COMMENT

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A								YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 Y	C01	NON	NON			C01						NON			NON	C01	C01	C01	NON	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B																														
01 C	C02																													
01 Y	C01	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON

QUESTION 7

IF OFF-THE-SHELF (COMPUTER) HARDWARE WAS USED, IN WHAT MODE OF OPERATION DID THE PRODUCTION SYSTEM RUN? (ADDED)

- A. BATCH
- B. MEMOTE BATCH/MEMOTE JOB ENTRY TERMINAL (RJET)
- C. INTERACTIVE PROCESSING (REAL TIME) (ADDED)
- D. TRANSACTION PROCESSING
- E. STAND ALONE
- Y. SYSTEM WAS NOT DEVELOPED FOR COMMERCIAL, OFF-THE-SHELF COMPUTER HARDWARE
- Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES			YES				YES					C03				YES	YES	YES	YES				YES						YES
01 B																							YES							
01 C					YES		YES			C03	C03	C03	C03	YES			YES	YES	YES	C03	YES	YES	YES	YES	YES					
01 D								YES									YES													
01 E									YES																					YES
01 Y			NON	NON		NON									NON	C01									C01		C01			C01
01 Z																				OTH										

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A					YES				YES			YES							YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B																		C03		YES				YES		YES				
01 C			C03				C03	C03										C03	YES	C03				YES	C03	YES	YES	YES	YES	YES
01 D																														YES
01 E									YES									YES												
01 Y			C01	NON				NON		NON	C01		NON	NON	NON	NON			NON				C03	NON						

QUESTION 8 IF THE TARGET (PRODUCTION) COMPUTER FOR THIS SOFTWARE CAPABILITY WAS  
 AN OFF-THE-SHELF COMMERCIAL SYSTEM:  
 A. GIVE MANUFACTURER, MAKE, AND MODEL  
 B. GIVE OPERATING SYSTEM EMPLOYED  
 Y. TARGET COMPUTER WAS NOT A COMMERCIAL COMPUTER  
 Z. COMMENT

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130			
01 A1				N/S	DEL		DEL	DEL	DEL	DEL			DEL	DEL			DEL	DEL	DEL	DEL	DEL	DEL	DEL	DEL	DEL	DEL	DEL	DEL	DEL	DEL	DEL		
01 A2				N/S	GMI		GP6	GP4	GMI	GMI		GP7	GMI				GMI	GP6	N/S			GP6	GMI	GP7	GP7	GP7	GP7	GP7	GP7	GP7	GP7	GP7	
01 A3							DEL										DEL																
01 A4							GP7										GMI																
01 B1				N/S	DEL		DEL		DEL				DEL				INH	DEL		DEL	DEL	SOC	DEL	DEL	DEL	DEL	DEL	DEL	DEL	DEL	DEL	DEL	DEL
01 B2				N/S	GOS		GOS		GOS				GOS				SOS	GOS		RSX	SYM	HTM	SCO	GOS	GOS	N/S							IMS
01 Y				NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230					
01 A1				DEL		N/S	ZER		HCS			UNI					ZER	HPK		DEL	DEL			DEL	DEL	DEL	DEL	DEL	DEL	DEL	DEL	DEL	DEL	DEL	
01 A2				GMI		GMI	GP4		GMI			GP7					GP4	GMI		GMI	GMI			GP7	GP7	GP7	GP7	GP7	GP7	GP7	GP7	GP7	GP7	GP7	GP7
01 A3							HCS		IBM																										
01 A4							GMI		GP7																										
01 B1				IBM		DEL											ZER	HPK		DEL	DEL			DEL	INH	DEL	IBM	DEL	IBM	DEL	IBM	DEL	IBM	DEL	
01 B2				OSM		GOS											RPM	RTE		GOS	GOS			GOS	SOS	GOS	SVS	SCO	SYS	SCO	SYS	SCO	SYS	SCO	
01 Y				NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	



QUESTION 10

IF THE SOFTWARE SYSTEM WAS DEVELOPED FOR SPECIAL PURPOSE HARDWARE,  
WAS THE HARDWARE DEVELOPMENT PART OF THE OVERALL PROJECT?

A. YES

B. NO

Y. SYSTEM WAS NOT DEVELOPED FOR SPECIAL PURPOSE HARDWARE.

Z. COMMENT:

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES					YES					YES	YES		YES	YES	YES				YES	YES				YES		YES	YES		
01 B	YES																													
01 Y																														

YES

YES

C02

NUN

NUN C01

NUN

NON C01 C01

NUN

NON NON NON C01

NUN NON

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A				YES	YES			C03	C04	YES	YES	YES	YES	YES	YES	YES				YES										
01 B	YES	YES																												
01 Y																														

YES

YES

YES YES

YES

NON

C01

C01

C04

C01

NON NON C01 C01 C04 C01 NUN



QUESTION 11

IF THE SOFTWARE SYSTEM WAS DEVELOPED FOR SPECIAL PURPOSE HARDWARE

WHAT TYPE WAS THIS?

A. EMBEDDED CENTRAL PROCESSOR

B. SPECIAL TERMINALS SUCH AS THOSE EMPLOYED IN COMMAND AND CONTROL AND AIRBORNE SYSTEMS, ETC.

C. SPECIAL SYSTEMS SUCH AS RADAR SENSORS, OR PROCESS CONTROL DEVICES, TRAINERS, ETC.

Y. SYSTEM WAS NOT DEVELOPED FOR SPECIAL PURPOSE HARDWARE

Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A		YES				YES							YES C02	YES C02			YES C02		YES						YES YES	YES C04				
01 B		YES	YES															YES YES		YES		C02			YES					
01 C		YES								YES YES						C02									YES					
01 Y	NON			NON	NON		NON	NON	NON	C01		NON					C01	C01			NON		NON	C01						NON
01 Z																			OTH											OTH

RESPONDOR

REAL SOURCE																														
PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A		YES		YES			C04	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B		YES	YES	YES			YES	C04		YES								YES				YES	YES							
01 C		YES	YES		YES		YES	C04					YES	YES	YES	YES	YES					YES	YES							
01 Y						C01					NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON
01 Z																														

IF A HOST (DEVELOPMENT) COMMERCIAL HARDWARE SYSTEM WAS USED  
IN DEVELOPING THIS SPECIAL PURPOSE CAPABILITY:

A. GIVE MANUFACTURER, MAKE, AND MODEL

B. GIVE OPERATING SYSTEM EMPLOYED

C. SYSTEM WAS DEVELOPED ON SPECIAL PURPOSE COMPUTER

Y. SYSTEM WAS NOT DEVELOPED FOR SPECIAL PURPOSE HARDWARE (ADDEND)

Z. COMMENT

[illegible]

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A1	GP6			N/S		IBM		IBM	MC8	CUC	IBM																			
01 A2	GP7			GMJ		GP7		GMJ	GP5	GP7																				
01 A3	DEL								IBM																					
01 A4									GP7																					
01 B1							IBM																							
01 B2							SOS																							
01 C				YES				C01					YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 Y	C01		C01			C01						C04					C01			C04	C01				C01	C01	C01	C04	C01	C01

## QUESTION 13

THE CUSTOMER OR USER WAS: (TAKEN PARTLY FROM COMPUTER DECISIONS APPLICATION FORM, JUNE 1977 ISSUE)

- A. IN-HOUSE TO MY COMPANY OR MAJOR DIVISION
- B. WITHIN MY PARENT ORGANIZATION
- C. A MANUFACTURER OF COMPUTER HARDWARE
- D. A MANUFACTURER OF OTHER THAN COMPUTER HARDWARE
- E. A SOFTWARE HOUSE
- F. AN ENGINEERING SERVICE AND TECHNICAL SUPPORT ORGANIZATION
- G. THE GOVERNMENT: FEDERAL (NON-MILITARY), FEDERAL (MILITARY), STATE, COUNTY, MUNICIPAL
- H. A UNIVERSITY OR EDUCATIONAL INSTITUTION
- I. A COMPUTER SERVICE BUREAU, TIME-SHARING SERVICE BUREAU
- J. AN ADP CONSULTANT AND/OR EDUCATION SERVICE
- K. FINANCIAL: BANKING, INSURANCE, REAL ESTATE, SECURITIES, CREDIT
- L. IN THE WHOLESALE OR RETAIL TRADE
- M. IN MEDICAL OR LEGAL SERVICES
- N. IN TRANSPORTATION SERVICES
- O. UTILITIES: COMMUNICATIONS, ELECTRIC, GAS
- P. FOREIGN GOVERNMENT (ADDED)
- Z. OTHER

## RESPONDOR

ALCOBORN																															
PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A					YES																									YES	
01 B							YES		YES					YES																	
01 C					YES																										
01 D							YES																								
01 G	YES	YES	YES	YES			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	
01 P																															

## RESPONDOR

RESPONDENT																															
PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A					YES	YES											YES		YES	YES	YES				YES	YES			YES	YES	
01 B																															
01 C	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	
01 D																															
01 E																															
01 F																															
01 G																															
01 H																															
01 I																															
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01 K																															
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01 M																															
01 N																															
01 O																															
01 P																															
01 Q																															
01 R																															
01 S																															
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01 U																															
01 V																															
01 W																															
01 X																															
01 Y																															
01 Z																															

C02

## WAS THE CUSTOMER PURCHASING THE SOFTWARE SYSTEM FOR OTHER USERS?

A.	YES
B.	NO
Z.	CUMULATIVE

PANT/SUB	RESPONDOR
101	102
103	103
104	104
105	105
106	106
107	107
108	108
109	109
110	110
111	111
112	112
113	113
114	114
115	115
116	116
117	117
118	118
119	119
120	120
121	121
122	122
123	123
124	124
125	125
126	126
127	127
128	128
129	129
130	130

[illegible]

RESPONDENT	
PANI/SUB	RESPONDENT
201	201
202	202
203	203
204	204
205	205
206	206
207	207
208	208
209	209
210	210
211	211
212	212
213	213
214	214
215	215
216	216
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218	218
219	219
220	220
221	221
222	222
223	223
224	224
225	225
226	226
227	227
228	228
229	229
230	230

Q	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	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	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00
Q	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	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	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00
Q	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	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	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00
Q	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	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	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00
Q	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	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	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00
Q	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	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	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81</																			



QUESTION 16

UNDER WHICH OF THE FOLLOWING CONTRACT TYPES OR AGREEMENTS WAS THE SOFTWARE SYSTEM DEVELOPED? (AFPM, 1976)

- A. FIRM FIXED PRICE
- B. FIXED PRICE WITH ECONOMIC PRICE ADJUSTMENT
- C. FIXED PRICE INCENTIVE
- D. FIRM FIXED PRICE LEVEL OF EFFORT
- E. COST
- F. COST SHARING
- G. COST PLUS INCENTIVE FEE
- H. COST PLUS AWARD FEE
- I. COST PLUS FIXED FEE
- J. TIME AND MATERIALS
- K. LABOR-HOUR
- L. BASIC ORDERING AGREEMENT
- Y. NO CONTRACT WAS USED (ADDED)
- Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A						YES								YES				YES	YES	YES	YES									
01 B																														
01 E					YES			YES		YES																				
01 F															YES															STA
01 G																								YES	YES	YES				
01 H																C03	YES													
01 I			YES	YES				YES																		YES	YES			
01 J																														
01 L																														
01 X																														
01 Y																														

MIS

C01

LO



QUESTION 17

IF THE CONTRACT HAD AN INCENTIVE CLAUSE (FOR SOFTWARE), WHAT WAS THE INCENTIVE BASED ON? (ADDED)  
 A. REDUCED (OR MEETS) COST (ADDED)  
 B. EARLY (OR MEETS) DELIVERY (ADDED)  
 C. INCREASED PERFORMANCE (EXPLAIN HOW IT WAS MEASURED)  
 Y. CONTRACT DID NOT HAVE AN INCENTIVE CLAUSE  
 Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A																YES					YES	YES	YES								
01 B																					YES	YES									
01 C																					YES	COM		YES	YES						
01 X																														MIS	
01 Y	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON											
01 Z																															

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A																															
01 B																															
01 C																															
01 Y	NON				NON	C01	C01	NON		NON	C01	NON	NON	NON	NON	NON	NON	C01	NON	NON	NON	NON	NON	NON	C01	C01		NON		NON	
01 Z																															



## QUESTION 18

WHAT WAS THE TOTAL COST OF THE PROJECT TO THE CUSTOMER? (IF EXACT  
AMOUNT NOT AVAILABLE, PLEASE GIVE A RANGE OR EXPLAIN)  
\$\*\*\*\*\*

## RESPONDER

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
01 001 505 275 136 355 204 255 374 135 306 156 255 526 507 105 UNK UNK 706 254 204 306 126 305 276 107 754 217 204 UNK 307 304

## RESPONDER

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
01 001 135 207 137 157 206 255 405 127 307 125 127 MIS 105 175 405 126 505 155 305 345 254 306 605 405 205 505 305 375 305 305

QUESTION 19

HOW MUCH OF THE TOTAL COST (ESTIMATED) WAS ATTRIBUTABLE TO THE  
PRODUCTION OF SOFTWARE, INCLUDING MACHINE TIME, PROGRAMMER SALARY,  
(MANAGEMENT OF SOFTWARE DEVELOPMENT, OVERHEAD RELATED TO SOFTWARE),  
AND OTHER ADP OPERATING EXPENSES? (ADDED)  
3\*\*\*\*\*

RESPONDOR																														
PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 001	355	275	405	355	204	204	254	135	505	205	704	185	157	504	UNK	UNK	505	503	303	905	705	305	166	856	704	186	154	356	206	304
RESPONDOR																														
PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 001	135	275	156	186	504	155	185	805	305	204	107	MIS	105	175	205	585	105	504	105	175	403	705	854	305	205	255	185	155	305	305

QUESTION 20

THIS PROJECT BEGAN (FIRST ASSIGNMENT) IN (SIGN OFF) IN  
(MONTH, YEAR) AND ENDED, (ON WILL END) (SIGN OFF) IN  
(MONTH, YEAR). (ADDED)

RESPONDOR

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
01 A 001 012 009 001 007 006 002 004 001 006 006 009 003 006 008 006 001 001 007 006 006 006 003 006 006 006 001 001 001  
01 B 070 072 073 076 075 076 072 074 071 076 076 072 073 074 069 074 072 076 072 073 075 073 072 072 074 072 075 061 077  
01 C 004 006 006 012 007 011 009 005 N/S 006 002 006 001 006 003 006 008 012 007 006 003 012 012 002 006 006 006 008 011 004  
01 D 073 075 077 078 077 077 077 075 INF 074 078 079 079 076 076 073 075 072 077 079 078 076 076 074 075 080 074 078 064 078

RESPONDOR

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
01 A 009 006 009 010 007 006 006 008 003 008 003 007 002 001 006 004 006 008 001 009 003 006 006 006 008 004 010 005  
01 B 071 067 074 073 068 071 073 077 075 075 073 073 075 075 069 071 070 075 076 076 074 073 072 075 074 074 074 076  
01 C 009 006 009 007 006 007 066 003 010 011 003 004 003 005 006 012 006 011 012 010 006 004 006 006 001 010 005 011  
01 D 073 083 076 083 071 075 075 082 076 077 080 077 078 077 077 077 073 072 077 077 077 076 075 076 078 077 076 076 077

01 X

MIS

MIS

# QUESTION 21

IN WHAT LANGUAGE WAS THIS DATA SYSTEM PROGRAMMED? IF MORE THAN ONE

LANGUAGE WAS USED PLEASE INDICATE APPROPRIATE PERCENTAGES.

A. FORTRAN \*\*\*\*\*

B. JOVIAL \*\*\*\*\*

C. COBOL \*\*\*\*\*

D. ASSEMBLER (UNSPECIFIED) (ADDED) \*\*\*\*\*

E. CMS-2 (ADDED) \*\*\*\*\*

F. PL/I (ADDED) \*\*\*\*\*

G. HIGHEN ORDER LANGUAGE (UNSPEC) (ADDED) \*\*\*\*\*

Z. OTHER \*\*\*\*\*

## RESPONDOR

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130

01 A 100 060 060 010 095 100 010 100 100 075 001 060 090 020 090

01 B 075 100 090 090 090

01 C 100 025 100 100 010 040 100 040 005 100 010 090 025 099 040 010 100 100

01 D 090 100 010 040 100 040 090 005 100 010 090 025 099 040 010 100 100

01 E 090 100 090 090 090 090 090 090 090 090 090 090 090 090 090 090 090 090

01 F 090 090 090 090 090 090 090 090 090 090 090 090 090 090 090 090 090 090

01 G 090 090 090 090 090 090 090 090 090 090 090 090 090 090 090 090 090 090

01 Z 010 090 090 090 090 090 090 090 090 090 090 090 090 090 090 090 090 090

## RESPONDOR

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230

01 A 080 080 010 015 080 095 070 010 090 070 085 002 090 060 100

01 B 095 095 095 095 095 095 095 095 095 095 095 095 095 095 095 095 095 095

01 C 095 095 095 095 095 095 095 095 095 095 095 095 095 095 095 095 095 095

01 D 020 020 090 030 100 085 100 020 100 100 030 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100

01 E 070

01 G 070

QUESTION 22

IN TOTAL, APPROXIMATELY HOW MANY LINES OF SOURCE CODE WERE WRITTEN?

A. EXECUTABLE

B. COMMENTS

C. OTHER NON-EXECUTABLE

RESPONDER

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	203	154	304	853	103	602	203	423	603	563	573	502	125	103	153	603	501	502	303	504	104	504	105	104	264	402	202	453	183	
01 B	103	503	303		103	302	502	104	603					153	103	500	501				401	105				801	102		702	
01 C			503		502	202	502	233		502	103				602	303	500	501		504		302							152	
01 X																														

MIS

RESPONDER

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	503	304	503	104	303	203	163	633	413	402	304		403	303	802	203	143	504	503	144	402	704	513	254	504	104	253	204	653	704
01 B	503		963	503	202		123		202				302	102	203				114	203	501	184			104	303			753	
01 C		203		502		103	202		202	104					102	153				103		393			503		203		203	
01 X																														

MIS

## QUESTION 23

USING TABLE 1 ON THE FOLLOWING PAGE PLEASE ESTIMATE THE COMPLEXITY  
OF THE DATA SYSTEM (FROM 12 TO 60). ALL DESCRIPTIONS PERTAIN TO  
SOFTWARE ONLY. THE COMPLEXITY RATING:\*\*\*\*\*

## RESPONDOR

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
01 001 053 049 041 048 050 014 040 038 046 039 041 040 050 050 041 046 047 020 060 046 053 043 057 049 049 044 038 036 054 024

## RESPONDOR

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
01 001 039 050 045 045 041 048 050 049 046 028 039 M15 045 047 039 047 043 042 048 036 028 048 044 041 048 040 042 045 043 041

## QUESTION 24

APPROXIMATELY HOW LARGE A DATA BASE WAS THE SYSTEM DESIGNED FOR?  
 (FILL IN BLANK WITH NUMBER OF BYTES OF DATA)\*\*\*\*\*

## RESPONDER

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
 01 001 205 104 605 107 188 202 306 105 108 403 503 103 304 MIS 202 N/A 303 104 404 203 108 805 405 505 508 MIS 303 602 MIS 205

## RESPONDER

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
 01 001 108 UNK 803 305 N/A 246 N/A 105 MIS 502 404 MIS 103 103 104 N/A 503 104 203 603 404 304 302 106 INF MIS 507 MIS 246 305

QUESTION 25

WHO PREPARED THE REQUIREMENT SPECIFICATIONS?

- A. THE CUSTOMER
- B. AN ORGANIZATION AFFILIATED WITH THE CUSTOMER, BUT NOT THE CUSTOMER HIMSELF
- C. YOUR ORGANIZATION, E.G., A TWO-STEP PROCUREMENT, AN UNSOLICITED PROPOSAL, ETC.
- D. AN OUTSIDE CONSULTING FIRM
- E. A THIRD CONTRACTOR, E.G., AN INTEGRATING CONTRACTOR
- F. NONE PREPARED (ADDED)
- Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A										YES	YES									YES		YES		YES	YES	YES				YES
01 B			YES	YES															YES		YES		YES		YES		YES			
01 C					YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 E	YES									YES																				

YES

C03

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A			YES				YES			YES			C03					YES		YES				YES						YES
01 B					YES						YES											C03			YES	YES	YES	YES	YES	YES
01 C	YES	YES		C03		YES	YES	C03	YES		C01		YES	YES	YES	YES	C03	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES



QUESTION 26

IF YOUR ORGANIZATION PREPARED THE REQUIREMENT SPECIFICATIONS DID THE CUSTOMER PARTICIPATE?

- A. YES
- B. NO (CUSTOMER DID NOT PARTICIPATE) (ADDED)
- C. NO, CUSTOMER WAS SOURCE (ADDED)
- Y. NOT APPLICABLE, YOUR ORGANIZATION DID NOT PREPARE SPECS (ADDED)
- Z. COMMENT

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A				C04	YES	YES	YES				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B					YES										YES	YES	YES	YES												
01 C								C02	C01	C01											C01			C04	C01					C01
01 X																														
01 Y				C01	C02	C02																								

MIS

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B					YES					YES				YES																
01 C				C04			YES		YES	YES		YES									YES				YES					
01 Y					NON																					NON	NON	NON	NON	NON

QUESTION 27

ON A SCALE OF 1 TO 7, WITH 1 BEING LITTLE MORE THAN THE NAME OF THE  
SYSTEM, AND 7 BEING COMPLETE SPECIFICATIONS DOWN THROUGH PRELIMINARY  
DESIGN, HOW DETAILED WERE THE SPECIFICATIONS PROVIDED?

RESPONDER

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
01 001 005 007 005 002 005 007 002 007 007 004 003 007 006 002 005 007 004 001 001 006 005 003 007 007 005 006 003 004 MIS 001

RESPONDER

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
01 001 005 003 004 003 003 005 005 007 005 005 MIS 005 006 003 006 005 004 007 003 003 007 002 005 005 004 003 006 004 005

QUESTION 2# WAS IT NECESSARY TO REWRITE THE SPECIFICATIONS BEFORE PROCEEDING WITH DESIGN?

- A. YES (SPECIFY PERCENT REWRITTEN)
- B. NO (SPECIFICATION WERE ADEQUATE) (ADDED)
- C. YES, HOWEVER SPECIFICATIONS NEVER REWRITTEN (ADDED)
- D. YES, REWRITTEN CONCURRENT WITH DESIGN (ADDED)
- Y. N/A, REQUIREMENT SPECIFICATIONS WERE NEVER REWRITTEN (ADDED)
- Z. COMMENT

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130		
01 A			020			020	030	060	060	080	020	050		095	050		020	100		100	050	050	015	020		050	100					
01 B	YES				YES		YES						YES				YES	YES			YES											
01 C																																
01 D																																

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230		
01 A				080	015	010		025	020	030	030	030		090	025	050	100		020	040	040	020		075	020	030	050					
01 B		YES	YES		YES								YES	YES	YES	YES		YES	YES													
01 X																																

QUESTION 29

IF IT WAS NECESSARY TO REWRITE THE SPECIFICATIONS, WHAT WAS THE REASON? (ORIGINALLY NARRATIVE)  
 A. ERRORS IN SPECIFICATION  
 B. SPECIFICATIONS WERE AMBIGUOUS, INCOMPLETE, AND/OR INCONSISTENT  
 C. CHANGE IN SCOPE OF PROJECT  
 D. CHANGE IN REQUIREMENTS OF PROJECT  
 E. CHANGE IN HARDWARE DESIGN  
 F. NORMAL WAY OF DOING BUSINESS  
 G. CUSTOMER AND/OR DEVELOPER BECAME BETTER INFORMED  
 Y. WAS NOT NECESSARY TO REWRITE SPECIFICATIONS OR REQUIREMENT  
 Z. OTHER

PART/SUB	RESPONDOR	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A	C02																															
01 B	C02 C02									C02 C02 C02 C02																						
01 C	C02																															
01 D	C02																															
01 E																																
01 F																																
01 G	C02																															
01 Y	C01																															

RESPONDOR		201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
PART/SUB																																
01 A										C02	C02													C02	C02	C02					C02	
01 B					C02								C02			C02							C02			C02					C02	
01 C																			C02													
01 D							C02											C02														
01 F													C02	C02																		
01 G								C02			C02	C02	C02							C02					C02						C02	
01 X	UNK																															
01 Y			C01	C01		C01		C01						C01	C01		C01					C01	C01								C01	

THE SPECIFICATIONS WERE PREPARED;  
 USING TOP-DOWN (HIERARCHY OF FUNCTION) TECHNIQUES  
 USING STRUCTURED DESIGN/FLOW TECHNIQUES  
 IN PHASES, WITH DESIGN AND CODING STARTED BEFORE THE REQUIREMENT  
 SPECIFICATION WAS COMPLETED  
 IN A FORMAL REQUIREMENT LANGUAGE (DESCRIBE)  
 IN SUCH A MANNER AS TO FACILITATE TRACKING THE DEVELOPMENT OF  
 SOFTWARE FROM REQUIREMENTS THROUGH CODING AND THE EACH DELIVERED  
 SOFTWARE MODULE TO SOME PART OF THE REQUIREMENTS.  
 (APPROXIMATELY++++++% OF THE REQUIREMENT COULD BE TRACKED)  
 IN PRECISE, MEASURABLE TERMS TO AID IN DEVELOPMENT OF ACCEPTANCE  
 TESTING (APPROXIMATELY++++++% OF THE REQUIREMENTS COULD BE  
 MEASURED)  
 G. ACCORDING TO MIL-STD8 (ADDED)  
 SPECIFICATION NEVER PREPARED/NONE (ADDED)  
 Y. COMMENT

44[illegible]

- THE FOLLOWING IS A LIST OF DOCUMENTATION THAT MAY BE REQUIRED BY A SOFTWARE DEVELOPMENT CONTRACT. CHECK EACH DOCUMENT REQUIRED IN THE PROJECT AND ADD REQUIRED DOCUMENTATION NOT CONTAINED IN THE LIST (DD FORM 4120.17M, DEC 1972)
- A. OBJECT LISTING/DECK/TAPE
  - B. SOURCE LISTING/DECK/TAPE
  - C. FUNCTIONAL DESCRIPTION--INITIAL DEFINITION OF A PROJECT WHICH PROVIDES THE ULTIMATE USER WITH A CLEAR STATEMENT OF THE OPERATIONAL CAPABILITIES TO BE DEVELOPED (ALSO SOMETIMES CALLED REQUIREMENTS SPECIFICATIONS).
  - D. DATA REQUIREMENTS DOCUMENT--PREPARED BY BOTH SYSTEM AND USER PERSONNEL WHEN A DATA COLLECTION EFFORT BY THE USER GROUP IS REQUIRED TO GENERATE AND MAINTAIN SYSTEM FILES.
  - E. SYSTEM/SUBSYSTEM SPECIFICATION--PREPARED FOR SYSTEM PERSONNEL, AS DETAILED AS POSSIBLE, CONCERNING THE ENVIRONMENT AND DESIGN ELEMENTS, IN ORDER TO PROVIDE MAXIMUM GUIDANCE TO THE PROGRAM DESIGN EFFORT; ALSO DEFINES SYSTEM/SUBSYSTEM INTERFACES.
  - F. PROGRAM SPECIFICATIONS--PREPARED FOR PROGRAMMERS; CONTAINS CONSIDERABLE DETAIL FOR THE PURPOSE OF GUIDING PROGRAM DEVELOPMENT
  - G. DATA BASE SPECIFICATION--PREPARED FOR PROGRAMMERS IN SUFFICIENT DETAIL TO PERMIT PROGRAM CODING AND DATA BASE GENERATION BY THE PROGRAMMING GROUP.
  - H. USERS MANUAL--TO PRESENT GENERAL AND SPECIFIC INFORMATION ON HOW A SPECIFIC COMPUTER PROGRAM WILL BE USED (INCLUDES POSITIONAL HANDBOOK FOR REMOTE INPUT TERMINALS) (ADDED)
  - I. COMPUTER OPERATIONS MANUAL--CONTAINS PRECISE DETAILED INFORMATION ON THE CONTROL, REQUIREMENTS AND OPERATING PROCEDURES NECESSARY TO SUCCESSFULLY INITIATE, RUN, AND TERMINATE THE SUBJECT SYSTEM.
  - J. PROGRAM MAINTENANCE MANUAL--CONTAINS GENERAL AND SPECIFIC INFORMATION FOR COMPUTER PERSONNEL RESPONSIBLE FOR THE MAINTENANCE OF THE COMPUTER PROGRAMS.
  - K. TEST AND IMPLEMENTATION PLAN--CONTAINS AN ORDERLY SCHEDULE OF EVENTS AND LISTS OF MATERIAL NECESSARY TO AFFECT TESTING AND DELIVERY OF A COMPLETE DATA PROCESSING SYSTEM.
  - L. TEST ANALYST REPORT--DESCRIBES THE STATUS OF THE COMPUTER PROGRAM SYSTEM AFTER TEST AND PROVIDES A PRESENTATION OF DEFICIENCIES FOR REVIEW BY STAFF AND MANAGEMENT PERSONNEL.
  - M. SOFTWARE DEVELOPMENT PLAN (ADDED)
  - N. SOFTWARE STANDARDS AND REQUIREMENTS (ADDED)
  - O. MANAGEMENT REPORTS (ADDED)
  - P. INTERFACE CONTROL (ADDED)
  - Q. BUDGET (ADDED)
  - R. PROGRESS REPORTS (ADDED)
  - S. ERROR/DISCREPANCY REPORT (ADDED)
  - T. PROGRAM CHANGE REQUESTS/STATUS (ADDED)
  - U. VERSION DESCRIPTION (ADDED)
  - V. SOFTWARE PRODUCT/OUTPUT SPECIFICATIONS (ADDED)
  - Y. DOCUMENTATION NOT REQUIRED (ADDED)
  - Z. OTHER



[illegible]





[illegible]

PART/SUB	RESPONDOR																															
	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230		
01 A1	IBM			N/S			IBM			IBM		IBM	IBM	LIT						DEL			N/S							CDC	CDC	CDC
01 A2	GP6			SMI	SLG		SMI			SMI		SMI	SMI	SMI						GM1			SLG							GP6	GP6	GP4
01 A3												LIT	LIT																			
01 A4													SMI	SMI																		
01 AA							YES	YES		015					012														012	015		
01 B				PCT	YES	643		YES		70X													483	YES						246		
01 BH																YES	YES			YES					YES				YES	YES	YES	
01 C	YES	PCT	YES	HTS			2-2		SRT	15X							SMI					SMI		YES		YES		202	202		SMI	YES

[illegible]

N/A

# QUESTION 33

IF YOU COULD AFFECT THE METHOD BY WHICH REQUIREMENTS WERE SPECIFIED, OR WERE ABLE TO INITIATE RESEARCH INTO IMPROVING THE REQUIREMENTS SPECIFICATION FUNCTION, WHAT ACTION WOULD YOU TAKE?

## RESPONDOR

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01 001	M2A	C1G	H7A	H11	MIS	H3B	H1P	MIS	CVD	MIS	H1B	H7D	MIS	MIS	H1J	MIS	H7H	MIS	H11	MIS	H1C	MIS	H4A	H1A	HMA	MIS	HMB	H9F	H4D	H1F
01 002	H3A	H1J	C1E			H3C	H1F	CVE			H9A	H1N		CME						H1J		H4B	H1B				H9E	D6L	CMO	
01 003																				CMC		P4A					H2B	H4A	H1J	
01 004																				CMC		P4B								H4C
01 005																														P3B

## RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230			
01 001	MIS	MIS	H1M	H4C	MIS	CRA	HRA	H4A	H9F	MIS	H4G	H1J	H1J	X1C	MIS	Q4C	H7A	H1J	H7E	MIS	H7B	Q5D	H4C	MIS	H1J	Q71	Q5A	P8A	H7A				
01 002				H4A	R9A						H7F	P8A	X1F	X9D				H7C	X7E	H4F				H7B		H4C	Q7A		H1C	H1D			
01 003																														H4B	H1L	H7L	CMH
01 004																														H4F	R9A	H1F	H4C
01 005																														H4E		H1H	

QUESTION 34

WHO DID THE PLANNING BEFORE THE PROJECT WAS ASSIGNED TO A GROUP OR INDIVIDUAL FOR ACCOMPLISHMENT?

- A. A (PERMANENT) PLANNING GROUP SET UP FOR THIS PURPOSE (ADDED)
- B. AN AD HOC PLANNING GROUP (ADDED)
- C. A STEERING COMMITTEE WHICH ESTABLISHED COSTS AND SCHEDULES
- D. AN ON-GOING PROJECT (ADDED)
- E. PROGRAM MANAGER WAS PICKED, AND HE DID THE INITIAL PLANNING
- F. A STAFF FUNCTION
- Y. NO PLANNING ACCOMPLISHED (ADDED)
- Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES	YES	YES	YES	YES										YES		YES				YES			YES		YES		YES		YES
01 H																														
01 C																														
01 E	YES	C03	C03	C03	C03	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	C03	YES	YES	YES	YES	YES	YES	YES	YES
01 F																YES									C03	YES				

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A				YES					YES		YES															YES				YES
01 B																											C03			
01 C															YES	YES	YES										C03			
01 D																														
01 E	YES	YES	YES	C03	C03	YES	YES	YES	YES	C03	C03	C03	C03	C03	C03	YES	C03	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	C03
01 F																														
01 Z																														

QUESTION 35

IN PLANNING FOR THIS PROJECT DID/WAS:

- A. THE PROJECT MANAGER USE A FORMAL PLANNING GUIDE?
- B. THE CUSTOMER ACTIVELY PARTICIPATE IN THE PLANNING FUNCTION?
- C. A WORK BREAKDOWN STRUCTURE (WBS) EMPLOYED IN PLANNING THE SOFTWARE DEVELOPMENT? (APPROXIMATELY HOW MANY LEVELS?)
- D. THE PROJECT DIVIDED INTO SEPARATE PHASES FOR THE PURPOSE OF PLANNING
- Y. NONE (ADDED)
- Z. COMMENT

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A				YES	YES	YES				YES		YES		YES		YES		YES		YES		YES		YES		YES		YES		YES
01 B	YES											YES		YES		YES		YES		YES		YES		YES		YES		YES		YES
01 C	006	004	005		YES	YES				004	001			001	YES			005		005		003	005	007		005				
01 D	YES		YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 Y																														C02
01 Z																														UTH

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A																														YES
01 B							YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C	006	YES	004		003	YES	004	YES	003	004				004	003	003	005	YES		005	003		006		006				005	005
01 D	YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 X																														
01 Y																														
01 Z																														UTH

NON

QUESTION 36

WHAT TOOLS WERE USED IN PLANNING THE PROJECT?

- A. PERT
- B. MODIFIED PERT
- C. CPM (CURM)
- D. GANTT
- E. WORKLOADING CHARTS
- F. MILESTONE (ADDED)
- G. CSCS (ADDED)
- H. WBS (ADDED)
- I. NONE
- J. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A													YES	YES							YES									
01 B			YES	YES		YES	YES		YES						YES								YES							
01 C																							YES							
01 D			YES	YES		YES			YES	YES	YES	YES	YES		YES						YES			YES						
01 E		YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 F																														
01 G																														
01 H																														
01 I																														
01 J																														
01 K																														

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A																														
01 B																														
01 D																														
01 E		YES																												
01 F																														
01 G																														
01 H																														
01 I																														
01 J																														
01 K																														

QUESTION 37

WHAT METHOD WAS USED IN ESTIMATING THE COST AND SCHEDULE FOR THE PROJECT?

- A. A FORMULA (TOP DOWN) (ADDED)
- B. ESTIMATES BASED ON A SIMILAR PROJECT
- C. PROVIDED BY SOMEONE WHO HAS A KNACK FOR ESTIMATING CORRECTLY
- D. BOTTOM-UP AGGREGATING (ADDED)
- E. COST AND/OR SCHEDULE WERE DICTATED (ADDED)
- F. SIMULATION MODEL
- G. CRYSTAL BALL (OR SIMILAR MEANS)
- H. COST AND SCHEDULE NOT ESTIMATED (ADDED)
- I. OTHER

RESPONDOR		101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
PART/SUB																															
01 A	C03				YES	YES	YES	YES				YES	YES	YES	YES	YES	YES	YES	YES					YES	YES						YES
01 B		YES	YES	YES		YES				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C				YES	YES																										YES
01 D	C03																				YES										
01 E																YES		YES	YES	YES		C03			YES						YES
01 G																		YES													YES
01 Z																															

RESPONDOR		201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
PART/SUB																															
01 A		YES						YES	YES	YES										YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C						YES	YES				YES							YES		YES											YES
01 D																															YES
01 E			YES					YES											YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 F																															
01 G	YES	YES																													YES



QUESTION 30

IF THE FORMULA APPROACH (AND/OR OTHER ESTIMATING TECHNIQUE) WAS USED  
WHAT WERE THE ELEMENTS OR VARIABLES CONSIDERED (ADDED) (GILSEN 1977)

- A. COMPUTER TIME
- B. DOCUMENTATION
- C. TRAINING
- D. TRAVEL
- E. SITE PREPARATION/CONSTRUCTION
- F. RATIO MANAGEMENT & OVERHEAD TO PROGRAMMERS
- G. KEYPUNCH
- H. OFFICE SUPPLIES
- I. OFFICE SPACE
- J. PERSONNEL EQUIPMENT, I.E., DESKS, PENCILS, PAPER, ETC.
- K. PROGRAMMER PROFICIENCY
- L. PROGRAM COMPLEXITY/FUNCTION
- M. TESTER PROFICIENCY
- N. NUMBER OF MODULES (SUB ROUTINES)
- O. LINES OF CODE (ADDED)
- P. SIZE OF PROGRAM (ADDED)
- Q. REQUIREMENT SPECIFICATION COMPLETENESS (ADDED)
- R. CUSTOMER SUPPORT (ADDED)
- S. HISTORICAL DATA (ADDED)
- T. AVAILABILITY OF SUPPORT SOFTWARE (ADDED)
- U. CALENDAR PERIOD (ADDED)
- V. SIZE OF DATA BASE (ADDED)
- W. EXPERIENCE (NEWNESS) WITH SYSTEM (ADDED)
- X. NOT USED
- Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES						YES								YES										YES					YES
01 B	YES				YES		YES	YES		YES	YES													YES		YES				YES
01 C					YES		YES																		YES					YES
01 D	YES				YES		YES																		YES					YES
01 E					YES																									
01 F					YES		YES			YES														YES		YES				
01 G										YES																				
01 H					YES																									
01 K	YES			YES	YES	YES	YES			YES																				YES
01 L	YES				YES		YES			YES	YES	YES	YES	YES	YES									YES						YES
01 M											YES													YES						
01 N	YES				YES	YES	YES			YES					YES									YES						YES
01 O																														
01 P																														



QUESTION 39

AFTER THE ORIGINAL SOFTWARE DEVELOPMENT PLAN AND SCHEDULE WERE DETERMINED AND SUBMITTED FOR REVIEW BY SENIOR MANAGEMENT AND/OR CUSTOMER WAST

- A. THE DELIVERY DATE SHORTENED BY SENIOR MANAGEMENT
- B. THE DELIVERY DATE SHORTENED BY THE CUSTOMER
- C. THE DELIVERY DATE LENGTHENED BY SENIOR MANAGEMENT
- D. THE DELIVERY DATE LENGTHENED BY THE CUSTOMER
- E. THE DELIVERY DATE ORIGINALLY DICTATED (ADDED)
- F. THE REQUIREMENTS CHANGED TO MATCH SCHEDULE (ADDED)
- G. RESOURCES REDUCED (ADDED)
- H. NO CHANGE (ADDED)
- I. COMMENT

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A															YES							YES								YES
01 B			YES									C03																		
01 C															YES	C03														
01 D													YES									YES		YES						YES
01 E			C02									C02									C01	C02								C02
01 F																														
01 G																														
01 X																														
01 Y																														

58

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A															YES								YES							YES
01 B																							YES		YES					YES
01 C																							YES							YES
01 D															YES							YES								YES
01 E																														
01 F																														
01 G																														
01 X																														
01 Y																														
01 Z																														

OTH

QUESTION 40

IN THE PROCESS OF SOFTWARE SYSTEM DEVELOPMENT WHICH OF THE FOLLOWING

PLANNING DOCUMENTS WERE PREPARED?

- A. PROJECT MANAGEMENT
- B. RESOURCE REQUIREMENTS
- C. ORGANIZATION
- D. STAFFING
- E. TRAINING
- F. TEST
- G. SOFTWARE DEVELOPMENT
- H. PHASE AND/OR DELIVERY
- I. DOCUMENTATION
- J. IMPLEMENTATION
- K. DATA CONVERSION
- L. CHANGE CONTROL
- M. CONFIGURATION MANAGEMENT (ADDED)
- N. REVIEW & REPORTING
- O. PRODUCT ASSURANCE (ADDED)
- P. WORK BREAKDOWN STRUCTURE (ADDED)
- Q. BUDGET (ADDED)
- Y. NONE
- Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES	YES	YES				YES	YES	YES	YES						YES				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B	YES	YES				YES	YES	YES	YES	YES	YES	YES	YES			YES				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES		YES				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 D	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 E	YES	YES					YES	YES	YES	YES						YES					YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 F	YES	YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 G	YES	YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 H		YES		YES	YES	YES	YES		YES	YES	YES	YES	YES	YES	YES	YES					YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 I	YES	YES			YES	YES	YES	YES	YES	YES			YES	YES	YES	YES					YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 J	YES	YES			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES					YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 K							YES									YES														
01 L	YES	YES	YES			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 M																														

C02



QUESTION 41

FROM PROJECT INCEPTION THROUGH DELIVERY OF THE COMPLETED SYSTEM,  
APPROXIMATELY WHAT PERCENT OF THE TIME WAS SPENT BY ALL PERSONNEL IN  
PLANNING FOR SOFTWARE? \*\*\*\*\*

RESPONDOR

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
01 001 MIS 005 MIS 003 040 005 010 005 030 005 015 010 012 005 002 MIS 003 010 005 005 015 MIS MIS 010 010 MIS 015 001 010 005

RESPONDOR

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
01 001 010 UNA 010 010 010 010 002 015 005 035 030 001 008 002 030 010 020 040 010 010 003 010 007 030 020 015 025 005 010

QUESTION 42

IN A FURTHER BREAKDOWN OF PLANNING ACTIVITIES, APPROXIMATELY WHAT PERCENTAGE OF THE TIME WAS SPENT ON EACH OF THE FOLLOWING? (SHOULD APPROXIMATE 100%)

- A. ORGANIZATIONAL PLANNING
- B. STAFF PLANNING
- C. DEVELOPING CONTROL PROCEDURES
- D. ADMINISTRATION PLANNING
- E. QUALITY ASSURANCE PLANNING
- F. DEVELOPING AN OVERALL PROJECT MANAGEMENT PLAN
- G. DESIGN STANDARDS (ADDED)
- H. TEST PLANNING (ADDED)
- I. DOCUMENT & CONFIGURATION MGMT. PLANNING (ADDED)
- J. NONE (ADDED)
- K. OTHER

RESPONDENT

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	005	010	033	010	010	010	010	005	010	025	010	002	016	005	YES		030	040	020		005	005			050		015			000
01 B		010	010	033	030	010	050	010	010	025	005	010	016	001		030	010	010		010	010			050		010			000	
01 C	050	030	033	020	030	010	010	020	010	005	010	020	042	004		005	010	015		015	005					020			020	
01 D		005	030		015	010	010	005	010	005	005	015		015		005	005	015		010	005					015			035	
01 E		015	010		015	025		015	030	010	020	015	008	025		010	005	010		010						020			015	
01 F		010	010		010	015	020	045	030	030	050	005	016	015		020	020	020		015	075					020			030	
01 X	MIS														MIS	MIS			MIS	MIS			MIS	MIS		MIS		MIS	MIS	
01 Z		005									033		035				010	010		035										

RESPONDENT

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	003		020	010	010	010		010	020	010	010	050	025	050	YES	020	010	005	040	010	005	020	010	020	000	015	010	020		
01 B	005		030	015	020	060	010		010	010	010	010		025	025	YES	010	020	010		030	015	005	030	030	005	045	010	005	
01 C		020	010	020	020	060		020	030	035	020	050		025	YES	020	010	025	040		010	010	010	005	005	015	005	020	020	
01 D	020			005	010	010			005	010	010	010			YES	005	020	015			005	010	010	020	000	010	030	020		
01 E	005			010	030		030		025	010	015	020			YES	010		025	020		015	005	015	005	005	005	020	030		
01 F	002		030	050	010			015	020	020	030		050		YES	035	040				030	040	050	025	020	020	010	040	015	
01 G	020							015																						
01 H	040																				030				010					
01 I	005																				010									
01 X																														
01 Z																														

CFU

UNK

QUESTION 43

THE SYSTEM WAS:  
 A. DELIVERED TO THE USER AS AN ENTITY  
 B. DELIVERED TO THE USER IN PHASED INCREMENTS  
 C. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A	YES																														
01 B	YES																														
01 Z																															

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A	YES																														
01 B	YES																														
01 X																															
01 Z																															



QUESTION 44

WAS EVERY MAJOR SOFTWARE MODULE DESIGNED IN TOTAL BEFORE ANY CODING  
WAS STARTED?  
A. YES  
B. NO (PERCENT OF DESIGN COMPLETED WHEN CODING STARTED\*\*\*\*\*X)  
Z. COMMENT

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A	YES					YES											YES	YES					YES	YES							
01 B		050	YES	075	030		YES	085	060	050	YES	YES	070	020	030	040	030			YES	060	YES	040		YES	090	060	050	020		
01 Z																															OTH

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A							YES		YES	YES	YES							YES		YES	YES	YES								YES	
01 B	075		YES	050	090	YES		YES			035	040	090	050	050	010	090	070		080	050			090	080	060	075	065	080		
01 X																															UNK

QUESTION 45

- A. QA PROGRAM WAS:  
 A. APPLIED INFORMALLY  
 B. APPLIED FORMALLY AND DOCUMENTED SEPARATELY  
 C. APPLIED FORMALLY AND DOCUMENTED AS PART OF THE PROJECT MANAGEMENT PLAN  
 Y. NOT APPLICABLE TO (OR USED ON) THIS PROJECT (ADDED)  
 Z. COMMENT

RESPONDER

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A				YES	YES	YES	YES	YES	YES	YES					YES						C01	YES		YES		YES		YES	YES	YES
01 B	YES		YES										YES																	
01 C											YES	YES					YES				YES			YES	YES					
01 X																														
01 Y															NON		NON	NON	NON											

MIS

RESPONDER

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	YES			YES			YES			YES	YES	YES			YES		YES				YES	YES		YES	YES		YES	YES	YES	YES
01 B		YES			YES	YES	YES		YES		YES										YES	YES			YES					
01 C							YES							YES			YES													
01 Y															NON		NON													
01 Z																														

C02

OTH

01

QUESTION 46

IN WHICH OF THE FOLLOWING AREAS WERE FORMAL (AND/OR) DOCUMENTED QA STANDARDS APPLIED AND WERE THESE COMPANY-WIDE STANDARDS OR STANDARDS DEVELOPED SPECIFICALLY FOR THIS PROJECT? (ADDED) (DURING 1976)

01 COMPANY-WIDE STANDARDS  
02 LOCAL TO PROJECT

- A. DOCUMENTATION  
B. WORK BREAKDOWN STRUCTURE (WBS) CODE  
C. SCHEDULING  
D. PERFORMANCE MEASUREMENT  
E. REQUIREMENT ANALYSIS  
F. PRELIMINARY DESIGN  
G. DETAIL DESIGN  
H. CODING  
I. TEST PLANNING  
J. SOFTWARE VERIFICATION  
K. REVIEWS AND AUDITS  
L. CONFIGURATION MANAGEMENT  
M. DISCREPANCY REPORTING AND CORRECTION  
N. SOFTWARE ACCEPTANCE  
Y. NO FORMAL (OR DOCUMENTED) QA STANDARDS (ADDED)  
Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A						YES			YES		YES												YES							
01 B		YES				YES			YES	YES					YES									YES						
01 C		YES				YES			YES						YES									YES						
01 D												YES												YES						
01 E												YES												YES						
01 F									YES				YES								YES			YES						
01 G						YES			YES			YES									YES			YES						
01 H						YES			YES			YES											YES							
01 I													YES											YES						
01 J																					YES			YES						
01 K		YES											YES		YES									YES						
01 L		YES				YES			YES			YES	YES								YES			YES						
01 M									YES															YES						
01 N									YES				YES											YES						
01 X													YES											YES						
01 Y																														

MIS

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RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A									YES			YES						YES	YES	YES					YES		YES	YES	YES	YES
01 B																			YES	YES		YES	YES							YES
01 C			YES						YES										YES	YES		YES	YES		YES		YES			
01 D																			YES			YES								
01 E																		YES	YES			YES								
01 F									YES			YES							YES						YES					YES
01 G								YES				YES							YES						YES		YES			YES
01 H																				YES										YES
01 I									YES		YES								YES	YES		YES							YES	YES
01 J																			YES	YES					YES		YES			YES
01 K			YES						YES	YES	YES							YES	YES			YES			YES		YES			YES
01 L			YES						YES										YES			YES	YES							YES
01 M									YES										YES	YES	YES		YES	YES		YES				YES
01 N																			YES	YES		YES	YES		YES		YES			YES
01 X																			YES	YES		YES			YES		YES			YES
01 Y																														

MIS

# RESPONDENT

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
02 A	YES	YES	YES	YES					YES		YES	YES	YES		YES				YES		YES			YES	YES		YES	YES		
02 B			YES									YES												YES	YES		YES			
02 C			YES	YES		YES					YES	YES									YES			YES	YES					
02 D		YES		YES		YES									YES	YES														
02 E		YES	YES	YES		YES									YES	YES	YES						YES	YES						
02 F		YES	YES	YES		YES					YES	YES			YES										YES		YES	YES		
02 G		YES	YES	YES							YES	YES			YES										YES			YES	YES	
02 H		YES		YES							YES	YES			YES								YES	YES			YES	YES		
02 I	YES	YES		YES		YES					YES	YES			YES					YES			YES				YES	YES		
02 J		YES	YES	YES		YES			YES		YES	YES			YES		YES						YES	YES		YES	YES			
02 K	YES		YES	YES		YES					YES	YES								YES			YES				YES			
02 L	YES		YES	YES							YES				YES		YES			YES			YES			YES	YES			
02 M	YES	YES	YES	YES		YES			YES		YES	YES			YES		YES			YES			YES	YES		YES	YES			
02 N	YES	YES	YES	YES		YES			YES		YES	YES			YES					YES			YES	YES		YES	YES			
02 X																														
02 Y																														

MIS

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NON

WART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230

[illegible]

A. PROGRAM MANAGER AUTHORITY--BOTH TECHNICAL AND ADMINISTRATIVE RESPONSIBILITY FOR PROJECT (HLACK 1977)

RESPONSIBILITY FOR PROJECT (BLACK 1977)

B. REVIEWS--FORMAL MILESTONE REVIEWS AT EACH PHASE (BLACK 1971)

### C. UNIT DEVELOPMENT FOLDERS--CAPTURE OF WORKING MATERIALS FOR E

IDENTIFIED ITEM TO FACILITATE AND ITEM DEVELOPMENT, TESTING,

DOCUMENTATION (INGRASSIA 1976)

## D. DESIGN DISCIPLINE AND VERIFICATION--TOP-DOWN DESIGN, FORMAL

REPRESENTATION, COMPLETION OF DESIGN, AND DELIBERATE VIRTIC

OF DESIGN PRIOR TO CODE (BLACK 1977)

## E. PROGRAM MODULARITY--DEFINITIONS/RESTRICTIONS ON DATA INTERFACES

## BETWEEN MODULES, ADHERENCE TO PARENT/CHILD RELATIONSHIPS HELD

**MODULES (BLACK 1977)**

## F. NAMING CONVENTIONS-STRUCTURED NAMES FOR MODULES AND/OR DATA

**NAMES (BLACK 1977)**

G. STRUCTURED FORMS--USE OF DIKSIIRA FORMS AS SUPPORTABLE IN YOUR PROGRAMMING LANGUAGE (1972)

# PROGRAMMING LANGUAGE (1972)

H. STRUCTURED WALKTHROUGHS--DELIBERATE PEER REVIEWS OF CODE FOR  
MIDWINTER (WINTER 1971)

# MODULE (WEINBERG 1971)

# 1. STRUCTURED ANALYSIS-A FORMAL DESCRIPTION OF THE USERS

1. STRUCTURED DESIGN--BUILDING SYSTEM FROM SMALL, HIGHLY INDEPENDENT REQUIREMENTS (LONDON 1978)

### 3. STRUCTURED DESIGN--BUILDING SYSTEM FROM SMALL, REUSEABLE SINGLE PURPOSE MODULES (YOURDON 1976)

K. CHIEF PROGRAMMER TEAMS--A DEVELOPMENT ORGANIZATION AROUND

# A PROGRAMME OF GREAT ABILITY (BAKER 1972)

L. HIPO--A DOCUMENTATION TECHNIQUE (IBM 1975)

### M. SUPPORT LIBRARIES AND FACILITIES--USE OF AUTOMATED OR

# PROCEDURALIZED DESIGN, CODING AND CONFIG MANAGEMENT

## ACCEPTANCE TESTING (BLACK 1977)

## N. PHASED TESTING--DEFINED AND FORMALIZED UNIT, FUNCTIONAL, AND

# ACCEPTANCE TESTING (BLACK 1977)

## 0. CONFIGURATION MGT/CHANGE CONTROL--CREATION AND CONTROL OF BA

AND PROCEDURES FOR PROBLEM REPORTING/RESOLUTION (BLACK 1977)

Y. NUNE OF THE ABOVE (ADDED)

## 2. OTHER

HOONDS 48

RESPONDENT																														
WANT/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130

[illegible][illegible][illegible][illegible][illegible][illegible][illegible]

[illegible]

## RESPONDER

[illegible]



QUESTION 48

WHICH OF THE BELOW LISTED DOCUMENTATION TYPES WERE USED IN THE PROJECT IF A SINGLE DOCUMENT COVERED MORE THAN ONE AREA, CHECK EACH AREA ACCOUNTED FOR. THE INTENT OF THIS QUESTION IS TO DETERMINE WHICH AREAS WERE COVERED BY DOCUMENTATION NOT THE ACTUAL DOCUMENT FORM. (SEE SECTION 2 FOR DEFINITIONS)

- A. FUNCTIONAL DESCRIPTION
- B. DATA REQUIREMENTS DOCUMENT
- C. SYSTEM/SUBSYSTEM SPECIFICATION
- D. PROGRAM SPECIFICATIONS
- E. DATA BASE SPECIFICATIONS
- F. USERS MANUAL
- G. COMPUTER OPERATIONS MANUAL
- H. PROGRAM MAINTENANCE MANUAL
- I. TEST ANALYST REPORT
- J. TEST PLANS (ADDED)
- K. INTERFACE CONTROL (ADDED)
- L. TRAINING COURSE (ADDED)
- M. VERSION DESCRIPTION (ADDED)
- N. SOFTWARE DEVELOPMENT PLAN (ADDED)
- Y. NONE (ADDED)
- Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 D	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 E	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 F	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 G	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 H	C04	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 I	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 J	C02											C02		C01						C02										C02
01 K																														
01 L																														
01 N																														
01 Z																														

RESPONDUM		201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
PART/SUM		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 A		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 D		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 E		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 F		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 G		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 H		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 I		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 J	C02																														
01 L	C02																														
01 M	C02																														
01 N	C02 YES																														
01 Z																															

QUESTION 49

WHICH SOFTWARE TOOLS/AIDS WERE SELECTED FOR USE ON THIS PROJECT?

- A. STRUCTURED PRE-COMPILERS
- B. AUTOMATIC FLOWCHARTERS
- C. LIBRARY MONITORS
- D. MACRO PROGRAMMING CAPABILITIES
- E. ON-LINE CAPABILITIES
- F. ON-LINE DEBUGGING
- G. AUTOMATIC TEST CASE GENERATORS
- H. SIMULATORS OR DRIVERS (ADDED)
- I. MATCH DEBUGGING AIDS (ADDED)
- J. STANDARDS AUDITORS (ADDED)
- Y. NO SOFTWARE TOOLS/AIDS EMPLOYED
- Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A											YES										YES					YES				
01 B	YES		YES										YES		C03				YES				YES	YES		YES		YES		
01 C	YES	YES	YES				YES				YES		YES		YES	YES	YES						YES		YES	YES				
01 D		YES	YES		YES		YES	YES	YES	YES					YES	YES					YES	YES	YES	YES	YES					
01 E	YES	YES		YES	YES	YES	YES	YES	YES	YES	YES		YES								YES				YES	YES				
01 F	YES	YES		YES	YES	C02	YES		YES	YES	YES	YES				YES					YES	YES	YES	YES	YES					YES
01 G													YES			YES					YES			YES						YES
01 H					YES																									
01 I															C02					C02										C02
01 J																								C02						
01 Y																			NON	NON										
01 Z																OTH	OTH			OTH	OTH									

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230			
01 A	YES																																
01 B			YES		YES														YES	YES													
01 C	YES																																
01 D	YES	YES				YES	YES				YES																						
01 E		YES	YES	YES		YES	YES	YES																									
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01 G			YES	YES							YES																						
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MON

OTH

A. COMPARISONS--USED TO COMPARE THE CODE OF ONE PROGRAM VERSION TO THAT OF ANOTHER FOR CODING ERRORS

## C. FLOWCHARTING--SHOW THE LOGIC STRUCTURE OF A PROGRAM

U. LOGIC/EQUATION GENERATORS--INTEGRATES LOGIC AND EQUATION GENERATION INTO A MACHINE-PROGRAMMING LANGUAGE.

THE MICROPROGRAMMING STATEMENTS INTO NETWORKS TO ANALYZE THE FLOW OF CONTROL AND CONSTRUCT ALGORITHMIC STATEMENTS

## E. PROGRAM

## F. CORRECTNESS PROVE-ESTABLISH

SYMBOLIC PRODUCTIONS

## INITIALIZATION TESTS--THE PERFORMANCE OF ALL INITIALIZATION

OPERATIONS IS TESTED TO ASSURE THAT ALL INDICATED INITIAL OPERATIONS ARE PERFORMED AND THAT CORRECT VALUES FOR ALL

### INITIALIZED QUANTITIES RESULT

OBTAINED FROM OTHER MODULES ARE EXAMINED TO DETERMINE THE

OR STATES

CHECKED TO DISCOVER WHEN INSUFFICIENT PRECISION IS ATTAINED.

INCORPORATING ANALYSIS OF THE LUNGEY AND SHOOTING  
STATIONS AND COLLECTIONS ARE FEASIBLE

FOR ALL TESTS ARE DETERMINED TO ESTABLISH THE EXECUTION BE CONTINUED FOR THE MIDDLE AND TO IDENTIFY POTENTIAL I

## PROBLEMS

BRANCH AND EACH CLOSED-LOUP TEST CASE ARE CHECKED. THE

CASES ARE IDENTIFIED AND THEIR CORRECTNESS DEMONSTRATED

### TEST CASES

WILL REPLACE (ADDED)

Y. NONE (ADDED)

6 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121

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PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 D																														
01 E																														
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# RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
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01 C																														
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01 H																														
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01 M																														
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# UNK

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C02 UNK

## QUESTION 51

IF YOU HAD TOTAL CONTROL OF THE PLANNING FUNCTION WITHIN YOUR ORGANIZATION, OR WERE ABLE TO INITIATE RESEARCH INTO HOW TO IMPROVE THE PLANNING FUNCTION, WHAT ACTIONS WOULD YOU TAKE?

## RESPONDENT

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
 01 001 PRE MIS PRD MIS PJD CIA P8B MIS P4C MIS MIS XMA P3A MIS P3A MIS PRD P5G P8B MIS D3H MIS MIS P1Y P3F MIS P8B MIS 91A X7A  
 01 002 P4E XRE P1D P8E 066  
 01 003 P4U D1H P8F  
 01 004 P1E  
 01 005 P1G

## RESPONDENT

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
 01 001 MIS MIS P8C 06A MIS MIS N/A PRD X9P MIS P5B P1A R1J X7B S2B P5H SIC D2C 02A MIS P1C CSG SIC X9F MIS P1D MIS P8B PRD X4A  
 01 002 P1D PHA P9B X1B X1F X7D P8J PHA CSC DSC X9U  
 01 003 CVB X1D CWC  
 01 004 CTC  
 01 005 X1E

QUESTION 52

IF IT WERE IN YOUR POWER TO MAKE CHANGES IN THE WAY TECHNICAL DECISIONS ARE MADE CONCERNING PROGRAMMING TECHNIQUES, TEST PROCEDURES, DOCUMENTATION STANDARDS, ETC., WHAT ACTION WOULD YOU TAKE?

RESPONDER

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 001	X98	MIS	X9A	MIS	CSI	X7C	XRB	MIS	XRB	MIS	MIS	X9E	MIS	MIS	P8E	04D	XRB	01H	07E	XRB	X7C	MIS	MIS	MIS	MIS	P1C	MIS	X9D	MIS	C1B	MIS
01 002			P1H																												
01 003																															

RESPONDER

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 001	MIS	MIS	X9C	CSA	MIS	MIS	X7C	C1A	X9N	MIS	X9K	S5A	X9L	X9M	01A	P5H	NON	X7C	02B	MIS	X7B	CSD	XRC	03A	MIS	CSE	MIS	X1A	MIS	CVB
01 002				CSC			X9D	CSH			H3B	03C			01B		06E				X7C			D3B		CSB		P9C		CMC
01 003												S5C													CSA		P9D			CMB
01 004												S5D													CSC					C1A
01 005												P5F																		



QUESTION 53

TO WHICH ORGANIZATION WITHIN THE FIRM WAS THIS SOFTWARE DEVELOPMENT PROJECT FIRST ASSIGNED?

A. A LINE ORGANIZATION UNDER THE AUTHORITY OF THE SENIOR ADP MANAGER

B. A LINE ORGANIZATION OUTSIDE THE AUTHORITY OF THE SENIOR ADP MANAGER (OR NO SENIOR ADP MANAGER) (ADDED)

C. A STAFF ORGANIZATION UNDER THE AUTHORITY OF THE SENIOR ADP MANAGER

D. A STAFF ORGANIZATION OUTSIDE THE AUTHORITY OF THE SENIOR ADP MANAGER (OR NO SENIOR ADP MANAGER) (ADDED)

Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	C03	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B						YES			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C																														
01 D																														

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	YES			YES	C03	C03	C04	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B		YES			YES	C03			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C																														
01 D																														

QUESTION 54

WHICH ORGANIZATION WAS RESPONSIBLE FOR DETERMINING THE INITIAL BUDGET, DELIVERY SCHEDULE, RESOURCE REQUIREMENTS, COMPUTER AVAILABILITY, ETC., (FOR SUPPLIANT)? (ADDED)

- A. THE ORGANIZATION TO WHICH THE PROJECT WAS INITIALLY ASSIGNED
- B. A LINE ORGANIZATION UNDER THE AUTHORITY OF THE SENIOR ADP MANAGER
- C. A LINE ORGANIZATION OUTSIDE THE AUTHORITY OF THE SENIOR ADP MANAGER (OR NO SENIOR ADP MANAGER) (ADDED)
- D. A STAFF ORGANIZATION UNDER THE AUTHORITY OF THE SENIOR ADP MANAGER
- E. A STAFF ORGANIZATION OUTSIDE THE AUTHORITY OF THE SENIOR ADP MANAGER (OR NO SENIOR ADP MANAGER) (ADDED)
- Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A	C03	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	C04
01 E																															YES

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230		
01 A	YES	YES	C03	YES		YES	YES	C04	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	C04		YES	YES	YES	YES	YES	YES	YES	YES	YES
01 H										YES	YES																					
01 C																																YES
01 D																																
01 E					YES																											

WHEN THIS PROJECT WAS INITIALLY ASSIGNED:

A. THE ULTIMATE PROJECT MANAGER PARTICIPATES IN DETERMINING THE

**SCHEDULE, BUDGET FIGURES, ETC.**

H. THE PLANNING, BUDGETING, AND ALLOCATION OF RESOURCES WAS DONE BY A

SPECIAL STAFF ESTABLISHED FOR THIS FUNCTION. (GIVE NAME)

C. AN AD HOC GROUP WAS SET UP TO HANDLE THE INITIAL ASSIGNMENT UNTIL

C. AN AD HOC GROUP WAS SET UP TO HANDLE THE ENTIRE REORGANIZING UNIT.  
A PERMANENT GROUP WAS ESTABLISHED

INFORMED  
A FURNISHED GROUP WAS ESTABLISHED

## RESPONDUR

REC#	ORDER#	DATE	TIME	UNIT	QTY	PRICE	TOTAL	TAX	GRAND TOTAL
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130

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STH QJV

**YES**

**WE SPONDER**

[illegible][illegible]

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QUESTION 56

TO WHICH ORGANIZATION WAS THE (SOFTWARE) PROJECT ASSIGNED FOR DEVELOPMENT? (ADDED)  
 A. THE ORGANIZATION TO WHICH THE PROJECT WAS INITIALLY ASSIGNED  
 B. THE ORGANIZATION RESPONSIBLE FOR DETERMINING INITIAL BUDGET, SCHEDULE, ETC.  
 C. A LINE ORGANIZATION UNDER THE AUTHORITY OF THE SENIOR ADP MANAGER  
 D. A LINE ORGANIZATION OUTSIDE THE AUTHORITY OF THE SENIOR ADP MANAGER (OR NO SENIOR ADP MANAGER) (ADDED)  
 E. A STAFF ORGANIZATION UNDER THE AUTHORITY OF THE SENIOR ADP MANAGER  
 F. A STAFF ORGANIZATION OUTSIDE THE AUTHORITY OF THE SENIOR ADP MANAGER (OR NO SENIOR ADP MANAGER) (ADDED)  
 Z. OTHER:

PART/SUB	RESPONDENT	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B																															
01 C																															
01 D																															

PART/SUB	RESPONDENT	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B																															
01 C																															
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01 X	MIS																														

QUESTION 57

THE SOFTWARE DEVELOPMENT WAS ORGANIZED UNDER (THE FOLLOWING PROJECT TYPES) (ADDED)

- A. A PROJECT ORGANIZATION
- B. A MATRIX ORGANIZATION
- C. A PROJECT MANAGER WITH ADMINISTRATIVE AUTHORITY WHILE THE ACTUAL DEVELOPMENT WORK WAS DONE BY LINE AND STAFF ORGANIZATIONS
- Y. NOT ORGANIZED UNDER A PROJECT (TYPE) ORGANIZATION (ADDED)
- Z. OTHER:

RESPONDOR		101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
PART/SUB		101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES YES YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B																															
01 C																															
01 Y																															

RESPONDOR		201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
PART/SUB		201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	YES YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B	YES YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C																															

QUESTION 58

IN THIS PROJECT:

- A. SOFTWARE DEVELOPMENT WAS HANDLED WITHIN THE ADP ENVIRONMENT WITH FUNCTIONAL ANALYSTS OR PROSPECTIVE USERS BEING ASSIGNED OR ATTACHED TO THE DEVELOPMENT TEAM
- B. ADP SPECIALISTS WERE DETAILED OR ASSIGNED TO THE FUNCTIONAL USER FOR THE DURATION OF THE DEVELOPMENT EFFORT
- C. THE FUNCTIONAL USER EMPLOYED "ANALYSTS" WHO DEVELOPED SPLICS., DESIGNS, ALGORITHMS, ETC., WHICH WERE THEN PRESENTED TO THE SOFTWARE DEVELOPMENT TEAM FOR IMPLEMENTATION
- D. THE ADP FUNCTION WAS DONE BY THE FUNCTIONAL ANALYST/USER (I.E. ADP WAS NOT A SEPARATE FUNCTION) (ADDED)
- E. THE FUNCTIONAL ANALYSIS WAS DONE BY THE ADP PERSONNEL (I.E. THERE WAS NOT A SEPARATE USER ANALYSIS) (ADDED)
- Y. NONE OF THE ABOVE (ADDED)
- Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A			YES		YES	YES	YES	YES		YES	YES	YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B																YES															
01 C	C03	YES		C04										YES			YES								YES						
01 E															C04					C03		C03									

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230		
01 A				YES		YES						YES					YES				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	
01 B		YES				YES	YES	YES		YES																						
01 C			YES		YES				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 D																																
01 E																																
01 Y																																

C02

C02 C02 C02

88

QUESTION 59 HOW MANY POSITIONS (FILLED & UNFILLED) SUPPORTED THE PROJECT? (ADDED)

## RESPONDOR

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
01 001 CFU 034 CFU 019 015 030 010 MIS 015 020 017 012 020 025 MIS MIS 040 003 002 100 008 066 130 275 004 MIS 015 CFU 100 006

## RESPONDOR

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
01 001 MIS 011 040 010 060 011 080 024 010 CFU MIS 015 003 020 MIS 020 010 010 010 005 MIS 008 030 MIS 030 MIS 032 050 100

## QUESTION 60

WAS THE (SOFTWARE) PROJECT ORGANIZATION DIVIDED INTO TEAMS EACH HEADED BY A TECHNICAL LEADER? NOTE: IN A SMALL PROJECT ORGANIZATION WITH DIVERSE ACTIVITIES IT WOULD BE POSSIBLE TO HAVE ONE-PERSON TEAMS (ADDE

A. YES  
B. NO  
Z. COMMENT

## RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130		
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	
01 B																																
01 X																																

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## RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A	YES	YES	C03	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	C03	YES	YES	YES	YES	YES	YES	YES	YES
01 U					YES						YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

YES



WHICH TYPES OF TEAMS WERE EMPLOYED IN SOFTWARE DEVELOPMENT (FOR THE PURPOSE OF THIS QUESTION AN ENGINEER IS CONSIDERED AN ANALYST) (ADDED)

A. COMBINED (FUNCTIONAL) ANALYSIS-PROGRAMMER TEAM (ADDED)

B. SEPARATE SOFTWARE (APPLICATION) ANALYSIS TEAM (ADDED)

C. SEPARATE PROGRAMMER TEAM

D. SEPARATE TEST TEAM

E. SEPARATE INTEGRATION TEAM

F. SEPARATE INTERFACE TEAM

G. SEPARATE PRODUCT ACCEPTANCE TEAM (ADDED)

H. DID NOT EMPLOY TEAMS

I. OTHER

QUESTION 61

RESPONDOR																																
PART/SUB		101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	
01 B													YES								YES			YES	YES							
01 C	YES																		YES				YES									
01 D	YES					YES					YES						YES	YES	YES	YES	YES	YES	YES	YES	YES							
01 E	YES										YES						YES	YES	YES				YES	YES	YES	YES						
01 F																		YES						YES								
01 G																																
01 X								MIS																			MIS					
01 Z																																

03

PART/SUB	RESPONDOR																														
		201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	YES YES CO3 YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B	CO3																														
01 C																															
01 D	YES																														
01 E	YES																														
01 F																															
01 G																															
01 Y																															
01 Z																															

NON

OTH

## QUESTION 62

WHICH OF THE FOLLOWING FUNCTIONS WERE INTERNAL TO THE PROJECT MANAGEMENT ORGANIZATION?

- A. ADMINISTRATION  
 B. PROJECT CONTROL  
 C. PROGRAM SUPPORT LIBRARIAN  
 D. PRODUCT/QUALITY ASSURANCE (ADDED)  
 E. CONFIGURATION MANAGEMENT (ADDED)  
 Y. NO FUNCTIONS OF THIS TYPE WERE INTERNAL IN THE PROJECT MANAGEMENT ORGANIZATION  
 Z. OTHERS

## RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 D																														
01 E																														
01 X																														
01 Y																														

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## RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 D																														
01 E																														
01 Y																														

C02

C02

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NON

NON

C03

QUESTION 63

TO WHOM DID THE TEST TEAM REPORT?

- A. THE PROJECT MANAGER
- B. OTHER THAN PROJECT MANAGER (ADDED)
- V. DID NOT EMPLOY A (SEPARATE) TEST TEAM (ADDED)
- Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B																														
01 X																														
01 Y																														

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RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B																														
01 Y																														

C02

C02

C02

QUESTION 64

HOW MANY INDIVIDUAL TEAMS WERE ASSIGNED TO THE PROJECT?

RESPONDOR

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
01 001 005 003 004 004 004 006 N/A 003 003 003 003 002 MIS 004 003 CPU 004 003 004 004 004 004 007 045 001 MIS 001 001 006 004

RESPONDOR

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
01 001 004 016 001 007 002 003 003 004 007 N/A UNK 003 002 003 004 VAR 004 005 010 003 002 VAR 003 001 003 005 004 003 010 005

QUESTION 65

THE TEAMS WERE ORGANIZED UNDER  
 A. A CHIEF PROGRAMMER (BAREN 1972)  
 B. A LEAD PROGRAMMER (A SENIOR EXPERIENCED PROGRAMMER)  
 C. TASK LEADER/WORK LEADER/PROJECT LEADER (ADDED)  
 D. LEAD ENGINEER/SYSTEMS ENGINEER/ANALYST (ADDED)  
 Y. DID NOT USE TEAMS  
 Z. OTHERS

PART/SUB	RESPONDOR	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 H		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C																															
01 D																															
01 X																															
01 Y																															
01 Z																															

PART/SUB	RESPONDOR	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B																															
01 C																															
01 D																															
01 Y																															

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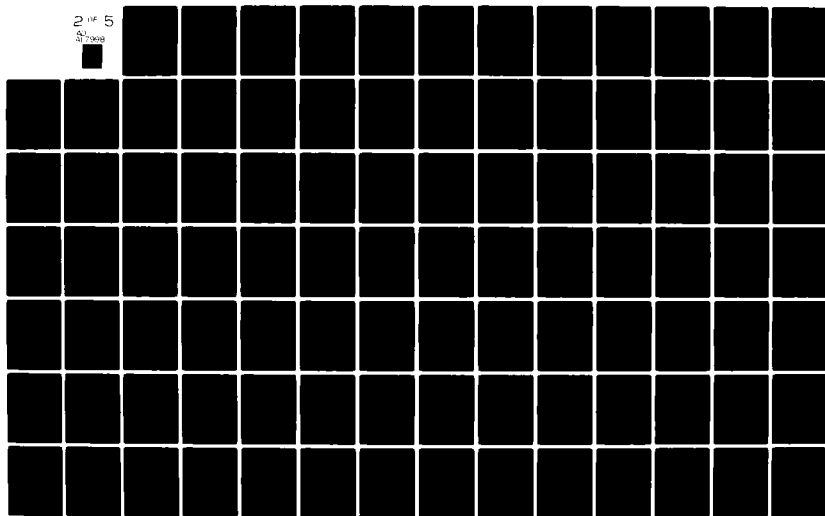
SACRAMENTO AIR LOGISTICS CENTER MCCLELLAN AFB CA SERV--ETC F/G 22/2  
RESULTS OF A SURVEY SOFTWARE DEVELOPMENT PROJECT MANAGEMENT IN --ETC(U)  
DEC 79 R H THAYER, J H LEHMAN  
SM-ALC/MME-TR-79-54-VOL-2

UNCLASSIFIED

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2 of 5

ALC/MME



QUESTION 46

WERE ANY OF THE POSITIONS IN THE DEVELOPMENT ORGANIZATION REFERRED TO BY THE FOLLOWING TITLES? (TITLES TAKEN FROM YOURDON, HOW TO MANAGE STRUCTURED PROGRAMMING, 1976, AND BROOKS MYTHICAL MAN-MONTH, 1975)

- A. CHIEF PROGRAMMER
- B. BACK-UP PROGRAMMER
- C. PROGRAM SUPPORT LIBRARIAN
- D. SURGEON
- E. ADMINISTRATOR
- F. EDITOR
- G. CO-PILOT
- H. PROGRAMMING CLERK
- I. TOOL SMITH
- J. TESTER
- K. LANGUAGE LAWYER
- L. SOFTWARE ARCHITECT
- M. SOFTWARE ENGINEER (ADDED)
- N. TECHNICAL DIRECTOR (ADDED)
- Y. NONE OF THE ABOVE (ADDED)
- Z. OTHER

RESPONDENT

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A		YES																							YES					
01 B				YES																					YES					
01 C				YES							YES		YES								YES									
01 E		YES		YES																					YES					
01 F		YES																												
01 J													YES				YES						YES	YES	YES					
01 L																	YES				YES		YES	YES	YES					
01 M	C02											C02									YES		YES	YES	YES					
01 X																														
01 Y			NON			NON	NON	NON	NON	NON	NON					NON	NON													

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PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230				
01 A	YES	YES	YES	YES	YES													YES			YES													
01 B	YES	YES	YES													YES					YES													
01 C	YES	YES	YES															YES			YES							YES						
01 E																																		
01 F																	YES																	
01 H			YES											YES	YES																			
01 J			YES												YES		YES																	
01 L			YES								YES																							
01 M			YES																															
01 Y																																		



WHICH OF THE MANY FORMS OF PROJECT ORGANIZATION DO YOU FEEL CONTINUATES THE MOST TO THE SUCCESS OF THE PROJECT?

**RESPONDER**

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130

[illegible]

01 002	05J 05K	05J	07G	07C	05C	05M
01 002	05J 05K	05J	07G	07C	05C	05M

01 005	070	050	065
500 10	050	050	065

01 004 070

500 10 070

## RESPONDER

NEOLORDON

PANT/SUR	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
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01 001 051 MIS 05E 05F 06E MIS 05G 05G MIS MIS MIS MIS 05Y 05Y 05L MIS 05G 05B 05G MIS MIS 05F 05E 05D 05I N/A

	06C	06F	06G	06H	06I	06J	06K	06L	06M	06N	06O	06P	06Q	06R	06S	06T	06U	06V	06W	06X	06Y	06Z	06AA	06AB	06AC	06AD	06AE	06AF	06AG	06AH	06AI	06AJ	06AK	06AL	06AM	06AN	06AO	06AP	06AQ	06AR	06AS	06AT	06AU	06AV	06AW	06AX	06AY	06AZ	06BA	06BB	06BC	06BD	06BE	06BF	06BG	06BH	06BI	06BJ	06BK	06BL	06BM	06BN	06BO	06BP	06BQ	06BR	06BS	06BT	06BU	06BV	06BW	06BX	06BY	06BZ	06CA	06CB	06CC	06CD	06CE	06CF	06CG	06CH	06CI	06CJ	06CK	06CL	06CM	06CN	06CO	06CP	06CQ	06CR	06CS	06CT	06CU	06CV	06CW	06CX	06CY	06CZ	06DA	06DB	06DC	06DD	06DE	06DF	06DG	06DH	06DI	06DJ	06DK	06DL	06DM	06DN	06DO	06DP	06DQ	06DR	06DS	06DT	06DU	06DV	06DW	06DX	06DY	06DZ	06EA	06EB	06EC	06ED	06EE	06EF	06EG	06EH	06EI	06EJ	06EK	06EL	06EM	06EN	06EO	06EP	06EQ	06ER	06ES	06ET	06EU	06EV	06EW	06EX	06EY	06EZ	06FA	06FB	06FC	06FD	06FE	06FF	06FG	06FH	06FI	06FJ	06FK	06FL	06FM	06FN	06FO	06FP	06FQ	06FR	06FS	06FT	06FU	06FV	06FW	06FX	06FY	06FZ	06GA	06GB	06GC	06GD	06GE	06GF	06GG	06GH	06GI	06GJ	06GK	06GL	06GM	06GN	06GO	06GP	06GQ	06GR	06GS	06GT	06GU	06GV	06GW	06GX	06GY	06GZ	06HA	06HB	06HC	06HD	06HE	06HF	06HG	06HH	06HI	06HJ	06HK	06HL	06HM	06HN	06HO	06HP	06HQ	06HR	06HS	06HT	06HU	06HV	06HW	06HX	06HY	06HZ	06IA	06IB	06IC	06ID	06IE	06IF	06IG	06IH	06II	06IJ	06IK	06IL	06IM	06IN	06IO	06IP	06IQ	06IR	06IS	06IT	06IU	06IV	06IW	06IX	06IY	06IZ	06JA	06JB	06JC	06JD	06JE	06JF	06JG	06JH	06JI	06JJ	06JK	06JL	06JM	06JN	06JO	06JP	06JQ	06JR	06JS	06JT	06JU	06JV	06JW	06JX	06JY	06JZ	06KA	06KB	06KC	06KD	06KE	06KF	06KG	06KH	06KI	06KJ	06KK	06KL	06KM	06KN	06KO	06KP	06KQ	06KR	06KS	06KT	06KU	06KV	06KW	06KX	06KY	06KZ	06LA	06LB	06LC	06LD	06LE	06LF	06LG	06LH	06LI	06LJ	06LK	06LL	06LM	06LN	06LO	06LP	06LQ	06LR	06LS	06LT	06LU	06LV	06LW	06LX	06LY	06LZ	06MA	06MB	06MC	06MD	06ME	06MF	06MG	06MH	06MI	06MJ	06MK	06ML	06MN	06MO	06MP	06MQ	06MR	06MS	06MT	06MU	06MV	06MW	06MX	06MY	06MZ	06NA	06NB	06NC	06ND	06NE	06NF	06NG	06NH	06NI	06NJ	06NK	06NL	06NM	06NN	06NO	06NP	06NQ	06NR	06NS	06NT	06NU	06NV	06NW	06NX	06NY	06NZ	06OA	06OB	06OC	06OD	06OE	06OF	06OG	06OH	06OI	06OJ	06OK	06OL	06OM	06ON	06OO	06OP	06OQ	06OR	06OS	06OT	06OU	06OV	06OW	06OX	06OY	06OZ	06PA	06PB	06PC	06PD	06PE	06PF	06PG	06PH	06PI	06PJ	06PK	06PL	06PM	06PN	06PO	06PP	06PQ	06PR	06PS	06PT	06PU	06PV	06PW	06PX	06PY	06PZ	06QA	06QB	06QC	06QD	06QE	06QF	06QG	06QH	06QI	06QJ	06QK	06QL	06QM	06QN	06QO	06QP	06QQ	06QR	06QS	06QT	06QU	06QV	06QW	06QX	06QY	06QZ	06RA	06RB	06RC	06RD	06RE	06RF	06RG	06RH	06RI	06RJ	06RK	06RL	06RM	06RN	06RO	06RP	06RQ	06RR	06RS	06RT	06RU	06RV	06RW	06RX	06RY	06RZ	06SA	06SB	06SC	06SD	06SE	06SF	06SG	06SH	06SI	06SJ	06SK	06SL	06SM	06SN</
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01 003 06H 09A

01 004 061

QUESTION 68

IF YOU HAD IT WITHIN YOUR POWER TO MAKE ONE CHANGE IN THE WAY THE PROJECT WAS ORGANIZED, WHAT ACTION WOULD YOU TAKE, OR IF YOU HAD THE RESOURCES AVAILABLE TO UNDERTAKE RESEARCH IN ANY AREA OF PROJECT ORGANIZATION, WHICH ASPECT WOULD YOU EXPLORE?

RESPONDOR

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
01 001 MIS MIS 01F MIS PSC OSC MIS MIS 05H MIS 05N MIS MIS MIS C10 PIC PIC MIS 31F MIS MIS MIS MIS MIS MIS MIS MIS 05F 55A  
01 002 06C 05M X91  
01 003 07G  
01 004 07H  
01 005 07F

RESPONDOR

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
01 001 NON D5B MIS NON MIS N/A PHD MIS MIS MIS 03E 06H P8E 03A NON 02D MIS MIS 511 03G 06E MIS MIS 0XA MIS 06I CNB 52E  
01 002 M1A 03B 06J CMT  
01 003 M1B CND

QUESTION 69

WHAT WAS THE SOURCE OF THE PROJECT MANAGER?

- A. NEW HIRE FROM ANOTHER COMPANY
- B. NEW HIRE FROM SCHOOL
- C. TRANSFER FROM ANOTHER PROJECT
- D. TRANSFER FROM WITHIN COMPANY OTHER THAN PROJECT
- E. PROMOTED FROM WITHIN PROJECT (ADDED)
- F. THE PROJECT MANAGER WAS APPOINTED OR SELECTED FOR THIS PROJECT BY
- G. DID NOT HAVE A PROJECT MANAGER (ADDED)
- H. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A																					YES									YES
01 C				YES	YES		C03	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	C03		C03			YES	YES				
01 D	YES	YES	YES			YES		YES	YES			YES			YES	YES							YES	YES	YES	YES	YES	YES	YES	YES
01 F	MPD	VPG	VPG	MCP	MEN	MEN	OTH	MGR	MPA	MCP	MCP	PEN	VPE	OCU	MGR	MGR	MPD	MGR	MPD	MEN	MGR	MCP	MPD	VPG	MCP	MIS	MEN	MGR	VPG	PMS

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A				YES														YES												YES
01 B																		YES												
01 C	YES	YES	YES		YES	YES	YES	C03	YES	C03	YES	YES	YES	YES	YES	C03	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	C03	
01 D	YES						C03			YES	YES	YES								YES					YES	YES	YES	YES	YES	C03
01 E																														
01 F	MGR	MPD	MPD	VPG	MEN	MGR	MEN	PMW	MPD	MGR	MIS	MGR	PEN	PEN	MGR	PMR	MIS	MCP	MCP	MIS	VPG	MCP	MCP	FFN	UNK	MEN	MPA	MEN	MEN	MCP
01 Z																														OTH

C02

## QUESTION 70

HOW MANY YEARS EXPERIENCE DID THE PROJECT MANAGER HAVE IN THE FOLLOWING AREAS?

A. FUNCTIONAL AREA OF PROJECT ++++++YNS

U. DATA PROCESSING ++++++YNS

Y. NO EXPERIENCE (NO PROJECT MANAGER) (AUDED)

Z. COMMENT

## RESPONDER

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	015	010	004	003	008	010	004	005	007	012	010	016	005	010	001	020	000	005	010	000	YES	007	005	025	010	006	012	008	000	000
01 B	015	015	010	003	013	005	020	012	005	006	012	018	10	000	006	015	012	010	002	005	YES	020	015	025	019	003	000	008	015	
01 Z																														

UIM

## RESPONDER

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	015	010		002	002	002	020	004	013	004	010		002	005	015	015	002	010	005	007	005	011	000	009	000	005	002	005	005	004
01 B	020	010		019	005	004	020	026	002	001	006		006	005	015	012	010	010	007	000	014	000	008	014	022	008	010	005	017	015
01 Y																														

NUN

NUN



PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A					004									000			002				002				002	002				004
01 B	020				002			001						007			010	005	007		005				008			005	005	
01 C	010							001						000			002	005										005		
01 D					002	004	020							000				005	005									005		
01 E	020				002		020			004				007	015		010	005										005	008	
01 F					002									000				001			005				005			004	004	
01 G	015				002	002								005	005			005	003						010			005		
01 H	020				002	004	010						002	005			008	005	005					004			005			
01 I	010			005		004								000				001									005			
01 J					006	004								007				002									005			
01 X																														
01 Y																														

MIS UNK



RESPONDUR  
PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130

03 A 003  
03 B 003 008 001 005 010  
03 D 000 005 002 001 002  
03 E 006 001 003 005 002 005 005  
03 F 002 001  
03 G 004 003  
03 H 004 003 002 002 002 003  
03 I 002  
03 J  
03 X MIS MIS MIS  
03 Y C02 C02 C02 C02 C02 C02 C02 C02 C01 C02

RESPONDUR  
PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230

03 A 000 002  
03 B 001 008 004 003 003 005 008 002 001  
03 C 000 001 005 002  
03 D 001 002 003 003 002  
03 E 001 004 004 003 003 001 002 003  
03 F 004 001 005 001  
03 G 000 005 003 002  
03 H 001 005 003 002 005 003 004 002  
03 I 000 001 002  
03 J 000 001 002  
03 X MIS UNK  
03 Y NUN C02 C02 C02 C02 C02 NUN C02 C01 C02 C02



RESPONDUM  
 PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130

04 A			000 002	005																										
04 B	004		005 008		005			005	002 YLS																					
04 C	001			002																					010 006					
04 D					005					001 005															006					
04 E	010 002				005				002						010														005	
04 F			002	002																										
04 G			005 005								008					002													010	
04 H	005 002					001 015	003	002 005 012								005 001													008 005	005
04 I						002										001														
04 J		001									003					001													010	
04 X																														
04 Y																														

RESPONDUM  
 PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230

04 A																														
04 B	010																													
04 C	005																													
04 D																														
04 E	010																													
04 F																														
04 G	005																													
04 H	010																													
04 I	005																													
04 J																														
04 X																														
04 Y																														

QUESTION 72

IN WHICH PROGRAMMING LANGUAGES AND AT WHAT LEVEL OF PROFICIENCY COULD THE PROJECT MANAGER PROGRAM?

01 HIGH 02 AVERAGE 03 LOW

- A. FORTRAN
- B. JOVIAL
- C. COBOL
- D. ASSEMBLER (UNSPECIFIED) (ADDED)
- E. CMS-2 (ADDED)
- F. PL/I (ADDED)
- G. HOL (UNSPECIFIED) (ADDED)
- H. NONE/NO PROJECT MANAGER (ADDED)
- I. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	002	001	002	001	002		002	001	001	001	002	002	003	001	001	001	001	001	003		002	002		003	002					
01 B	002		002				002					003	003	003		001														
01 C				003	001		003	003	002	001	003	002	003		003					002										002
01 D	003	002	001		001	003	003	001	001	001	002		003	001	001	003				002		003	003	001	005	002			001	003
01 E	003	003	001																											
01 F																														
01 X																														
01 Y																														

MIS

MIS

001

002 002

104

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	003			003	001	001	002	001	003	001	001	002	002	003	002	001	001	001	001	002	001		001	001	001				001	003
01 B	003						002									003	003				001	002	003		003					003
01 C					001		003			001				003											003		001			003
01 D	003			001	001	002	001	002		001	001	001	001	001	001	002	001	001	001	001	001	001	001	001	001	001	002	002		
01 E																														
01 F	003									002																				
01 X																														
01 Y																														
01 Z																														

MIS N/A

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QUESTION 73 THE AGE OF PROJECT MANAGER AT THE BEGINNING OF THE PROJECT WAS++++YRS

## RESPONDER

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
01 001 045 040 035 037 034 045 043 034 034 035 038 041 042 035 045 041 039 040 050 MIS 035 035 045 039 045 040 035 MIS 039 039

## RESPONDER

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
01 001 045 045 UNK 047 024 026 042 043 034 040 035 035 MIS 029 040 MIS 037 030 031 034 036 039 034 031 044 028 034 027 039 040

QUESTION 74

WAS THE PROJ MGR EVEN A CHIEF PROGRAMMER (AS DEFINED BY BAKEM, 1972) ?

A. YES

B. NO

Y. NO PROJECT MANAGER (ADDED)

Z. COMMENT

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A					YES						YES				YES															
01 B	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 X							MIS		MIS							MIS			MIS											

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A															YES	YES					YES									
01 B	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 X																														

QUESTION 75

DID THE PROJECT MANAGER RECEIVE TRAINING IN ANY OF THE FOLLOWING AREAS PRIOR TO (OR EARLY IN) THE PROJECT DEVELOPMENT CYCLE?

- FUNCTIONAL AREA OF PROJECT
- GENERAL DATA PROCESSING
- MODERN PROGRAMMING TECHNIQUES
- PROJECT MANAGEMENT
- GENERAL MANAGEMENT
- PROGRAMMING LANGUAGES (GIVE LANGUAGE)
- NONE/NO PROJECT MANAGER (ADDED)
- OTHER PROJECT RELATED AREA

RESPONDENT

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES			YES	YES	YES				YES	YES	YES		YES	YES	YES		YES				YES	YES	YES	YES	YES	YES			YES
01 B	YES			YES	YES				YES	YES	YES	YES		YES	YES	YES		YES			YES	YES	YES	YES	YES	YES				
01 C							YES			YES	YES	YES					YES	YES		YES	YES		YES	YES	YES	YES				
01 D	YES			YES		YES				YES	YES	YES	YES	YES	YES	YES	YES			YES	YES		YES	YES	YES	YES				
01 E	YES			YES		YES		YES		YES	YES	YES	YES	YES	YES	YES	YES		YES	YES		YES	YES	YES	YES	YES				
01 F1			JOB FOR				YES		FOR								FOR	FOR									PL1	YES		
01 X																														
01 Y																														
01 Z																														

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RESPONDENT

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES									YES	YES		
01 B					YES			YES					YES	YES	YES	YES	YES									YES	YES	YES		
01 C					YES			YES		YES	YES									YES				YES	YES	YES	YES			
01 D	YES		YES					YES	YES	YES	YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	
01 E	YES							YES	YES	YES	YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	
01 F1	FUN					FUN				HAL			FUN	FUN	FUN															YES
01 F2					ASS																									
01 X																														
01 Y																														

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QUESTION 76

HIGHEST EDUCATION LEVEL ATTAINED BY THE PROJECT MANAGER WAS?

- A. LESS THAN HIGH SCHOOL
- B. HIGH SCHOOL
- C. AA DEGREE OR TWO YEARS OF COLLEGE
- D. BETWEEN 2 AND 4 YEARS OF COLLEGE
- E. BS/BA DEGREE
- F. MASTER'S DEGREE
- G. MASTER DEGREE PLUS 30 HOURS OR DOCTORAL CANDIDATE
- H. PHD (OR EQUIVALENT)
- I. DID NOT HAVE PROJECT MANAGER (ADDED)
- J. OTHER

RESPONDENT

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 M																															YES
01 O							YES	YES																							
01 E		YES	YES				YES			YES										YES						YES					
01 F			YES	YES	YES					YES		YES	YES	YES				YES				CO3				YES		YES			
01 G												YES			YES					YES					YES		YES		YES		
01 H																YES	YES	YES						YES							

RESPONDENT

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 D					SEA																				YES					
01 E			YES	YES	SEA	YES				YES	YES	SEA			YES	YES	YES		YES		YES	YES	YES	YES	YES	YES	YES			
01 F	YES						YES	SEA	SEA	YES	SEA				YES	YES	YES	YES	SEA	YES										CO3
01 G							YES	YES	SEA			YES	YES								YES									

QUESTION 77

IF THE PROJECT MANAGER ATTENDED COLLEGE, HIS MAJOR OR SPECIALITY WAS?

- A. COMPUTER SCIENCE
- B. MATHEMATICS
- C. ENGINEERING
- D. PHYSICS (ADDED)
- E. GENERAL SCIENCE (ADDED)
- F. BUSINESS
- G. LIBERAL ARTS
- H. DID NOT ATTEND/NO PROJECT MANAGER (ADDED)
- I. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A																					YES									
01 B					YES		YES	YES	YES		YES								YES		YES									
01 C			YES	YES		YES			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 D																														
01 F					YES	YES																								
01 Y																														

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A																														
01 B								YES			YES	YES	YES	YES	YES						YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C	YES			YES	YES	YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 D																														
01 E																														
01 F																														
01 G																														
01 X																														

QUESTION 78

LIST THE NUMBER OF POSITIONS AUTHORIZED BY CATEGORY OVER THE LIFE OF THE PROJECT AND LIST NEXT TO THAT THE ACTUAL NUMBER OF INDIVIDUALS WHO OCCUPIED THESE POSITIONS (E.G., IF ONE PROJECT MANAGER POSITION WAS DESIGNATED, BUT DURING THE COURSE OF THE PROJECT THAT POSITION WAS OCCUPIED BY THREE INDIVIDUALS AT DIFFERENT TIMES THE ANSWER WOULD BE: (1) (3) )

01  
02  
AUTHORIZED OCCUPIED BY

POSITION

A. PROJECT MANAGER  
B. ASST PROJECT MANAGER (ADDED)  
C. FUNCTIONAL ANALYST (ENGINEER) (ADDED)  
D. DATA PROCESSING ANALYST  
E. PROGRAMMER  
F. SUPPORT LIBRARIAN  
G. SECRETARY  
H. ADMINISTRATOR  
I. USER/CUSTOMER (IF PART OF THE DEVELOPMENT TEAM)  
J. NONE (ADDED)  
K. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	001	001	YES	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001
01 B																				002	002									
01 C	C/S	010	YES	002	002	001	006							003				003	025	005		010	090	001	001	001			001	001
01 D	005		YES			001	006				002			002						005		020	040						001	001
01 E	025	020	YES	008	003	005	013	011	012		005		005	006	020			002	020	025	037	025	090	001	002	004			004	004
01 F	003		YES	002						001	001								001	001	001	002	010			001			000	000
01 G	001	001	YES	001	001		001				001						003		012	001	006	008	020						000	000
01 H	001		002	YES																									000	000
01 I	003	008					002												001	003	001	002	001						002	002
01 X																														MIS
01 Y																														
01 Z																														

C02

MIS

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PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230		
01 A	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	002		
01 B	001																															
01 C	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	
01 D	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	
01 E	012	036	006	015	012	012	012	012	034	003	100	010	002	006	010	015	006	002	035	006	015	012	020	010	003	020	040					
01 F	001																															
01 G	001	002	001	001	001	001	001	001	001	001	004																					
01 H		001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001
01 I		004	002																													
01 X																																
01 Y																																
01 Z																																

RESPONDUM

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
02 A	002	002	003	002	001	002	001	001	002	001	002	002	002	002	001	002	YES	001	002	005	002	002	003	001	001	001	002	002	002	002
02 C	008	015	005	002	001	006	001	006	006	004	005	016	011	020	020	008	040	002	060	050	037	025	270	001	002	002	002	002	002	001
02 D	007	003	003	003	001	006	001	006	006	003	002	002	002	002	002	002	002	YES	003	100	010	010	020	120	005	005	005	005	005	005
02 E	035	030	006	008	004	005	016	011	020	020	008	007	008	007	008	040	002	060	050	037	025	270	001	002	002	002	002	002	002	003
02 F	003	003	001	002	001	001	001	001	001	001	001	001	001	001	001	001	002	002	002	002	002	002	002	002	002	002	002	002	002	002
02 G	001	000	001	001	002	003	003	003	003	003	003	003	003	003	003	006	006	006	006	006	006	006	006	006	006	006	006	006	006	006
02 H	001	003	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001
02 I	004	013	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002
02 X																														
02 Z																														

MIS

RESPONDUM

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
02 A	002	003	001	001	001	002	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001
02 B	001																														
02 C	004	002	005	002	001	006	001	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002
02 D	006	003	003	003	003	003	003	003	003	003	003	003	003	003	003	003	003	003	003	003	003	003	003	003	003	003	003	003	003	003	003
02 E	015	036	008	020	012	012	012	042	003	150	002	010	006	008	015	017	006	004	045	010	020	012	030	010	003	022	040	003	003	003	003
02 F	003																														
02 G	004	002	003	002	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001
02 H		001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001
02 I		006	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002	002
02 X																															
02 Y																															
02 Z																															

MIS

WHAT WAS THE SOURCE (BY PERCENT) OF THE PROGRAMMER/ANALYST STAFF?

WHAT WAS THE SOURCE (BY PERCENT) OF THE PROGRAMMER/ANALYST STAFF?

- \*\*\*\*\*  
 A. NEW HIRE FROM ANOTHER COMPANY \*\*\*\*\*  
 B. NEW HIRE FROM SCHOOL \*\*\*\*\*  
 C. TRANSFER FROM ANOTHER PROJECT \*\*\*\*\*  
 D. TRANSFER FROM OTHER THAN ANOTHER PROJECT \*\*\*\*\*  
 E. ADP STAFF (ADDED) \*\*\*\*\*  
 F. SUBCONTRACTOR (ADDED) \*\*\*\*\*  
 G. OTHER \*\*\*\*\*  
 \*\*\*\*\*

## RESPOND

[illegible]

## RESPONDER

[illegible]

QUESTION R0 AT WHAT LEVEL WAS THE PROGRAMMER SUPPORT LIBRARIAN?

- A. CLERK/PROGRAMMER TECHNICIAN  
 B. JUNIOR PROGRAMMER  
 C. SENIOR PROGRAMMER  
 Y. DID NOT USE PROGRAMMING SUPPORT LIBRARIAN  
 Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A				YES	YES					YES	YES									YES			YES							
01 B													YES										YES							
01 C																														
01 X															MIS					MIS		MIS								
01 Y																														
01 Z																														

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	YES					YES			YES	YES	YES									YES		YES								
01 B																														
01 C																														
01 X																														
01 Y																														

QUESTION 81

THE CHIEF PROGRAMMERS WENT?  
 A. SENIOR PROGRAMMERS  
 B. FUNCTIONAL AREA EXPERTS  
 C. SPECIALLY TRAINED FOR TASK  
 Y. DID NOT USE CHIEF PROGRAMMERS  
 Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A	YES				YES	YES		YES	YES	YES	YES	YES		YES			YES	YES	YES												
01 B		YES																						YES							
01 X																		YES						YES	YES						
01 Y	NUN		NUN	NUN			NUN						NUN		C01		NUN		C01		C01	NUN								NUN	NUN

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A	YES			YES		YES		YES	YES	YES	YES	YES			YES	YES	YES	YES	YES	YES	YES	YES	YES		YES	YES	YES	YES	YES	YES	
01 B					YES	YES		YES																							
01 C																															
01 X																															
01 Y							NUN																								

QUESTION 82

WHAT WAS THE EDUCATION LEVEL OF THE PROGRAMMER/ANALYST (BY PROGRAM)?  
 A. LESS THAN HIGH SCHOOL \*\*\*\*\*  
 B. HIGH SCHOOL \*\*\*\*\*  
 C. AA DEGREE OR TWO YEARS OF COLLEGE \*\*\*\*\*  
 D. BETWEEN 2 AND 4 YEARS OF COLLEGE \*\*\*\*\*  
 E. BS/BA DEGREE \*\*\*\*\*  
 F. MASTERS DEGREE \*\*\*\*\*  
 G. MASTERS DEGREE PLUS 30 HOURS OR DOCTORATE CANDIDATE \*\*\*\*\*  
 H. PHD (OR EQUIVALENT) \*\*\*\*\*  
 I. OTHER \*\*\*\*\*

RESPOND

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A					000																									
01 B					005	000																								
01 C					005	010																								
01 D					010	010																								
01 E					075	065																								
01 F					005	010																								
01 G																														
01 H																														
01 X																														
01 Z																														

RESPOND

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A																														
01 B																														
01 C																														
01 D																														
01 E																														
01 F																														
01 G																														
01 H																														
01 X																														
01 Z																														

QUESTION 83

WHAT PERCENT OF THE PROGRAMMER/ANALYST STAFF WERE ORIGINALLY COMPUTER  
OPERATORS WHO MOVED DIRECTLY FROM MACHINE OPERATION TO  
PROGRAMMING? \*\*\*\*\*

RESPONDOR

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
01 001 004 001 000 015 020 000 000 000 000 000 000 005 050 000 000 000 000 000 005 001 003 025 000 000 000 001 055

RESPONDOR

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
01 001 004 000 003 000 002

QUESTION 84

DID THESE FORMER OPERATORS MAKE SUCCESSFUL PROGRAMMERS? (ORIGINALLY NARRATIVE)

- A. YES, EXCELLENT
- B. YES, GOOD/AVERAGE
- C. YES, FAIR
- D. NO, POOR
- Y. DID NOT USE EX-OPERATORS AS PROGRAMMERS
- Z. COMMENT

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A																															
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01 D																															
01 X																															
01 Y																															

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A																															
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01 C																															
01 D																															
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01 Y																															
01 Z																															



QUESTION 85

WERE THE FOLLOWING SERVICES PROVIDED FROM WITHIN THE PROJECT MGMT RESOURCES, OR SUPPLIED BY A STAFF FUNCTION WITHIN THE COMPANY? (INDICATE BY INSERTING W FOR WITHIN THE PROJECT RESOURCES, O FOR OUTSIDE THE PROJECT RESOURCES R FOR BOTH) (ADDED)

- A. PERSONNEL
- B. ACCOUNTING
- C. BUDGETING
- D. COMPUTER OPERATION
- E. TRAVEL ARRANGEMENT
- F. TRAINING
- G. TYPING
- Y. NONE (ADDED)
- Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	000	WWW	000	WWW	000	000	WWW	WWW	000	000	000	000	000	000	000	000	000	WWW	WWW	000	000	000	000	000	000	000	000	000	WWW	000
01 B	000	000	000	WWW	000	000	000	000	000	000	000	000	000	000	000	000	000	WWW	WWW	000	000	WWW	WWW	000	000	000	000	000	WWW	000
01 C	WWW	WWW	000	WWW	000	000	WWW	WWW	000	000	000	000	000	000	000	000	000	WWW	WWW	000	000	WWW	WWW	000	000	000	000	000	WWW	000
01 D	WWW	000	000	WWW	WWW	000	000	000	WWW	WWW	000	000	000	000	000	000	000	WWW	WWW	000	000	WWW	WWW	000	000	000	000	000	WWW	000
01 E	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW
01 F	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW
01 G	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW
01 Z																														

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RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	000	000	000	000	000	000	WWW	000	WWW	000	WWW	WWW	000	000	000	000	000	WWW	000	WWW	000	000	000	000	000	000	000	000	000	000
01 B	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	000	WWW	000	000	000	WWW	WWW	000	000	000	000	000	000	000
01 C	WWW	000	000	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW
01 D	000	000	000	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW
01 E	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW
01 F	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW
01 G	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW	WWW
01 X																														
01 Z																														

MIS

## QUESTION 86

WAS THE PROJECT MANAGER RESPONSIBLE FOR IDENTIFYING TRAINING REQUIREMENT OF THE DEVELOPMENT TEAM MEMBERS?

A. YES

B. NO

Y. THERE WAS NO TRAINING REQUIREMENTS ON NO PROJECT MANAGER (ADDED)

Z. OTHER

## RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

## RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

C01

YES

YES YES

MIS

C02

C02

# QUESTION 87

TRAINING REQUIREMENTS GENERATED AS A RESULT OF THE PROJECT WERE SATISFIED FROM WHICH OF THE FOLLOWING SOURCES? (INSERT 0 FOR METHODS/SOURCES NOT EMPLOYED AND RANK ORDER THE REMAINING METHODS/SOURCES WITH 1 BEING THE MOST IMPORTANT)

- A. ON THE JOB TRAINING
- B. CLASSES CONDUCTED BY PROJECT TEAM MEMBERS
- C. CLASSES CONDUCTED BY COMPANY LAURE
- D. CLASSES CONDUCTED BY THE SYSTEM USER
- E. CLASSES CONDUCTED BY INDEPENDENT TRAINING CONSULTANTS
- F. CLASSES CONDUCTED BY HARDWARE/SOFTWARE VENDORS
- G. CLASSES CONDUCTED BY COLLEGES/UNIVERSITIES
- Y. NONE (ADDED)
- Z. OTHER

## RESPONDOR

PART/SUB	RESPONSE																													
	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	001	001	001	003	001	001	001	001	001	004	001	001	001		001	001	001		001	001	001	001	002	001	001	001	001	001	001	002
01 B	002	002	000	000	002		000	002	002	000	003		003		000	002	002	000	001	002	000	002	003		001	002	001	001	001	001
01 C	003	000	000	000	000		000	000	000	002	000	002		000	000	000	000		003		000	000			000		000		000	000
01 D	000	003	000	000	000		000	004	003	000	000		001		000	000	000	000	000		000	000	000			001		000		000
01 E	000	000	000	001	000		000	000	000	000	002				000	000	000		000	004	000	000		002		000		000		000
01 F	000	000	000	002	000	002	000	003	001	000	000		001		001	002	002			000	005	000	003	003		000	003		003	003
01 G	000	000	000	000	000		000	000	000	000	000				000	000	000			000	000	000	000		000	004		000		000

MIS

C02

## RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	YES		001	002	001	001	001	002	001	001	001			001	001	001	001	002	001	001	001	001	001	001	001	001	001	005	004	001
01 B	YES		001	002	002	000	001	000	000	001				002	000	000	000	000	001		000	000	002	002	008	002	001	001	003	000
01 C			000		000	000	000	000	000	000	002				000	000	000	002	000		000	000	000	000		000	002	003	002	000
01 D			000		000	000	000	000	000	000					000	000	000	000	000		000	000	000	003	000	003	003	000	000	003
01 E			000		000	000	003	002	000	001	001			000	000	000	000	000	000		000	000	000		000	000	000	000	000	000
01 F			003		003	000	003	003	000	001				000	000	000	000	003	004		002	000	000	000	004	000	000	004	002	000
01 G			000		000	000	000	000	002	000				000	000	000	000	003			000	000	000	005	000	000	000	000	000	004
01 X																														
01 Y																														

MIS

003

QUESTION 88 WHAT PERCENT OF THE PERSONNEL ASSIGNED TO THE PROJECT RECEIVED  
ADDITIONAL TRAINING IN THE PROGRAMMING LANGUAGE SELECTED? \*\*\*\*\*2

## RESPONDOR

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
01 001 100 050 050 100 050 040 010 020 075 000 075 100 080 000 100 100 000 000 000 000 020 000 030 050 050 000 100 100 MIS 100

## RESPONDOR

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
01 001 000 MIS 000 000 050 100 000 000 075 100 090 000 000 072 000 010 075 010 000 000 020 005 050 025 000 020 000 040 000 015

QUESTION 89 WHAT PERCENT OF THE PERSONNEL ASSIGNED TO THE PROJECT REQUIRED ADDITIONAL TRAINING ON THE OPERATING SYSTEM THAT WAS USED?\*\*\*\*\*X

RESPONDOR

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
01 001 100 100 100 100 080 000 080 100 100 000 100 030 050 100 100 030 005 000 000 M15 020 095 030 020 025 000 100 M15 100

RESPONDOR

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
01 001 008 M15 100 000 000 100 000 100 050 010 010 000 000 072 000 100 000 050 000 010 020 100 100 050 000 020 050 060 010

QUESTION 90 IF IT WERE WITHIN YOUR POWER TO MAKE ANY CHANGES, OR INITIATE ANY RESEARCH IN THE AREA OF STAFFING, WHAT WOULD YOU CONSIDER THE MOST FRUITFUL AREA FOR MODIFICATION OR STUDY?

RESPONDOR

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
 01 001 MIS MIS S2B MIS STM 07F SRC MIS DWA MIS MIS MIS MIS MIS S1E MIS STG MIS S1H MIS MIS MIS MIS SKD MIS MIS MIS S1A S1A  
 01 002 S2C STH STI S2B

RESPONDOR

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
 01 001 SKD MIS S1J S1E  
 01 002 STH 07F S1A S1D SKH 05H S1A  
 01 003 01 003 S1L  
 01 004 01 004 09C

QUESTION 91

WHICH OF THE FOLLOWING AUTOMATED OR MANUAL SYSTEMS WERE USED FOR

PROJECT CONTROL?

- A. PERT
- B. MODIFIED PERT
- C. CPM (COMM)
- D. GANTT CHARTS
- E. CSES (ADDED)
- F. WBS (ADDED)
- G. GRAPHS/RATE CHARTS (ADDED)
- H. WORKLOADING
- I. MILESTONE TRACKING
- J. NO PROJECT CONTROL
- K. OTHER

RESPONDOR

NAME/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A													YES							YES	YES									
01 B		YES	YES		YES	YES	YES	YES							YES							YES								
01 C																						YES								
01 D		YES	YES		YES						YES	YES	YES	YES	YES						YES			YES						
01 E												C02								C02				C02						
01 F																				C02										
01 G						C02														C02										
01 H		YES			YES	YES	YES	YES	YES						YES	YES	YES	YES			YES			YES						
01 I		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 J																														
01 K																														
01 L																														
01 M																														





## QUESTION 92

WAS A MARK UNLAWFUL STRUCTURE CODE USED IN THE CONTROL OF SYSTEM

DEVELOPMENT?

A. YES

B. NO

Z. COMMENT

## RESPONDENT

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A	YES	YES	YES		YES			YES	YES	YES	YES	YES	YES		YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES					
01 B				YES	YES		YES	YES						YES		YES		YES		YES						YES	YES	YES	YES		

## RESPONDENT

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	
01 B	YES			YES			YES	YES				YES	YES		YES	YES		YES		YES				YES	YES	YES	YES				

WHICH MANUAL REPORTING PROCEDURES WERE USED IN PROJECT MONITORING, AND  
MANAGEMENT? AT WHAT LEVEL DID THEY ORIGINATE AND HOW HIGH DID THEY GO?  
HOW OFTEN WERE THEY AGGREGATED, CONDENSED, OR EDITED AS THEY MOVED  
THROUGH THE CHAIN?

US  
W. W.  
ALLS/ELIS

WEEKEND ILL  
EARLY/MONTHLY ACTIVITY

A. WEEKLY/MONTHLY /  
B. PROJECT STATUS

B.	PROJECT STATUS
C.	SIGNIFICANT CHG
1	1
2	2
3	3
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100	100

C. SIGNIFICANT CHG  
D. COST VS PERFORMANCE (ADDED)

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• • •

DATE / TIME

## RESPONDENT

101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
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JAC

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212

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PAINT/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
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01 A CPM ENG FIC CPM WOH FLS ENG LSE CPM FLS CPA WOH CHP WOH FLS FLS WOH FLS

Year	PMW	FTC	CHP	PMW	CPH	SPC	ENG	PLN	SPR
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[illegible]

## RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130			
02 A	PMR	PMR	PMR	MCP	MGR	MGR	VPG	PMR	PMR	PMR	PEN	ESW	MGR		VPG	VPG	PMR	YES		MGR		PMR	PMR							PMR	VPL		
02 B	PMR		VPG	MCP	MGR	MGR	VPG	MGR	PMR	MGR	PMR	PMS	MGR		VPG	OCU	PMR			MGR		OCU	PMR	YES						PMR	VPL	PMR	MCP
02 C	PMR					PMR		MGR	PMR				MGR		VPG		PMR			MGR			PMR								PMR		
02 D																																	
02 X																																	
02 Y																																	

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## RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
02 A	PMR		PMR	PMR	PMR	PMR	PMR	PMR	OCU	PEN	FLS		PMR		MPD		MGR	MGR	VPG	PMR	PMR	PMR	PMR		PMR		VPG	PMR	PMR	MGR	
02 B	MGR			VPG	PMR		PMR	VPG	OCU	MEN	MEN			FLS	OCU		MGR	MGR	VPG	VPG	VPG	PMR	PMR	FLS	PMR	PMR	VPG	VPG	PMR	VPG	
02 C				VPG		PMR	PMR	PMR	PMS		PMR						MGR							FLS	PMR	FLS	VPG	VPG	PMR	VPG	
02 X																															
02 Y																															

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PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
03 A	003	003	001		002	003	001	001	002	000	000	000			004	002	004	YES		001		001		000					004	
03 B	002		002		001	003	003	001	002	002	002	000			003	002	002			001		002							005	001
03 C	000				003		001	002							002		002													
03 D											000																			
03 X																														
03 Y																														

RESPONDUN

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
03 A	000		000	001	000	000		002		001			003		005		001	003	006	001	000	002	001					001	001	002	
03 B				002	001	000		001		001				001	006		000	003	005	001	001	002	001				001	001	003	001	
03 C				002		000		002									000										001	003	001		
03 X																															
03 Y																															

C01

QUESTION 94

WHICH AUTOMATED REPORTING SYSTEMS WERE USED IN PROJECT MONITORING AND MANAGEMENT?

01  
LUMEST  
ORIGINATOR  
02  
HIGHERS:  
RECIPIENT

- A. MANUALLY BY ACTIVITY (E.G.,  
CODE, FLOW DIAGRAM, ETC.)  
H. MANDAY BY TASK (E.G., PREPARE  
USERS GUIDE, DESIGN DATA BASE,  
ETC.)  
Y. NONE/UNKNOWN  
Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	WUN	CPR				LSP	CPR	CPR	CPA	SAC	SAC	ENG	ENG		YES		YES						WUN		YES					
01 B										CPA	SAC	SAC	FSW	ENG		WUN								CPA	YES					
01 X																				MIS		MIS				MIS				
01 Y																														
01 Z																														

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A			ENG																											
01 B								WUN			CPR																			
01 X											SPC		CPR	FLS	CPR	CPR				FLS					WUN					
01 Y																														

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RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
02 A	PMR	PMR				PMR	PMR	PMR	PMR	PMR	PEN		PMR		YES			YLS		MIS		PMR		YLS							
02 B																VPC								PMR	YLS						
02 X																			MIS		MIS										
02 Y			NON	NON	NON									COI			NON		NON							NON			NON	NON	
7																															

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230		
02 A			PMR					SPC		NON	PMR						MGR															
02 B									PEN	PMR			PMR	PEN	PMR	PMR			PMR					PMR						VPC	PMR	MCP
02 X																																
02 Y	NON			NON	NON	NON	NON		NON		COI							NON		NON	NON	NON	NON			NON	NON					

IN MINIMUM SYSTEM DEVELOPMENT, SYSTEM SOFTWARE WAS USED FOR:

IN MINIMUM SYSTEM DEVELOPMENT, SYSTEM SOFTWARE WAS USED FOR:

- A. COUNT COMPLETES PER MODULE
- B. COUNT LINES OF CODE PRODUCED
- C. CHECK FOR ADHERENCE TO CODING CONVENTIONS
- D. CHECK FOR USE OF STANDARD DATA ELEMENT NAMES
- E. PERFORM MANHOUR/COST ACCOUNTING (ADDED)
- F. CHECK PERFORMANCE (ADDED)
- G. MONITOR CHANGES (ADDED)
- H. DID NOT USE SOFTWARE TO MONITOR SYSTEM DEVELOPMENT
- I. OTHER

HE SPUNDR	
PANT/100S	101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130

51A 51A 51A

YES YES

YFS

YES YES

202

207

**MS**

**SM**

**NUN**

**HIS**

512

**NUF NUF**

[illegible]

54

ys

57A 53A

515

**YES**

YES YES

**ST S**

Yes

YES YES

202

574

11

**NON**

**NUM NUM NUM NUM COS**

NON NON

**202**

**MIN**

**MIN**

QUESTION 96

LIST PRODUCTIVITY INDEXES SUCH AS LINES OF CODE, PROGRAM ERRORS, SOURCES OF ERRORS, TURN AROUND REQUIRED PER COMPLETED TASK, ETC., THAT WERE EMPLOYED IN MONITORING PERFORMANCE. (OPTIONALLY NARRATIVE)

- A. LINES OF CODE (PER UNIT OF TIME)
- B. MODULES COMPILED (PER UNIT OF TIME)
- C. PROGRAM ERRORS
- D. COMPUTER TIME USED
- E. DOCUMENTED PAGES
- F. DID NOT USE PRODUCTIVITY INDEXES
- Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	C02	C02			C02	C02				C02	C02	C02	C02											C02						
01 B						C02				C02	C02													C02		C02				
01 C	C02					C02							C02				C02	C02						C02						
01 D	C02												C02					C02	C02		YLS			C02						
01 E	C02																							C02						
01 X															MIS					MIS					MIS		MIS			
01 Y													C01																	
01 Z																														

RESPONDOR

PART/SUB	REC OF ORDER																														
	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A																															
01 B																															
01 C																															
01 E																															
01 X																															
01 Y																															



QUESTION 97

SPECIFIC STANDARDS EMPLOYED DURING THE COURSE OF THE PROJECT WERE DEVELOPED, ADAPTED, OR DIRECTED BY:

01 PROJECT MANAGER 02 COMPANY 03 USER 04 WAS NONE

- STANDARD  
A. DATA NAMES  
B. CODING  
C. PROGRAMMING  
D. DOCUMENTATION  
E. TESTING  
F. MANAGEMENT REPORT  
G. CONFIGURATION CONTROL (ADDED)  
H. QUALITY ASSURANCE (ADDED)  
I. NO STANDARDS (ADDED)  
J. OTHER

RESPONDENT

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 D	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 E	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 F	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 G																														
01 H																														
01 X																														
01 Y																														

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RESPONDUM		201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
PART/SUB																															
01 A	YES					YES		YES	YES					YES		YES	YES	YES	YES	YES		YES	YES						YES	YES	
01 H	YES				YES	YES	YES	YES	YES					YES		YES	YES	YES	YES	YES		YES	YES	YES	YES			YES		YES	
01 C	YES				YES	YES	YES	YES	YES					YES		YES	YES		YES			YES	YES	YES	YES			YES		YES	
01 D	YES				YES		YES		YES		YES			YES		YES	YES	YES				YES	YES		YES						
01 F					YES	YES	YES	YES	YES	YES	YES			YES		YES	YES	YES	YES	YES		YES	YES	YES	YES			YES	YES	YES	YES
01 F					YES	YES			YES	YES	YES	YES		YES								YES						YES	YES		YES
01 G	C02																														
01 X																															
01 Y																															

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# MTSPUNOOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
02 A													YES					YES				YES								
02 B													YES					YES		YES		YES								YES
02 C						YES							YES					YES			YES	YES								YES
02 D					YES	YES				YES			YES			YES				YES	YES	YES								YES
02 E			YES										YES			YES					YES	YES								YES
02 F	YES			YES		YES									YES	YES					YES		YES							YES
02 G						C02														C02										
02 H																														
02 X																														
02 Y		C02			C02	C02	C02	C02			C02	C02	C01			YES	C02	C02	C02					C02	C02	C02	C02	C02	C02	C02

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# MTSPUNOOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
02 A																				YES							YES			YES
02 B																				YES							YES			YES
02 C																				YES	YES					YES		YES		YES
02 D										YES	YES	YES							YES	YES	YES				YES		YES	YES		YES
02 E											YES								YES	YES	YES				YES					YES
02 F								YES											YES	YES				YES	YES			YES		YES
02 H																														
02 X																														
02 Y					C02	C02	C02	C02																						
02 Z																														

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## RESPONDUM

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
03 A																				YES	YES										
03 B																					YES										
03 C																					YES										
03 D											YES					YES	YES	YES		YES					YES						
03 E											YES										YES										
03 F											YES																				
03 X																															
03 Y																															

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## RESPONDUM

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230		
03 A											YES	YES																				
03 B										YES	YES	YES																				
03 C										YES																						
03 D										YES																						
03 E										YES																						
03 F										YES																						
03 X																																
03 Y																																
03 Z																																

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OTH

PART/SUB	RESPOND	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
04 A						YES	YES	YES			YES						YES	YES	YES													
04 B							YES										YES															
04 C							YES										YES															
04 D							YES																									
04 E							YES										YES	YES	YES													
04 F							YES										YES	YES														
04 G							C02										C02	C02	C02													
04 H							C02										C02	C02	C02													
04 X																																
04 Y							C02	C02	C02	C02	C02	C02	C02	C02	C01	C02	C02															

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PART/SUB	RESPOND	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
04 A								YES							YES											YES	YES					
04 B							YES								YES											YES	YES					
04 C							YES								YES											YES						
04 D							YES																									
04 E							YES																									
04 F							YES								YES																	
04 X																																
04 Y							C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	

MIS

YES

QUESTION 98

WHICH OF THE FOLLOWING WERE RECOGNIZED AS DISTINCT PHASES IN THE DEVELOPMENT EFFORT? (AFR 500-15, 1976)

- A. SYSTEM DEFINITION
- H. REQUIREMENTS DEFINITION
- C. PRELIMINARY DESIGN (ADDED)
- D. DETAIL DESIGN (ADDED)
- E. SYSTEM DESIGN
- F. MODULE DESIGN
- G. CODING
- H. MODULE TEST
- I. SUBSYSTEM INTEGRATION
- J. SYSTEM INTEGRATION
- K. SYSTEM TEST
- L. ACCEPTANCE (ADDED)
- M. VALIDATION (ADDED)
- N. OPERATION
- O. MAINTENANCE (ADDED)
- Y. DEVELOPMENT WAS NOT DIVIDED INTO (RECOGNIZED) PHASES (ADDED)
- Z. OTHER

RESPONDENT

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES			YES	YES	YES	YES	YES			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B	YES			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C																														
01 D																														
01 E	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 F	YES	YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 G	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 H	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 I	YES	YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 J	YES	YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 K	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 L																														
01 M																														
01 N	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 O																														
01 Z																														

OTH

RESPONDUM

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C	C02																													
01 D	C02																													
01 E	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 F	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 G	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 H	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 I	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 J	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 K	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 L	C02																													
01 M	C02																													
01 N	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 O	C02																													
01 Z																														

201

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## QUESTION 99

TASK ASSIGNMENT  
ACTION/FREQUENCY 01 06

A. WERE TASK ASSIGNMENTS TO THE  
PROJECT PLANS GIVEN IN  
WRITING?

B. WERE REQUIRED COMPLETION  
DATES INCLUDED WITH EACH  
WRITTEN TASK ASSIGNMENT?

C. WERE WRITTEN TASK  
ASSIGNMENTS PREPARED IN SUCH  
A WAY THAT THE RELATIONSHIP  
OF THE TASK TO THE NEXT  
HIGHER LEVEL TASK WAS CLEARLY  
DELINEATED?

D. WERE TASK ASSIGNMENTS GIVEN  
TO INDIVIDUAL TEAM MEMBERS  
IN WRITING?

E. WERE REQUIRED COMPLETION DATES  
INCLUDED WITH EACH INDIVIDUAL  
TEAM MEMBER'S WRITTEN TASK  
ASSIGNMENT?

F. WERE INDIVIDUAL TEAM MEMBERS  
WRITTEN TASK ASSIGNMENTS  
PREPARED IN SUCH A WAY THAT  
THE RELATIONSHIP OF THE TASK  
TO THE NEXT HIGHER LEVEL  
TASK WAS CLEARLY DELINEATED?

Y. NO TEAM (ADDED)  
Z. COMMENT

01 = ALWAYS

02 = MOST OF THE TIME

03 = ABOUT 1/2 OF TIME

04 = LESS THAN 1/2 OF TIME

05 = SELDOM

06 = NEVER

## RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	001	002	005	004	002	002	002	002	005	002	002	005	003	006	002	001	005	001	002	001	005	002	003	001	001	001	002	005	005	005
01 B	001	002	001	002	002	002	002	002	002	002	002	001	003	006	002	001	005	001	002	001	001	001	001	001	001	002	002	002	006	006
01 C	001	004	005	002	001	005	003	005	005	003	005	003	004	006	002	001	005	001	002	005	003	002	002	002	002	002	002	005	005	005
01 D	005	002	006	006	002	002	001	002	002	002	002	003	006	005	005	004	004	001	002	002	005	005	001	001	001	004	002	005	005	005
01 E	001	002	006	002	002	001	002	001	002	001	001	001	006	006	003	001	004	001	002	002	005	003	003	002	002	002	002	002	006	006
01 F	001	004	006	002	001	006	005	002	002	002	002	003	006	006	002	002	005	001	002	002	005	003	003	001	001	002	002	002	006	006

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01 Y





QUESTION 100

WERE TASK WORK TIME ESTIMATES PROVIDED AT THE TIME OF TASK ASSIGNMENT OR DID INDIVIDUAL TEAM MEMBERS PROVIDE TIME ESTIMATES AFTER REVIEWING THIS ASSIGNMENT?

A. TIME AND TASK ASSIGNED

B. TIME AND TASK ASSIGNED WITH VERIFICATION OR MODIFICATION OF TIME ALLOTTED BEING PROVIDED BY INDIVIDUAL TEAM MEMBER AS A MATTER OF PROCEDURE

C. INDIVIDUAL TEAM MEMBER PROVIDED THE TIME ESTIMATE FOR EACH TASK ASSIGNED

Y. NO EFFORT WAS MADE TO DETERMINE TIME REQUIREMENTS FOR INDIVIDUAL TASKS

Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B						YES				YES							YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C		YES							YES								YES													
01 Y					NUN				YES	NUN					NUN	NUN	NUN													NUN

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A								YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B	YES			YES	YES	YES	YES	YES							YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C																														
01 X							YES				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

QUESTION 101

AT WHAT INTERVALS WERE TASK ASSIGNMENTS MADE TO INDIVIDUAL TEAM MEMBERS

- A. EVERY 5 WORK DAYS
- B. EVERY 10 WORK DAYS
- C. EVERY MONTH
- D. AS TASKS WERE DEVELOPED AND DEFINED
- E. AS RESOURCES BECAME AVAILABLE TO WORK ON THE TASK
- F. TASK ASSIGNMENT NOT MADE TO INDIVIDUAL TEAM MEMBERS (ADDU)
- G. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 B																														
01 C																														
01 D	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 E	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 X																														
01 Y																														
01 Z																														

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RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A																														
01 B																														
01 D	YES					YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 E	YES					YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 X																														
01 Z																														

OTH

THE PROCEDURES USED IN WHICH PROGRAMMERS OR ANALYSIS WED ON SPECIFIC TASKS IN THE DEVELOPMENT PROJECT? (P.6. "I'LL WRITE THE EDIT PROGRAM FOR \$1,217.12")

**2. COMMENT**

PAWANI/SUH 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130

571

[illegible]

**SLIM**

NEW YORK

PARI/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230

57A

[illegible]

01 x  
MIS MIS  
MIS MIS

IF HIDING AS DESCRIBED ABOVE WAS EMPLOYED, HOW SUCCESSFUL WAS IT?

IF HIDING AS DESCRIBED ABOVE WAS EMPLOYED, HOW SUCCESSFUL WAS IT?

A. VEXXV

### H. MODERATELY

**1. UNSUCCESSFUL**

Y. NOT EMPLOYED

2. USE ONLY UNDER THE FOLLOWING CONDITIONS:

## RESPONSE

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130

**101**

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**01 x**

**MISS**

**SMIS**

101

	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	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	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	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	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	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

## RESPONSE

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230

01 A

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**MIS MIS**

01 Y 103

[illegible]

THE FOLLOWING FORMAL REVIEWS WERE CONDUCTED AS A REQUIREMENT OF THE SOFTWARE DEVELOPMENT EFFORT. (AFM 300-15, 1978)

- A. SYSTEMS REQUIREMENTS REVIEW
- B. SYSTEMS DESIGN REVIEW
- C. PRELIMINARY DESIGN REVIEW
- D. CRITICAL DESIGN REVIEW
- E. FORMAL QUALIFICATIONS REVIEW
- F. NO FORMAL REVIEWS WERE CONDUCTED
- G. OTHER

148[illegible]

## QUESTION 105

CONCERNING REVIEWS  
ACTION/FREQUENCY  
A. WAS FORMAL DOCUMENTATION  
PROVIDED IN ADVANCE OF  
EACH REVIEW?  
B. DID REVIEWS TAKE PLACE  
ON SCHEDULE?  
C. WERE THE REVIEW PROCEEDINGS  
FORMALLY DOCUMENTED?  
D. DID TOP MANAGEMENT ATTEND  
FORMAL REVIEWS?  
E. DID THE CUSTOMER/USER  
ATTEND FORMAL REVIEWS?  
F. WAS AN INDEPENDENT  
REVIEW TEAM USED  
(INDEPENDENT OF PROJECT  
MANAGER)?  
G. DID THE PROJECT MANAGER  
ATTEND THE FORMAL  
REVIEWS?  
H. WHAT WAS THE TITLE, POSITION AND  
AFFILIATION OF THE CHAIRPERSON  
OF THE FORMAL REVIEWS?  
Y. WERE THERE NO FORMAL  
REVIEWS (ADDED)  
01 = ALWAYS  
02 = MOST OF THE TIME  
03 = ABOUT 1/2 OF TIME  
04 = LESS THAN 1/2 OF TIME  
05 = SELDOM  
06 = NEVER

## RESPONDENT

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130		
01 A	001	001	001	006	003	002	002	004	001	001	001	001	006		001	001	001	002	001	002	001	002	001	001	002	002	001	005	001			
01 B	002	002	003	006	003	002	002	001	002	002	002	002	006		001	003	001	002	001	002	001	002	001	002	002	003	001	005	006			
01 C	001	002	002	006	003	002	004	003	002	001	002	001	006		001	004	001	002	001	002	001	002	001	001	002	004	001	005	001			
01 D	002	006	004	006	003	003	005	004	005	005	003	001	006		001	003	003	005	005	002	003	005	002	006	003	005	001	005	002			
01 E	001	001	001	006		004	004	001	001	001	001	001	004		001	001	001	001	001	002	001	002	001	001	002	002	001	005	001			
01 F	001	006	005	006		006	006	006	006	006	002	006	006		006	004	006	006		002		002	001	005	002	006	005	005	001			
01 G	001	001	001	006	001	001	004	001	001	001	001	001	003		001	003	001	001		001		002	001	001	002	003	001	001	002			
01 H	VAR	UCU	PTD	PMR	MEN	PMR	N/A	FILE	UCU	PMR	ENS	PMR	MIS	MIS	VPG	PMR	MPD	MIS	FSD	MIS	MIS	MIS	ENS	MIS	UNK	VAR	LSW	PMR	MCP	FTI		

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01 Y

RESPONDUR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230		
01 A	002	001	001	003	002	001	005	001	001	002	001	002	001	002	001	002	001	003	002	002	001	002	001	002	001	002	002	002	002	005	002	
01 B	004	002	004	002	002	002	001	002	002	002	003	002	002	002	001	002	002	004	002	002	002	002	002	002	002	002	004	002	001	002	002	
01 C	002	001	002	002	002	001	001	006	002	002	001	003	002	002	001	002	002	002	001	003	002	001	002	001	002	002	002	001	001	002	002	
01 D	002	001	003	002	005	005	006	001	006	002	002	005	002	004	002	002	004	002	002	005	005	004	004	004	002	002	002	002	003	005	001	
01 E	001	001	001	002	002	005	001	001	001	002	001	005	002	001	001	001	001	003	002	002	001	002	003	001	002	002	003	001	002	002	002	
01 F	003	002	006	002	006	006	001	006	002	006	006	005	006	004	005	006	006	006	006	005	006	004	005	001	002	002	004	004	005	005	005	
01 G	001	002	001	002	002	001	001	002	002	002	001	006	002	001	001	001	001	001	001	001	006	001	002	001	002	001	002	001	002	001	002	001
01 H	UCU	PEN	MPD	PTD	MIS	ENS	UCU	VAN	PMW	MEN	FLS	MIS	MIS	PMW	PMR	MIS	MCP	MCP	MCP	PMK	PMK	UCU	PMK	TNS	VAK	PMK	VAN	PMK	PMW	MCP	MLP	



QUESTION 106

WAS A SOFTWARE CONFIGURATION MANAGEMENT SYSTEM EMPLOYED?

A. YES - GIVE TITLE/NAME  
B. NO  
C. COMMENT

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130			
01 A	YES	C03	YES		SUM	C03				IND	IND	YES		IND	YES	YES				MAN	IND	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES		
01 B				YES			YES	YES	YES	YES					YES					YES	YES										YES	YES	
01 X																																	

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RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230			
01 A			YES		YES	483	LIP	CUS	YES		YES				YES	YES	YES	483	IND	SKD	CCS		MAC	IND	IND	IND	YES			YES			
01 B	YES			YES						YES					YES	YES															YES	YES	YES
01 X																																	

MIS

QUESTION 107

THE SYSTEM WAS BASE LINED AFTER (AFM 100-15 1978)

- A. SYSTEM REQUIREMENTS REVIEW
- B. SYSTEM DESIGN REVIEW
- C. PRELIMINARY DESIGN REVIEW
- D. CRITICAL DESIGN REVIEW
- E. DID NOT BASE LINE SYSTEM (ADDED)
- Z. OTHER

RESPONDUM

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A							YES											YES		YES		YES		YES						
01 B						YES						YES																		
01 C	YES			YES																	YES	YES			YES	YES				
01 D	YES	YES				YES							YES										YES	YES	YES	YES				
01 X																			MIS		MIS									
01 Y					NON		NON		NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON										NON

RESPONDUM

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A												YES							YES							YES	YES			
01 B					YES													YES	YES			YES			YES					
01 C	YES					YES	YES	YES	YES	YES	YES				YES		YES		YES											
01 D				YES		YES															YES	YES	YES	YES	YES					
01 Y	NON				NON									NON	NON	NON	NON	NON	NON							NON	NON			
01 Z																														OTH

QUESTION 108 WERE FORMAL CONFIGURATION CONTROL RECORDS EMPLOYED?

A. YES

B. NO

C. COMMENT

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A	YES	YES	YES								YES	YES				YES	YES			YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	
01 B				YES	YES	YES	YES	YES	YES	YES	YES			YES	YES															YES	YES
01 X																					MIS										

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A	YES	YES			YES	YES		YES	YES		YES			YES				YES		YES		YES		YES	YES	YES				YES	
01 B	YES			YES			YES			YES		CO1	YES		YES	YES	YES	YES	YES		YES		YES				YES	CO1		YES	

QUESTIONS 104

1. GIVE TITLE, POSITION AND AFFILIATION OF CHAIRPERSON OF (SOFTWARE) CONFIGURATION CONTROL BOARD. (ADD)

## RESPOND

[illegible]

01 001 WPD OCU MIS N/A N/A N/A N/A N/A N/A N/A PMK N/A UCU FSU N/A N/A MIS PMK MIS ENS PMK PMK FSU MPD PMK N/A N/A

**MT SPUNNUN**

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
WSPUNDRK																														
01 001	N/A	MPD	DCU	N/A	FSD	MIS	N/A	MIS	MEN	N/A	MPG	N/A	N/A	PLN	N/A	N/A	MEN	N/A	FSD	N/A	PMH	N/A	ENS	PMH	PMH	N/A	N/A	PMH	N/A	

HOW OFTEN WERE INFORMAL REVIEWS CONDUCTED BETWEEN THE PROJECT MANAGER AND HIS SUPERVISORS?

A. DAILY  
B. WEEKLY  
C. MONTHLY  
D. AS REQUIRED  
E. THERE NONE  
F. OTHER

[illegible][illegible]

QUESTION 111

WALK-THROUGHS (AS DEFINED BY WEINBERG, 1971) WERE USED FOR:

- A. DESIGN REVIEWS
- B. CODING REVIEWS
- Y. DID NOT USE WALK-THROUGHS
- Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES				YES	YES		YES		YES	YES	YES	YES			
01 B			YES	YES	YES	YES	YES	YES			YES			YES	YES	YES				YES	YES			YES	YES	YES	YES				
01 Y	NON		NON				NON		NON	NON				NON		NON	NON	NON				NON								COI	NON
01 Z																															OTH

OTH

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A	YES	YES		YES	YES		YES	YES		YES								YES	YES			YES	YES		YES		YES			YES	
01 B	YES					YES		YES	YES		YES	YES							YES			YES	YES		YES	YES	YES			YES	
01 X																															
01 Y							NON							NON	NON	NON	NON	NON		NON	NON		NON		NON		NON	NON	NON	NON	

QUESTION 112

HOW OFTEN WERE WALK-THROUGHS SCHEDULED?

- A. DAILY
- H. WEEKLY
- C. MONTHLY
- D. AS REQUIRED
- Y. NOT USED
- Z. OTHER

RESPONDENT

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A						YES					YES																			
01 B						YES																								
01 D			YES		YES			YES				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 Y							NON		NON	NON				NON			NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON

RESPONDENT

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A																						YES	YES								
01 B																															
01 C																															
01 D		YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 X																															
01 Y																															
01 Z																															

QUESTION 113

WHO NORMALLY ATTENDED WALK-THROUGHS?

01 DESIGN 02 CODING 03 OTHER

- A. PEER PROGRAMMERS OR ANALYSTS
- H. PROGRAMMER OR ANALYST TRAINEES
- C. PROGRAMMER'S OR ANALYST'S SUPERVISOR
- D. PROJECT MANAGER
- E. STANDARDS MONITOR
- F. TOP LEVEL MANAGER
- G. USER/CUSTOMER
- H. QUALITY ASSURANCE (ADDED)
- I. LEAD/SYSTEM ENGINEER (ADDED)
- J. TEST PERSONNEL (ADDED)
- Y. DID NOT USE WALK-THROUGHS
- Z. OTHER

RESPONDOR

PART/SUR	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C	YES			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 D				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 E				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 F				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 G				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 H				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 I				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 J				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 X				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 Y	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON
01 Z	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH	OTH



PART/SUM	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230		
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES								YES	YES		YES	YES										
01 B	YES	YES	YES	YES	YES			YES													YES									YES		
01 C	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES										YES				YES				YES	YES		
01 D	YES		YES	YES	YES	YES	YES	YES										YES							YES							
01 E				YES				YES																								
01 F																																
01 G	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES														YES							
01 J																					YES											
01 X																																
01 Y							NON	COI					COI	NON	NON	NON	COI	COI		NON	NON		COI			NON						

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## RESPONDUM

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
02 A			YES	YES	YES	YES					YES		YES							YES	YES			YES						
02 B						YES									YES						YES									
02 C	YES										YES	YES	YES	YES	YES							YES								
02 D											YES		YES																	
02 E													YES																	
02 G													YES																	
02 H													YES																	
02 I																														
02 X																														
02 Y	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON

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## RESPONDUM

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
02 A	YES			YES	YES	YES	YES	YES	YES	YES	YES								YES			YES		YES	YES	YES	YES	YES	YES	YES
02 B	YES			YES								YES						YES				YES		YES	YES	YES	YES	YES	YES	YES
02 C	YES			YES				YES														YES			YES		YES		YES	YES
02 E																						YES					YES		YES	YES
02 J																														
02 X																														
02 Y	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON

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C02

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
03 A				YES	YES	YES																									
03 B						YES																									
03 C																															
03 D															YES																
03 F																															
03 G																															
03 I																															
03 X																															
03 Y																															

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
03 A																															
03 B																															
03 C																															
03 D																															
03 G																															
03 X																															
03 Y																															

QUESTION 114

WERE WALK-THROUGH MINUTES/RECORDS KEPT?

A. YES  
B. NO  
Y. WALK-THROUGHS NOT USED  
Z. OTHER

01 02 03  
DESIGN CODING OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A				YES	YES	YES	YES	YES			YES										YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B		YES																			YES									
01 X																														
01 Y																														

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A		YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B		YES																												
01 X																														
01 Y																														

PART/SUB	RESPONDING	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
02 A				YES								YES												YES								
02 B		YES						YES					YES	YES	YES	YES					YES	YES						YES				
02 X																MIS																
02 Y		NON		NUN		NON	NUN	NON		NUN	NUN						NUN	C01	C01				NUN		NUN	NUN				NUN	C01	C01

PART/SUN		RESPONDENT																													
		201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
02 A				YES					YES	YES	C03												YES					YES			YES
02 B	YES												YES						YES	YES	YES			YES							YES
02 X			UNK			MIS																									
02 Y		NON			NON		C01				NON			NON	NON	NON	C01	C01			NON	NON			NON	NON	NON	NON			NON

[illegible]

PARENT/SUB	RESPONDENT																				YES										
	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220		221	222	223	224	225	226	227	228	229	230
03 A																															
03 B																															
03 X																															
03 Y	C01	N0N		N0N	N0N		C01	C01	N0N	C01	N0N		N0N	N0N	N0N	C01	C01		C01	N0N	N0N	C01	C01	N0N	N0N	N0N	N0N	C01	N0N	C01	

## QUESTION 115

IF IT WERE WITHIN YOUR POWER TO MAKE ANY CHANGES IN THE METHOD OR PROCEDURES FOLLOWED IN CONTROLLING THIS PROJECT WHAT WOULD THESE CHANGES BE, OR, IF YOU HAD RESOURCES AVAILABLE TO UNDERTAKE RESEARCH IN THE AREA OF PLANNING WHICH ASPECT WOULD YOU EXPLORE?

## RESPONDOR

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
 01 001 MIS MIS XTH MIS CTE CMB CIF MIS CMC CVB MIS MIS MIS MIS PRE MIS CIF PIA PIA N/A CMD MIS MIS MIS NON XRF MIS MIS CIB CIB  
 01 002 CMC CVB UGD PRH CVC XIF  
 01 003 CMC LMB

## RESPONDOR

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
 01 001 MIS MIS MIS NON MIS CMB MIS MIS CII PRH MIS CMC MIS CME UGD CMC CVA MIS MIS CIK LRE CSU CMD MIS CMB MIS CIB CIB CMB  
 01 002 PSI CMF CMF CSJ NIO CRC

ENTER THE NUMBER OF POSITIONS (BY CATEGORY DESCRIBED) DIRECTLY INVOLVED IN THIS DEVELOPMENT PROJECT

A.	FULL TIME,	REPORT TO PROJECT MANAGER	
B.	FULL TIME,	REPORT OUTSIDE PROJECT MANAGER'S ORGN	
C.	FULL TIME,	OUTSIDE CONTRACTOR/CONSULTANT	
D.	FULL TIME,	CUSTOMER	
E.	PART TIME,	REPORT TO PROJECT MANAGER	
F.	PART TIME,	REPORT OUTSIDE PROJECT MANAGER'S ORGN	
G.	PART TIME,	OUTSIDE CONTRACTOR/CONSULTANT	
H.	PART TIME,	CUSTOMER	

[illegible]

# 51

[illegible]

QUESTION 117

THE PROJECT MANAGER WAS RESPONSIBLE FOR  
 A. TECHNICAL QUALITY  
 B. HIRE AND FIRE ASSIGNED PERSONNEL (WITHIN FIRM POLICY)  
 C. EVALUATE PERFORMANCE OF INDIVIDUAL PERSONNEL  
 D. ADMINISTRATION, BUDGET, ETC.  
 E. ALLOCATING COMPUTER RESOURCES  
 F. ALLOCATING NON-COMPUTER RESOURCES  
 G. MEETING SCHEDULE COMMITMENTS  
 H. NEGOTIATING SPECIFICATION CHANGES WITH CUSTOMER  
 I. MAKING A PROFIT (I.E., OPERATING WITHIN A BUDGET)  
 J. NONE OF THE ABOVE (ADDED)  
 Z. OTHER

PART/SUB	RESPONDOR																													
	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B	YES	YES	YES	YES	YES								YES				YES		YES		YES		YES		YES				YES	
01 C	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES		YES	YES
01 D	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 E	YES		YES	YES	YES	YES		YES	YES	YES	YES	YES	YES				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 F	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 G	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 H	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 I	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

MIS

OTH





## QUESTION 118

THE TITLE AND POSITION OF THE PROJECT MANAGER'S SUPERVISOR WAS

## RESPONDOR

PART/SUH 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
 01 001 MPD MEN MEN MCP MEN MPA MCP MPA MEN MCP PEN VPE MEN MPD MIS MPD MPD MEN MIS MCP MPD MPD VPG MPD

## RESPONDOR

PART/SUH 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
 01 001 MCP MIS MPD VPG MEN MCP MEN PMW MPD VPG MEN MEN MEN PEN PEN PEN PEN MCP MGR FEN MEN MCP PMR MGR FIN FLS FSA MPA MEN MPD MCP

## QUESTION 119

THE SPAN OF CONTROL OF THE PROJECT MANAGER'S SUPERVISOR (INCLUDING  
THE PROJECT MANAGER) WAS+++++PERSONS.

## RESPONDER

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
01 001 004 004 004 002 040 400 004 060 090 020 140 004 999 MIS 060 MIS 100 006 007 MIS 006 010 010 250 025 004 021 006 100 060

## RESPONDER

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
01 001 400 MIS 005 013 030 060 100 060 080 004 450 003 035 060 030 050 007 100 035 003 024 255 015 100 125 MIS 075 140 150 300

## QUESTION 120

THE TITLE, POSITION, AND NUMBER OF PEOPLE REPORTING DIRECTLY TO THE  
PROJECT MANAGER WAS

01 TITLE POSITION 02 03  
NUMBER

A.  
B.  
C.  
D.  
E.  
F.  
G.  
H.

PROJECT MANAGER'S SPAN OF CONTROL IS ---- PERSONS.  
Y. NONE/UNKNOWN (ADDED)

## RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A	FSE	FTE	PTD	CAN	LPA	ENS	LPA	CAN	LPA	ENJ	LSE	ECH	ESW	LAN	CDV	LSA	FLS	PMA	PMA	UMA	ESW	LSW	PMK	CPA							
01 B	FSA	FLS	FLS	CPR	SMG	ENH	CPA	CAN	ENG	ENG	ENH	CDV	LAN	CPA	CPR	ENG	FLS	SEC	UMA	ENH	LSW	PMK	CPA								
01 C	FTI		SEC	SEC	ESW		CPA	LSE	ENJ	CAN	COP		CMS	ENG	CPR	SEC			UMA	CAN	CPR	SAS									
01 D			SLI	CPR			CAN	SLI	CDV				ESW																		
01 E							CPR						SAD																		
01 X																															

## RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	LSP			PTD	CPR	ENG	ESW	FSR	PMA	FSY	CAN	CPA	CPJ	FTC	CAN	FSY	FSA	LSE	WMT	FLS	SEC	CPA	FLS	CPR	FAP	FAP	PMA	CPH		
01 B	PMC			FTC				ENG	FSA	FAP			CPR	CPR	CPR	FSW	ENT	SPC												
01 C	FLS						CAN	FSA	FVS			ESW	FTG	FTM	ENS															
01 D	LPA						ENT	FSU	FPC			ESW	SUP	LSA																
01 E							FTG																							
01 F							SEC																							
01 X																														
01 Y																														

C01

C01

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
02 A	FLS							CHP				FLS		FLN										CPA						GLZ	
02 B	FLS							CAN				FLS		FLN										SAD						GLJ	
02 C	FLS							CPA				FLS												STS							
02 D								CAN				FLS																			
02 E								CPM																							
02 X																															
02 Y																															

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
02 A								FLS	FLS									FLS												FAP	
02 B								FLS	FLS									FLS					WMT							LAN	
02 C								FLS	FLS									FLS					WMT							CDA	
02 D								FLS	FLS														WMT								
02 E								FLS																							
02 F								SEC																							
02 X																															
02 Y																															



QUESTION 121

INDICATE THE REVIEWS THE PROJECT MANAGER ATTENDED AND THE CAPACITY IN WHICH HE ATTENDED

01 REVIEWER 02 REVIEWEE 03 UNSTRV

A. FORMAL (MANAGEMENT) REVIEWS (ADDED)

B. WALK-THROUGHS

C. BUDGET REVIEWS (ADDED)

D. TECHNICAL REVIEWS (ADDED)

E. THERE WERE NO REVIEWS (ADDED)

F. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B					YES	YES	YES				YES															YES	YES	YES		
01 C	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 X																														
01 Y			C01	C01					C01	C01																				

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	C02	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B					YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C	YES								YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 D																														
01 X																														
01 Y							C01	C01	C01																					

RESPONDUM

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
02 A	YES		YES		YES		YES	YES	YES	YES	YES	YES			YES		YES					CO2		YES						YES	
02 B															YES																
02 C	YES	YES	YES		YES	YES	YES	YES	YES	YES	YES				YES		YES							YES						YES	YES
02 X																															
02 Y				NON			NON								MIS	MIS		CO1	CO1	CO1	NON		CO1						CO1	CO1	

RESPONDUM

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
02 A	CO2			YES		YES	YES	YES		YES				YES		YES		YES		YES	YES	YES			YES	YES	YES	YES	YES		
02 B				YES																											
02 C	YES			YES	YES	YES	YES		YES								YES							YES	YES	YES	YES	YES	YES	YES	
02 D																															
02 X																															
02 Y								CO1	NON				CO1	CO1	CO1			CO1													



## RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
03 A		YES				YES									YES						YES	YES	YES								
03 B		YES						YES													YES	YES									
03 C																															YES
03 X																															
03 Y	C01	C01	C01	C01	C01	C01	NON		C01	C01	C01	C01	C01								NON				C01	NON	C01				

## RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230			
03 A																																	
03 B	YES					YES		YES		YES								YES	YES														
03 C																																	
03 D																																	
03 X																																	
03 Y					C01	C01	C01	C01	C01	C01												C01	C01		C01	C01							

QUESTION 122

THE PROJECT MANAGER WAS EXPECTED (BY CORPORATE MGMT) TO BE (ADDED)

- A. A TECHNICAL SUPERVISOR
- B. A NON-TECHNICAL SUPERVISOR
- C. PROJECT ADMINISTRATOR (ONLY) (ADDED)
- Y. NONE OF THE ABOVE (ADDED)
- Z. COMMENT

RESPONDENT

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B	YES	YES	YES	YES													YES													
01 C	YES		YES	YES		YES	YES	YES							YES				YES											
01 X																														

MIS

MIS

RESPONDENT

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A					YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B				YES			YES										YES													
01 C			YES		YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 X	MIS	MIS																												

MIS

QUESTION 12.

IN THE CONDUCT OF THIS PROJECT DID THE COMPANY OR PROJECT MANAGER  
MAKE A CONSCIOUS EFFORT TO APPLY ANY OF THE FOLLOWING MANAGEMENT  
TECHNIQUES?

- 01 COMPANY  
02 PROJ MGR
- A. MANAGEMENT BY OBJECTIVES (DRUCKER 1954)  
B. JOB ENRICHMENT (HERZBERG 1977)  
C. (MOTIVATION) THEORIES (MASLOW 1943) (CURR)  
D. SUGGESTION PROGRAM  
E. INCENTIVE AND/OR BONUS PROGRAM  
F. PARTICIPATIVE MANAGEMENT  
G. MANAGEMENT BY EXCEPTION  
Y. NONE OF THE ABOVE (ADDED)  
Z. OTHERS

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES			YES	YES	YES	YES	YES	YES			YES			CO1			YES		YES		YES	YES	YES		YES		YES		YES
01 B																		YES												
01 D				YES											YES															
01 E																														
01 F																			YES											
01 G	YES		YES				YES								YES															
01 X																														
01 Y																														
01 Z																														

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A				YES	YES			YES	YES								YES	YES						YES						
01 B									YES																					
01 D	YES							YES	YES						YES															
01 E																														
01 F																														
01 G																														
01 X																														
01 Y																														

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
02 A	YES		YES	YES	YES		YES	YES				YES	YES	YES				YES	YES				YES			YES	YES	YES	YES	YES
02 B													YES		YES															
02 D													YES		YES															YES
02 F													YES		YES															YES
02 G	YES		YES				YES	YES				YES																		MIS
02 X																														
02 Y																														

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
02 A	YES			YES	YES	YES	YES		YES			YES					YES			YES			YES	YES	YES	YES	YES	YES	YES	YES
02 B																														
02 D																														
02 E																														
02 F																														
02 G	YES																													
02 X																														
02 Y																														

QUESTION 124

IN USING MANAGEMENT BY OBJECTIVES THE OBJECTIVES WERE:  
 A. SET BY THE PROJECT MANAGER WITHOUT INPUT FROM THE TEAM MEMBER  
 B. SET BY THE PROJECT MANAGER WITH INPUT FROM THE TEAM MEMBER  
 C. PERIODICALLY REVIEWED  
 Y. DID NOT USE MANAGEMENT BY OBJECTIVES  
 Z. COMMENT

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A							YES																							
01 B	YES				YES	YES	YES	YES	YES			YES	YES	YES			YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C	YES				YES			YES	YES			YES	YES				YES		YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 X										MIS						MIS					MIS									
01 Y	NON		NON							NON		NON			NON		NON		NON	NON	NON									COI

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A												YES																		
01 B	YES			YES	YES	YES		YES	YES	YES							YES	YES	YES	YES			YES	YES	YES	YES	YES	YES	YES	YES
01 C	YES						YES										YES	YES												
01 X																					MIS									
01 Y			MIS	UNK			MIS								NON	NON	NON	NON	NON			NON				COI				NON

QUESTION 125

THE PROJECT MANAGER:  
 A. ISSUED INSTRUCTIONS TO HIS SUBORDINATES IN WRITING  
 B. DELEGATED TECHNICAL DECISIONS TO HIS DIRECT SUBORDINATES (TEAM CHIEFS)  
 C. HAD AN OPEN DOOR POLICY  
 D. EMPLOYED QUALITY STANDARDS DEFINING WHAT WAS EXPECTED OF EACH PROGRAMMER/ANALYST  
 E. EMPLOYED QUANTITY STANDARDS DEFINING HOW MUCH EACH PROGRAMMER/ANALYST SHOULD ACCOMPLISH  
 F. MONITORED PROGRESS WITH THE AID OF A CONTROL BOARD AND/OR CONTROL ROOM  
 G. HAD A SEPARATE OFFICE TO INSURE PRIVACY  
 H. HAD A PERSONAL SECRETARY

RESPONDOR

PART/SUB	MIS																													
	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES		YES	YES	YES	YES	YES					YES					YES				YES		YES	YES				YES	YES	
01 B	YES	YES	YES	YES			YES	YES				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	
01 C	YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	
01 D				YES						YES								YES	YES								YES	YES	YES	
01 E				YES			YES	YES	YES																				YES	
01 F	YES	YES	YES	YES			YES					YES					YES				YES	YES	YES	YES	YES					
01 G	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	
01 H	YES		YES	YES	YES	YES	YES			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	
01 X																														

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RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A								YES	YES		YES	YES			YES		YES		YES					YES				YES	YES	YES
01 B	YES			YES		YES		YES	YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C	YES			YES	YES	YES	YES	YES	YES	YES	YES			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 D					YES			YES	YES					YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 E								YES						YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 F	YES			YES		YES			YES	YES	YES			YES								YES				YES		YES	YES	YES
01 G	YES			YES			YES	YES	YES	YES							YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 H				YES			YES	YES	YES	YES	YES																	YES	YES	YES
01 X																														

MIS UNK

QUESTION 126

HOW DID THE UNION CONTRACT AFFECT THE RESPONSIBILITY AND AUTHORITY OF THE PROJECT MANAGER?

- A. LIMITED HIS ABILITY TO HIRE AND FIRE HIS STAFF
- B. REQUIRED CLEARANCE FROM THE UNION PRIOR TO TAKING CERTAIN MANAGEMENT ACTIONS
- C. UNION HELPED MOTIVATE TEAM PERSONNEL TOWARD BETTER PERFORMANCE
- D. UNION LABOR STANDARDS ENHANCED THE PROJECT MANAGERS AUTHORITY
- E. UNION LABOR STANDARDS RETARDED THE PROJECT MANAGERS AUTHORITY
- F. UNION LABOR STANDARDS ENHANCED PRODUCTION
- G. UNION LABOR STANDARDS RETARDED PRODUCTION
- H. UNION MEMBERSHIP HAD NO RECOGNIZABLE AFFECT ON THE PROJECT
- I. NO TEAM MEMBERS WERE REPRESENTED BY A UNION
- J. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A				YES																										
01 B				YES																										
01 H				YES	YES		YES									YES														
01 X																														
01 Y	NUN	NUN	NUN		NUN	NUN	NUN		NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 H					YES				YES	YES									YES				YES							
01 X				MIS	UNK																									
01 Y	NUN			NUN	NUN		NUN	NUN		NUN		NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN	NUN

IF YOU HAD IT WITHIN YOUR POWER TO IMPLEMENT CHANGES IN THE WAY THIS PROJECT WAS DIRECTED, OR HAD THE RESOURCES TO DEVOTE TO RESEARCH IN THIS AREA, WHAT ACTION WOULD YOU TAKE?

PANT/SUB	RESPOND									
01 001	MIS	MIS	DIB	MIS	PSE	MIS	U1D	MIS	MIS	MIS
01 002	DIC	U3D								
		101	102	103	104	105	106	107	108	109
		110	111	112	113	114	115	116	117	118
		119	120	121	122	123	124	125	126	127
		128	129	130						

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[illegible]

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U5H



QUESTION 128

THIS PROJECT IS

- A. 50% COMPLETE OR LESS
- B. 51% TO 75% COMPLETE
- C. 76% TO 90% COMPLETE
- D. 91% TO 99% COMPLETE
- E. 99% TO 99.99% COMPLETE
- F. 100% COMPLETE AND ACCEPTED BY CUSTOMER
- Y. CANCELLED/NOT DELIVERABLE (ADDED)
- Z. COMMENT

RESPONDER

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 B				YES								YES	YES																	
01 C									YES		YES																			YES
01 D			YES		YES	YES	YES	YES																YES						YES
01 E																					YES									
01 F	YES	YES								YES				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 Y																														

C04

RESPONDER

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A			YES	YES	YES				YES																					
01 C																														
01 D				YES											YES	YES					YES									
01 E							YES																							
01 F				YES	YES				YES	YES			YES				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 X																														
01 Y																														

MIS MIS

C02

QUESTION 129

WAS THE PROJECT COMPLETED ON OR BEFORE SCHEDULE?

- A. YES, ON SCHEDULE  
 B. YES,-----MONTHS EARLY,-----X EARLY  
 C. NO,-----MONTHS LATE,-----X LATE  
 D. YES, HOWEVER SPECIFICATIONS WERE REDUCED (ADDED)  
 Y. PROJECT NOT COMPLETED AND/OR NO ESTIMATE AVAILABLE (ADDFU)  
 Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C1			N/S				006	008	003	012	006			015		006				001	017		006		024	004	001			001
01 C2			030				040	035	010	100	030			100		050				004	047		025		100	016	015			006
01 D																														
01 Y																														
01 Z																														

C02

OTH

RESPONDOR

REASON FOR DISCONTINUATION																																			
PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230					
01 A				YES	YES	YES	YES	YES	YES			YES	C04	YES	YES	YES	YES					YES													
01 C1			006	006						003									006	006	003	003	010	003	004	006	002	002	001	003					
01 C2			011	015						010									025	025	012	030		045	007	025	010	008	011	003	018				
01 X											MIS																								
01 Y																																			

MIS

C02

IF NOT COMPLETED ON TIME WHAT WAS THE MAJOR CAUSE OF SLIPPAGE

IT NOT COMPLETED ON TIME WHAT WAS THE MAJOR CAUSE OF SLIPPAGE

(/CANCELLATION) (ADDED)

### A. CHANGE IN REQUIREMENT

## CHANGÉ IN METHOD OF DESIGN

**C. HAD INITIAL ESTIMATE**

UNREASONABLE ESTIMATE, BY EITHER TOP MANAGEMENT OR THE CUSTOMER.

**3. LIMITED AUTHORITY OVER RESOURCES**

4. EXCESSIVE ABSENCES ON THE PART OF THE PROJECT TEAM MEMBERS

**G. POOR MANAGEMENT (ADULT)**

Y. PROJECT WAS COMPLETED OR IS ON SCHEDULE (ADDED)

## 2. OTHER

PANT/SUH	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
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SJA SJA SJA  
YES YES YES

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571

YES YES

CU3

**YES**

202

CO1

617

PARI/SUH	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
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**WFO**

QUESTION 132 IF PROJECT WAS LATE, WHAT PORTION (IN PERCENT) IS ATTRIBUTABLE TO CHANGE IN REQUIREMENTS? \*\*\*\*\*2

RESPONDOR

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01 001 N/A N/A MIS N/A N/A 000 080 080 050 015 095 N/A 050 100 N/A 015 N/A 090 020 N/A 015 N/A 050 000 090 N/A N/A 000

RESPONDOR

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01 001 070 020 002 050 N/A N/A N/A N/A N/A 010 MIS 030 000 N/A N/A N/A 040 060 000 005 N/A 075 003 010 075 001 007 080 005

# QUESTION 133

WHAT, IF ANYTHING, COULD THE PROJECT MANAGER HAVE DONE TO IMPROVE HIS ABILITY TO MEET THE SCHEDULE? (ORIGINALLY NARRATIVE)

- A. RESTRICT THE NUMBER OF CHANGES
- B. REQUIRE FORMAL SYSTEM OF CHANGES
- C. REQUIRE A FIRM REQUIREMENTS BASELINE
- D. CONDUCT MORE REVIEWS
- E. RECEIVE MORE AUTHORITY OVER PROJECT
- F. MAKE A BETTER ESTIMATE OF SCHEDULE
- G. PERFORM BETTER PLANNING
- H. NOTHING
- I. BETTER DIRECTION AND CONTROL
- J. BETTER AND EARLIER REQUIREMENT SPECIFICATIONS
- Y. PROJECT WAS COMPLETED OR IS ON SCHEDULE
- Z. OTHER

## RESPOND

RECORDING																															
PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
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137

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01 A	C02															C02			C02											YES	C02	
01 B																C02																
01 C	C02																									C02						C02
01 E																										C02				YES		
01 F	C02																															
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AD-A117 998

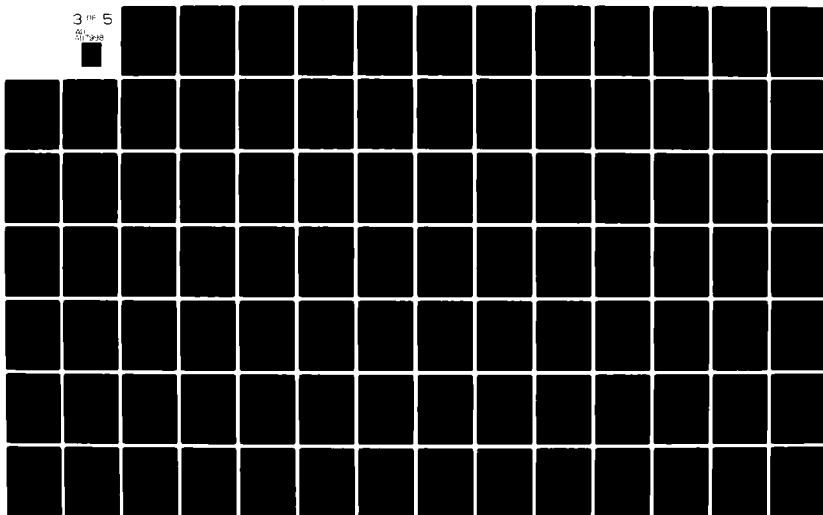
SACRAMENTO AIR LOGISTICS CENTER MCCLELLAN AFB CA SERV--ETC F/G 22/2  
RESULTS OF A SURVEY SOFTWARE DEVELOPMENT PROJECT MANAGEMENT IN --ETC(U)  
DEC 79 R H THAYER, J H LEHMAN  
SM-ALC/MME-TR-79-54-VOL-2

UNCLASSIFIED

NL

3 OF 5

AD-A117 998



WAS THE PROJECT DELIVERED WITHIN THE ORIGINAL BUDGET?

189



# QUESTION 135

IF NOT COMPLETED WITHIN THE ORIGINAL BUDGET, WHAT WAS THE CAUSE OF THIS SLIPPAGE (CANCELLATION)? (ADDED)

- A. CHANGE IN REQUIREMENTS
- H. CHANGE IN METHOD OF DESIGN
- C. BAD INITIAL ESTIMATE
- D. UNREASONABLE ESTIMATE, BY EITHER THE MANAGER OR THE CUSTOMER
- E. LIMITED AUTHORITY OVER RESOURCES
- F. EXCESSIVE ARSENCES ON THE PART OF THE PROJECT TEAM MEMBERS
- G. POOR MANAGEMENT (ADDED)
- Y. PROJECT WAS COMPLETED ON IS WITHIN COST (ADDED)
- Z. OTHER

## RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B				YES																	YES									
01 C				YES						YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 D			YES								YES										YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 E								YES																						C03
01 F								YES																						
01 G																														C03
01 H																														C03
01 I																														C03
01 J																														C03
01 K																														C03
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## RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	YES								YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B												YES	YES																	
01 C	YES		YES						YES									YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
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OTH

QUESTION 136

IF PROJECT EXCEEDED COST ESTIMATES, WHAT PORTION OF THE OVERRUN (IN PERCENT) WAS CAUSED BY A CHANGE IN REQUIREMENTS? \*\*\*\*\*X

RESPONDOR

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
01 001 N/A 100 050 100 N/A N/A 000 075 100 MIS 010 N/A N/A 050 100 N/A 005 N/A N/A 090 020 100 010 N/A 050 MIS 090 N/A N/A 000

RESPONDOR

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01 001 070 N/A 002 N/A N/A N/A N/A 005 010 MIS 033 020 000 N/A N/A 000 090 100 N/A MIS N/A 075 005 010 075 N/A 008 080 005

QUESTION 137

WHAT, IF ANYTHING, COULD THE PROGRAM MANAGER HAVE DONE TO IMPROVE HIS ABILITY TO MEET THE BUDGET? (ORIGINALLY NARRATIVE)

- A. RESTRICT THE NUMBER OF CHANGES
- B. REDEFINE FORMAL SYSTEM OF CHANGES
- C. REQUIRE A FIRM REQUIREMENTS BASELINE
- D. CONDUCT MORE REVIEWS
- E. RECEIVE MORE AUTHORITY OVER PROJECT
- F. MAKE A BETTER ESTIMATE OF COSTS
- G. PERFORM BETTER PLANNING
- H. NOTHING
- I. BETTER DIRECTION AND CONTROL
- J. BETTER AND EARLIER REQUIREMENT SPECIFICATIONS
- K. PROJECT WAS COMPLETED OR IS WITHIN COST
- L. OTHER

RESPONDOR

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PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
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PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
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QUESTION 130

DID THE DELIVERED SOFTWARE MEET THE REQUIREMENTS AS ORIGINALLY SPECIFIED BY THE CUSTOMER?

A. YES

B. NO

Y. NO REQUIREMENTS SPECIFIED (AND/OR PROJECT NOT COMPLETED) (ADDED)

Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A	YES	YES		YES	YES	YES			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 H							YES																								
01 Y																															

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A				YES	YES	YES	YES		YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B																															
01 X																															
01 Y																															

## QUESTION 159

DID THE CUSTOMER ACCEPT THE DELIVERED SYSTEM AS MEETING SPECIFIED REQUIREMENTS IN TOTAL, OR DID HE IDENTIFY EXCEPTIONS?

A. ACCEPTED SYSTEM IN TOTAL AS MEETING SPECIFIED REQUIREMENTS

B. IDENTIFIED EXCEPTIONS

Y. NO REQUIREMENTS SPECIFIED (AND/OR PROJECT NOT COMPLETED) (ADDED)

Z. OTHER

## RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A	YES	YES			C03	YES			YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B			YES							YES							YES			YES	YES			YES							
01 Y				NUN																											

NUN C01

## RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 B			YES								YES																				
01 Y	C02	NUN									YES	YES	YES							YES				YES	YES	YES	YES				

NUN

## QUESTION 140

HOW WAS IT DETERMINED THAT THE SYSTEM MET THE REQUIREMENTS SPECIFIED?  
(ORIGINALLY NARRATIVE)

- A. QUALIFICATION/FIELD TEST
- H. SYSTEM IN OPERATION
- C. FORMAL SYSTEM/ACCEPTANCE TEST
- D. INDEPENDENT VERIFICATION AND VALIDATION
- E. CHECK AGAINST KNOWN ANSWERS
- F. SIMULATION

- G. SYSTEM DID NOT MEET REQUIREMENTS SPECIFIED
- Y. NO REQUIREMENTS SPECIFIED AND/OR PROJECT NOT COMPLETED
- Z. COMMENT

## RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A	C02	C02					C02			C02		C02	C02	C02	C02	C02	C02			C02		C02		C02	C02	C02	C02	C02	C02	C02	C02
01 B																															
01 C							C02																								
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## RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A	C02		C02						C02		C02		C02				C02		C02		C02		C02		C02						
01 B																															
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01 D																															
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QUESTION 141

WHY DID THE SYSTEM NOT MEET THE REQUIRED SPECIFICATION? (ORIGINALLY NARRATIVE)

- A. REQUIREMENTS CHANGED
- B. INITIAL ESTIMATE HAD
- C. REQUIREMENTS IGNORED/CUSTOMER ACCEPTED WITHOUT CORRECTION (ADDED)
- D. SYSTEM MET REQUIREMENTS SPECIFIED
- E. NO REQUIREMENTS SPECIFIED AND/OR PROJECT NOT COMPLETED
- Z. COMMENT

PART/SUB	RESPONDOR	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
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01 B																															
01 D	YES C01																														
01 X																															
01 Y																															

PART/SUB	RESPONDOR	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A																															
01 B																															
01 C																															
01 D																															
01 Y	C01 NON																														
01 Z																															



QUESTION 142

DID THE DELIVERED SOFTWARE MEET THE RELIABILITY STANDARDS ORIGINALLY SPECIFIED?

A. YES

B. NO

Y. NO STANDARDS SPECIFIED (AND/OR PROJECT NOT COMPLETED) (ADDED)

Z. COMMENT

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A					YES							YES	YES					YES		YES				YES	YES					
01 B																														
01 Y	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	CO1	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON

YES

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A					YES	YES	YES	YES			YES							YES	YES				YES	YES						
01 B																														
01 X																														
01 Y	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON

MIS

YES YES

# QUESTION 143

WHY DID THE DELIVERED SOFTWARE FAIL TO MEET THE RELIABILITY STANDARDS?

- A. REQUIREMENTS CHANGED (ADDED)
- B. NOT ENOUGH REVIEWS AND TESTING (ADDED)
- C.
- D. SYSTEM MET THE SPECIFIED RELIABILITY STANDARDS
- Y. NO STANDARDS SPECIFIED (AND/OR PROJECT NOT COMPLETED) (ADDED)
- Z. COMMENT

## RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 D																															
01 Y	NUN	C01	NUN	NUN																											

## RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A																														
01 H																														
01 D																														
01 X																														
01 Y	NUN																													

WHICH, IF ANY, OF THE FOLLOWING METHODS OF MEASURING RELIABILITY OF THE DELIVERED SOFTWARE SYSTEM WERE USED IN THE PROJECT? (GILH 19/7)

A. THE FINISHED SYSTEM WAS SALIED WITH KNOWN BUGS (AFTER INTEGRATION TESTING AND BEFORE SIGN OFF). THE SYSTEM WAS THEN DEBugged FOR A FIXED (GIVEN) PERIOD OF TIME AFTER WHICH THE RATIO OF FOUND KNOWN BUGS TO FOUND UNKNOWN BUGS WAS JUDGED EQUAL TO THE RATIO OF UNFOUND KNOWN BUGS TO UNFOUND UNKNOWN BUGS.

B. CURVES OF ERRORS FOUND TO TIME SPENT DEBugging WERE CALCULATED

C. A SOFTWARE RELIABILITY ERROR PREDICTION MODEL WAS EMPLOYED

D. SPECIAL TEST DRIVERS WERE EMPLOYED TO STRESS SYSTEM (ADDED)

E. REPORTED ERRORS PER UNIT OF TIME (MTBF) AND SYSTEM ACCEPTED WHEN ERROR RATE REACHED ACCEPTABLE LEVEL (ADDED)

F. NO RELIABILITY MEASURING METHOD WAS EMPLOYED (AND/OR PROJECT NOT COMPLETED) (ADDED) :

G. OTHER

200

RESPONDENT		201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
PART	SUB																														
01	A	C03																													
01	B	YES																													
01	C	YES																													
01	D	C02																													
01	E	C02																													
01	X	MIS																													
01	Y	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	
01	Z	OTH																													

QUESTION 145

DID THE DELIVERED SOFTWARE MEET THE MAINTAINABILITY STANDARDS

ORIGINALLY SPECIFIED?

A. YES

B. NO

Y. NO STANDARDS SPECIFIED AND/OR PROJECT NOT COMPLETED (ADDED)

Z. COMMENT

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A	YES				YES							YES								YES											
01 X																															
01 Y	C02		C02	C01	C02	C02	C01	C02	C02	C02	C02	C02	C01	C02	C01	C02	C02	C01	C02	C01	C01	C02	C02	C02	C02	C02	C01	C02	C02	C02	C02

MIS

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	
01 Y	C02			C03	C03	C03	NON	C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	C02	C03	C02	C01	C02			C01						C02

QUESTION 146

WHY DID THE DELIVERED SOFTWARE FAIL TO MEET THE MAINTAINABILITY STANDARDS?

- A.
- B.
- C.
- D.
- E.
- F.
- G.
- H.
- I.
- J.
- K.
- L.
- M.
- N.
- O.
- P.
- Q.
- R.
- S.
- T.
- U.
- V.
- W.
- X.
- Y.
- Z.

SOFTWARE MET THE SPECIFIED MAINTAINABILITY STANDARDS  
 Y. NO STANDARDS SPECIFIED (AND/OR PROJECT NOT COMPLETED) (ADDED)  
 Z. COMMENT

RESPONDER

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 D			C01		C01								YES								YES									
01 X																														
01 Y	NON		NON	C02		NON	NON	NON	NON	NON	NON	C01		NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	C01		NON	NON	C01	NON	

MIS

MIS

RESPONDER

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 D			C01	YES		C01					C01													YES	YES		YES	YES	YES	
01 Y	NON		NON		NON	NON	NON	NON	NON	NON	NON	NON	C01	NON	NON	NON	NON	NON	NON	NON	NON	NON	C01			NON				NON

# QUESTION 147

WHICH IF ANY OF THE FOLLOWING METHODS OF MEASURING THE MAINTAINABILITY OF THE DELIVERED SOFTWARE WERE USED IN THE PROJECT? (JULY 1977)

A. MEASURED THE TIME TO REPAIR THE FIRST N NUMBER OF BUGS REPORTED (AFTER INTEGRATION TESTING AND JUST BEFORE SIGN OFF) THE AVERAGE TIME TO FIND A BUG BECAME THE MEAN TIME TO REPAIR (MTTR).

B. SALTED THE FINISHED CODE WITH KNOWN BUGS. THE AVERAGE TIME TO FIND AND REPAIR THE KNOWN BUGS BECAME THE MEAN TIME REPAIR (MTTR).

C. COST TO MAINTAIN PROGRAM PER UNIT OF TIME AND ACCEPTED WHEN COST REACHED AN ACCEPTABLE LEVEL (ADDED)

Y. NO MAINTAINABILITY MEASURES WERE EMPLOYED AND/OR PROJECT NOT COMPLETED (ADDED)

Z. OTHER

## RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A																															
01 X																															
01 Y																															
01 Z																															

## RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A																															
01 C																															
01 X																															
01 Y																															
01 Z																															

QUESTION 140

WAS THE DELIVERED SYSTEM USABLE? IF SO, HOW WAS THIS DETERMINATION MADE? (ORIGINAL NARRATIVE)

- A. YES, SYSTEM IS IN PRODUCTION
- B. YES, SYSTEM IS IN USE
- C. YES, INDEPENDENT VERIFICATION AND VALIDATION
- D. YES, FIELD OR QUALIFICATION TESTING
- E. YES, CUSTOMER WAS SATISFIED
- F. UNKNOWN, HAS NOT BEEN DETERMINED
- G. NO, USER WAS NOT SATISFIED
- Y. NO, THE SYSTEM WAS NOT DELIVERED/CANCELLED
- Z. OTHER

RESPONDENT

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A																														
01 B	C02				C02															YES		C02	C02							C02
01 C																				YES		C02								
01 D																														
01 E																														
01 F																														
01 G																														
01 X																														
01 Y																														

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MIS MIS MIS

RESPONDENT

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 B																														
01 D																														
01 E																														
01 F																														
01 X																														
01 Y																														

MIS

NUM

QUESTION 149

WHAT WAS THE PERIOD OF THE FINAL PRODUCT WARRANTY?

- A. 1 YEAR
- B. 2 YEARS
- C. 3-5 YEARS
- D. 6 OR MORE YEARS
- E. NO WARRANTY
- F. OTHER

RESPONDOR

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130

YES

YES YES

MIS

NUN NUN NUN

OTH

RESPONDOR

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230

YES

YES YES

YES

YES YES

YES

YES

MIS

NUN

NUN NUN

NUN NUN

NUN NUN

NUN

NUN NUN

NUN

NUN NUN

NUN NUN

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NUN NUN



QUESTION 150

WHAT WAS THE APPROXIMATE PRODUCTION RATE (LINES OF CODE PER DAY) FOR THE ENTIRE PROJECT?

- A. AVERAGE PROGRAMMER/ANALYST
- H. BEST PROGRAMMER/ANALYST
- C. WORST PROGRAMMER/ANALYST
- Z. COMMENT

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	003	006		010	010	003	020	020	060	004	011	003	004		011	001	030	040		013	015		004	025	007	010				
01 B				015			040	100			001						020	012		007	015								013	
01 C				006			005	020		005							008													
01 X			UNK																											

MIS UNK

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	020		016		068	015	015		003	004	005		004	004	003	004	015	015	016	012		015	010	010	030	015		020	015	004
01 B	100		024		088						008		006	006	007	006	012	020	050			UNK	UNK	020	060	030		035	025	006
01 C	005		008		028						004		002	002	001	002	010	010	NEG			UNK	UNK	005	010	005		005	003	

UNK

MIS

DIS

UNK

UNK

MIS

UNK

## QUESTION 151

HOW MANY LINES OF CODE WERE PRODUCED PER PAGE OF DOCUMENTATION?

## RESPONDENT

PART/SUR 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
 01 001 MIS 010 MIS UNK 025 008 200 010 020 028 MIS 008 UNK MIS 010 N/A 100 030 030 MIS UNK MIS UNK MIS MIS MIS 250 005 UNK UNK

## RESPONDENT

PART/SUR 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
 01 001 100 MIS UNK UNK MIS 015 015 MIS 010 058 UNK MIS 021 025 010 100 025 008 200 MIS MIS 027 001 030 150 025 MIS UNK MIS UNK

QUESTION 152 WHAT WAS THE COST PER LINE OF CODE? \*\*\*\*\*

## RESPONDUM

PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
01 001 079 019 015 008 010 030 008 020 005 040 018 100 160 025 020 MIS 040 100 006 MIS UNK 075 UNK 100 010 060 050 MIS UNK 006

## RESPONDUM

PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
01 001 011 MIS 013 UNK 022 016 015 MIS 100 050 050 015 050 050 070 050 027 030 030 MIS 006 017 012 010 010 052 UNK 004 004

QUESTION 153

WAS SOFTWARE DEVELOPMENT THE PAGING FACTOR (CRITICAL PATH) ON THE PROJECT?

- A. YES, HARDWARE WAS DEVELOPED AHEAD OF SOFTWARE
- B. NO, SOFTWARE WAS DEVELOPED AHEAD OF HARDWARE
- C. YES, PROJECT WAS ALMOST ALL SOFTWARE
- D. NO, HARDWARE AND SOFTWARE DELIVERED TOGETHER (ADDED)
- E. VARIED HARDWARE AND SOFTWARE ALTERNATED (ADDED)
- F. PROJECT NOT COMPLETED/THERE WAS NO PAGING FACTOR (ADDED)
- 2. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A			YES								YES YES	YES		YES		YES	YES				YES	YES YES	YES							
01 B										YES						YES	YES													C03
01 C				YES YES			YES YES									YES					YES									C04
01 D	C02						C02					C02			C02											YES				
01 E			C02							C02																				C02
01 X																														

MIS

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A				YES					YES	YES	YES					YES						YES					YES YES	YES		
01 B			YES		YES YES YES YES							YES				YES YES YES YES	YES YES YES YES				YES YES									
01 C	YES												YES			YES YES				YES				YES YES						YES YES
01 D										C02																				
01 X																														

MIS

QUESTION 154

WHAT PERCENT OF PRODUCTION (CALENDAR TIME) WAS SPENT IN THE FOLLOWING AREA? (ADDED)

A. REQUIREMENT SPECIFICATION  
B. PRELIMINARY DESIGN  
C. DETAILED DESIGN  
D. PROGRAMMING/UNIT TESTING  
E. INTEGRATION TESTING  
F. SYSTEM TESTING  
Y. PROJECT NOT COMPLETE (ADDED)  
Z. COMMENT

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A	010			005	020	015	008	030	015	005	010	025	025	010	010	019	010	005				010	015	010		015	010			006
01 B	010	020	010	010	020	015	011	010	010	005	010	010	015	010	020	019	010	010				010	010	015		015	010			003
01 C	020	020		045	020	020	017	020	015	015	010	020	020	030	030	010	020	025				020	015	020		030	010			008
01 D	020	010	025	030	015	020	040	035	025	050	040	015	015	030	010	010	010	040				020	010	015		020	020			029
01 E	030	030	035	005	015	010	015	005	020	010	020	010	015	020	015	016	040	010				040	040	010		010	020			006
01 F	010	020	010	005	010	020	009	000	015	010	010	020	020	020	015	016	010	010				010	030		010	020				048
01 X																					MIS	UNK								
01 Y																														

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A	015		010	010	012	030		015	020	010	020		010	005	010	000	017	010	010		005	013	005	020	010	020			010	020	
01 B	010		010	010	008	010	020	015	015	005	010		010	005	010	010	007	010	020	020	010	014	006	010	015	010			020	010	
01 C	025		030	040	005	020	020	010	010	015	020		060	020	010	020	019	010	025	020	015	015	017	015	035	020			020	010	
01 D	050		020	020	040	010	020	020	015	010	020		010	020	025	010	035	010	030	020	030	016	007	030	040	025			010	020	
01 E			020	010	015	025	020	020	020	030	020		005	010	025	010	007	030	010	020	030	020	028	015	010	020			020	030	
01 F			010	010	020	005	020	020	020	030	010		005	040	020	050	015	030	005	020	010	022		010	010	005			020	010	040
01 X																															

MIS

MIS

MIS

NON

QUESTION 155

IF THE PROJECT USED ON-LINE, INTERACTIVE PROGRAMMING FOR PROGRAM

- DEVELOPMENT, WAS IT  
 A. A HIGHLY EFFECTIVE DEVELOPMENT TOOL  
 B. EFFECTIVE IN SOME CASES  
 C. OF LIMITED UTILITY  
 D. A DRAIN ON HUMAN RESOURCES  
 E. A NICE TOY  
 F. ON-LINE, INTERACTIVE PROGRAM WAS NOT USED/UNKNOWN  
 G. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A									YES			YES	YES	YES			YES				YES			YES						YES
01 B				YES	YES		YES														YES									
01 C																														
01 D																														
01 E																														
01 F																														
01 G																														
01 H																														
01 I																														
01 J																														
01 K																														
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01 M																														
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01 O																														
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01 Q																														
01 R																														
01 S																														
01 T																														
01 U																														
01 V																														
01 W																														
01 X																														
01 Y																														
01 Z																														

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A																														
01 B																														
01 C																														
01 D																														
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01 S																														
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01 U																														
01 V																														
01 W																														
01 X																														
01 Y																														
01 Z																														

QUESTION 156

IF YOUR EXPERIENCE REFLECTS THAT ON-LINE, INTERACTIVE PROGRAMMING WAS AN EFFECTIVE TOOL, IN WHICH SITUATION WAS IT MOST EFFECTIVE? (CHECK OR MARK ORDER)  
 A. DURING DEVELOPMENT OF CODE  
 B. TO TRY SHORT LENGTH OF CODE FOR POSSIBLE USE (SIMULATION APPROACH)  
 C. DURING DEBUGGING  
 D. DURING TESTING  
 E. NOT AN EFFECTIVE TOOL  
 F. DID NOT USE ON-LINE, INTERACTIVE PROGRAMMING/UNKNOWN  
 G. OTHER

RESPONDOR																															
PART/SUB		101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A				004				YES		004			YES	YES																YES	
01 B					57A					002									YES												
01 C				003				YES	YES	001			YES	YES							YES					YES				YES	
01 D				002						YES	003																				YES
01 E				001																											YES
01 X			MIS												MIS		MIS				MIS				MIS				MIS	MIS	
01 Y			NON				NON			NON	NON					NON		NON		NON			NON	NON							NON

PART/SUB	RESPONDOR																														
	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A	100		SEA										SEA					100	SEA	YES	YES	YES				YES	YES			YES	
01 B	200					SEA					SEA		SEA					200													
01 C	300		SEA									SEA	SEA	SEA		SEA	SEA	300		SEA	SEA			SEA	SEA	SEA	SEA			SEA	
01 D	400												SEA	SEA	SEA	SEA	SEA	400						SEA		SEA	SEA			SEA	
01 X	10		MIS				MIS	MIS																							
01 Y	10																														

QUESTION 157

IF YOUR EXPERIENCE REFLECTS THAT ON-LINE, INTERACTIVE PROGRAMMING WAS AN EFFECTIVE TOOL WHAT DO YOU FEEL THE IMPROVEMENT IN PROGRAMMER PRODUCTIVITY OVER CONVENTIONAL (BATCH) SOFTWARE DEVELOPMENT WAS?

- A. NOT AN IMPROVEMENT
- B. 1-5% IMPROVEMENT
- C. 2% IMPROVEMENT
- D. 3% IMPROVEMENT
- E. 5% IMPROVEMENT
- F. DID NOT USE ON-LINE, INTERACTIVE PROGRAMMING/UNKNOWN
- G. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 B					YES		YES										YES				YES									YES
01 C												YES	YES																	YES
01 D																														
01 E																														
01 X																														
01 Y																														

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A																														
01 B																														
01 C																														
01 D																														
01 E																														
01 X																														
01 Y																														
7 10																														

OTH



OVERALL, HOW WELL DO YOU THINK THAT THIS PROJECT MET THE PROJECT MANAGERS MAJOR GOALS TO DELIVER ON TIME, WITHIN BUDGET, AND MEETING THE REQUIREMENT OF THE SYSTEM, WHERE THE FINAL SOFTWARE PRODUCT IS RELIABLE, MAINTAINABLE, AND USABLE?

- A. EXTREMELY WELL  
B. VERY WELL  
C. GOOD  
D. FAIR  
E. POOR  
F. FAILED  
G. OTHER

[illegible][illegible]

QUESTION 159 GIVE SOME LESSONS LEARNED FROM THIS PROJECT

RESPONDER  
 PART/SUB 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130  
 01 001 MIS MIS MIS P5C MIS H1G MIS 01C H1D H1D MIS P9G MIS H9C S5B P3E 06G P3F H3C MIS S1A  
 01 002 P5D H1J 01C X1E X1E 04H P1A H1E CMM X9D 06B X1E  
 01 003 STM P8B 05C P1B H1G H7F CMA  
 01 004 P8D P1C CMA CMA  
 01 005 P1E CIA P9J  
 01 006 CIA 01A

RESPONDER  
 PART/SUB 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230  
 01 001 P9H MIS P1C MIS 07E 09A MIS MIS CSF P1E H1D MIS CMA 03E MIS P9E C1E P5C MIS MIS C1E H9H 03B MIS CSF MIS C1H H1Y H1A  
 01 002 P9I P1D 07F D9B X9G CRG P5C 03E P9F L1J L1D LSC P8H CMC CMA  
 01 003 X1E X1E H9D P5D X9K CMC C1E 01B CMA P3L CMC  
 01 004 P8I CMA P5G CSF CSF S2D X1E C1A  
 01 005 P1A P1A H1B 05D 03F P9K  
 01 006 C1D C1F 03F P5D 06J S1D  
 01 007 C1F P3H S2A  
 01 008 X7H 05A  
 01 010 X9H C1C  
 01 011 P3C 05B

## QUESTION 160

PLACE THE FOLLOWING OBJECTIVES OF A PROJECT MANAGER IN ORDER OF IMPORTANCE (ENTER NUMBER 1 THROUGH 6 IN THE SPACE PROVIDED) THE PROJECT SHOULD

- A. BE WITHIN BUDGET
- B. BE ON SCHEDULE
- C. MEET REQUIREMENTS
- D. BE MAINTAINABLE
- E. BE RELIABLE
- F. BE USABLE
- G. DEPENDS ON CONTRACT INCENTIVE (ADDED)
- H. VARIES WITH JOB (ADDED)

PART/SUB	RESPONDOR																														MIS
	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A	006	005	001	006	006	003	003	006	003	006	006	002	005	002			003	002	001	003	001	001		002	005	005	006	003	006	006	
01 B	005	003	004	005	005	005	004	004	002	005	005	003	004	003			002	003	004	004	001	002		002	003	004	005	002	005	005	
01 C	002	002	002	001	004	001	001	001	001	002	002	001	001	001			001	004	002	005	001	003		001	001	002	001	001	001	002	
01 D	004	006	005	002	003	006	006	005	006	004	004	006	006	006			006	006	MIS	006	002	006		005	006	006	004	005	004	004	
01 E	003	004	006	003	002	004	005	003	005	003	003	005	003	005			005	005	MIS	002	002	005		005	004	003	002	006	003	003	
01 F	001	001	003	004	001	002	002	002	004	001	001	004	002	004			004	001	003	001	002	004		005	002	001	003	004	002	001	
01 G																															
01 H																															
01 X																															

C02

C02

MIS

PART/SUB	RESPOND																													
	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 A	002	003	002	002	006	006	005	004		003	002	004	004	006	003	004	003	003	003	006	004	004	003	004	005	002	005	003	004	003
01 B	003	001	001	003	005	004	004	004		002	003	005	003	005	002	003	004	004	002	002	004	003	004	005	004	001	006	002	001	002
01 C	001	002	003	005	003	001	002	001		001	001	001	001	002	004	002	001	001	001	003	002	002	003	001	003	001	001	001	002	001
01 D	006	006	005	006	004	005	006	004		006	006	006	005	004	006	MIS	006	006	006	005	005	006	006	006	006	006	004	005	006	005
01 E	005	005	006	001	002	003	001	002		005	005	003	006	003	005	MIS	002	002	004	006	002	005	005	002	003	004	003	006	005	006
01 F	004	004	004	004	001	002	003	003		004	004	002	002	001	001	MIS	005	005	005	004	001	001	001	001	002	005	002	004	002	004
01 X	MIS																													

MIS

QUESTION 161

IT IS REPORTED IN LITERATURE THAT: 1 SUPPLEMENT LIBRARIAN, PLUS 2 PROGRAMMERS CAN DO THE WORK OF 5 PROGRAMMERS. DO YOU BELIEVE THIS?

- A. YES  
B. NO  
C. DO NOT KNOW, INSUFFICIENT DATA/EXPERIENCE (ADDED)  
Z. OTHER

RESPONDOR

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 A			YES YES				YES	YES YES		YES YES		YES YES		YES YES		CO3	YES	YES	YES	YES	YES	CO3	YES								
01 B	YES YES				YES YES YES		YES		YES		CO3				CO3	YES YES YES YES YES YES				YES						YES	YES YES YES YES				
01 C																															CO2
01 X																															MIS

RESPONDOR

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A	YES YES				YES CO3 YES						YES			YES				YES YES		YES YES		YES		YES YES YES YES YES							
01 B			YES YES						CO3		YES YES YES		YES YES		YES			YES				YES							YES		
01 C																															CO2
01 X																															MIS MIS

IF YOU BELIEVE THE SUPPORT CLIMBMAN DOES RELIEVE THE PROGRAMMER/  
ANALYST OF UNNECESSARY TASKS, BUT DO NOT BELIEVE THE RATIO IS 2 TO 1,  
WHAT RATIO DO YOU CONSIDER MORE ACCURATE?

A.	1	10	1
B.	3	10	1
C.	4	10	1
D.	5	10	1
E.	10	10	1
F.	VARIES,		
G.	DO NOT		
H.	BELIEVE		
I.	OTHER		

E. TO TO 1  
F. VARIES, ACCORDING TO SKILL LEVEL (ADDED)  
G. DO NOT BELIEVE/DO NOT KNOW (ADDED)  
H. BELIEVE 2 TO 1  
I. OTHER

RESPONDENT

**§ 71A**

YES YES

51A

Yes

303

33

54A

ms

103

MIN  
MID

218

**Cus**

cos

# THIS

01

**HOSPONDON**

518

571

57A

5

102

202

# His

COI

## THIS

QUESTION 163

WHAT ACTIONS ARE CUSTOMARILY TAKEN BY THE PROJECT MANAGER WHEN IT IS DISCOVERED THAT A PROJECT IS BEHIND SCHEDULE?

- A. WING HANDS
- B. ASSIGN MORE PERSONNEL TO THE PROJECT
- C. RENEGOTIATE SCHEDULE WITH CUSTOMER
- D. RENEGOTIATE SCHEDULE WITH MANAGER
- E. QUIT
- F. SAY NOTHING TO TOP MANAGEMENT HOPING TO MAKE UP SCHEDULE TIME
- G. REDUCE PROJECTS GOALS (ADDED)
- H. REALIGN MANPOWER (ADDED)
- I. USE OVERTIME (ADDED)
- J. REPLAN THE PROJECT (ADDED)
- K. VARIES, DEPENDS ON SITUATION (ADDED)
- L. NOTHING (ADDED)
- Z. OTHER

RESPONDENT

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
01 A																														
01 B		YES				YES	YES			YES	YES		YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	003
01 C				YES		YES				C02									YES	YES	YES	YES	YES	YES	YES	C03	YES	002		
01 D				YES		YES											YES							YES	YES	YES	YES	C03	001	
01 F							YES																							
01 G																														
01 H																														
01 I																														
01 J																														
01 K																														
01 X																														
01 Z																														

21  
10

01H

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	
01 A	YES																														
01 B	YES	YES		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 C							YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 D									YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
01 E																															
01 F					YES							YES																			
01 G																															
01 I																															
01 J																															
01 K																															
01 X																															

QUESTION 104

PLEASE FURNISH ANY ADDITIONAL COMMENTS OR STATEMENTS CONCERNING  
THIS SURVEY ON THE SCIENCE OF SOFTWARE ENGINEERING PROJECT MANAGEMENT

RESPONDUM

PART/SUB	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	
01 001	MIS	MIS	A01	MIS	MIS	A03	A07	MIS	A12	MIS	MIS	A16	MIS	MIS	MIS	MIS	A18	MIS	MIS	MIS	A22	MIS	MIS	A15	MIS	MIS				MIS	MIS
01 002			A02			A04	A08		A13			A17					A19														
01 003						A05	A09		A14								A20														
01 004						A06	A10		A15								A21														
01 005																	A11														

RESPONDUM

PART/SUB	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230
01 001	MIS	A23	A20	A25	A26	MIS	MIS	MIS	MIS	MIS	MIS	MIS	MIS	MIS	MIS	A19	A27	MIS	MIS	MIS	MIS	MIS	MIS	A25	MIS	MIS	MIS	MIS	MIS	MIS
01 002																														



## SECTION 3

## REFERENCE

INTRODUCTION

In preparing this survey, literally hundreds of books, articles, and papers were read. The results of this literature search became a general model of how software engineering project management was accomplished. This model is represented by the original questionnaire (see Appendix B). It would be impractical in an informal report such as this to list all these publications, particularly since many of the ideas contributed were general across many different publications. However, where one document was the source of most of one question (or a group of questions) or a unique definition was used (i.e., structural programming, HIPO, chief programmer, Orthodox Job Enrichment, etc.) a reference is given. We hope nobody was slighted.

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APPENDIX A  
CONTRIBUTORS

INTRODUCTION

This appendix lists those individuals (usually project managers) and firms who completed the survey. This list is provided to: 1) acknowledge the contribution, hard work and willingness to contribute to the general knowledge of computer science by these individuals; and 2) to lend credibility to this report by making visible the excellent source of the data.

These people and companies are all members and supporters of the AIAA Technical Committee on Computer Systems.

At the end of this list is a group of individuals that wished to remain anonymous in order that they could provide more candid, truthful answers.

It was obvious from the answers received that the contributors worked very hard making the answers as truthful as possible. Again, the authors thank you.

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(Non-Military)

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Aircraft Development  
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APPENDIX B  
QUESTIONNAIRE

INTRODUCTION

This appendix contains Part Two of the questionnaire, plus Questions 1 through 4 and 25 of Part Three (renumbered Questions 160 through 164 of Part Two). Other reports will contain the balance of the questionnaire.

The questionnaire, as printed in this report is a modified version of the questionnaire as originally answered. This was done for the following reasons:

- (1) Not all questions had accompanying multiple choice answers but were narrative in nature,
- (2) The original questionnaire contains space for project managers to add their own comments as answers to the questions rather than select one of the pre-given answers, and
- (3) There were errors (typo and otherwise) in the original survey which needed correcting.

The procedures used to report on those questions that did not have preselected answers was to modify the original questionnaire to make it "look like" the authors had preselected these possible answers and the participants had checked them. In truth, the answer set was derived from the submitted answers. To indicate which questions were originally narrative in form, a notation in parenthesis following the question will indicate "originally narrative."

In addition, the original questionnaire contained space for project managers to add their own comments as answers to the questions rather than select one of the pre-given answers. This was encouraged by the authors in order to insure that the answers to the questionnaire were as accurate as possible and not distorted by forcing the participant to only select from our pre-conceived answers. Again, to provide structure so the answers can be encoded in a computer data base system, the "comment" answers were grouped and the possible "answer set" expanded to include these answers. To indicate these additional answers the word "added" will be placed in parenthesis at the end of the question.

In contrast, Questions 33, 51, 52, 67, 68, 90, 115, 127, 159, and 164 were left in narrative form. This was done because of the extreme number of different answers that were submitted. These questions were very open-ended questions pertaining to "lessons learned" and "research needed," and were extremely varied and opinionated. These questions are answered by encoding the variety of answers and entering this code on the tabulation sheets.

Other modifications were made to the original questionnaire where the participants indicated the question was poorly worded or where the participants modified the original question by the insertion of a word or phrase. The authors inserted these in the interest of making this version of the questionnaire more complete. These additions to the original questions and/or original answers are indicated by placing the added portion in brackets "[ ]" and placing the word "added" in parenthesis at the end of the question or answer.

Where typographical errors were made, the questionnaire was corrected. The corrected word was contained in brackets "[ ]" and the word "corr" placed in parenthesis at the end of the question or answer.

The authors hope that the above explanations do not appear to be too complex. They were done purely in the interest of conveying the maximum amount of information to the reader about the original questions and the possible answers presented to the respondent. The questionnaire follows.

After the questionnaire was sent out, it was discovered that there were two Questions 68. This was corrected by having the second Question 68 renumbered 69f.

References were added where they were needed or where the addition of a reference would make the question clearer. An abbreviated source is contained in brackets "[ ]" and the complete source follows this appendix.



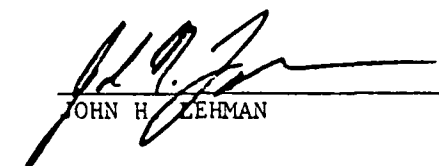
RULES AND CONDITIONS FOR PARTICIPATING IN SURVEY

It is important that no company, or individual suffer any loss of proprietary information or receive unfavorable publicity as a result of this survey. Each individual participating in the survey has our full assurance that the data he provides will be treated in accordance with the above principles. In order to achieve this we stipulate the following:

1. Unless specifically authorized, the names of participating firms, or individuals will not be listed in the report as contributors.
2. The anonymity of the company, department, individual, and project will be preserved in every instance.
3. Any proprietary or company confidential information, if so identified (by writing "CONF" beside the question) will be protected and used only in deriving statistical data.
4. The individual completing the questionnaire can omit the answer to any question without invalidating the questionnaire.
5. Only if cleared for further dissemination will raw data (completed forms) be made available to the participating AIAA TC members, should such request be made, to assist them in research work of their own. Without exception, all company, department, project, and individual names, as well as responses identified as "CONF" will be systematically deleted prior to release.
6. If so requested by the submitter, only statistical data will be derived from the survey, and the survey form destroyed upon publication of the final report.

Though it is seen as providing benefits to all participants, including the U.S. Air Force, this survey is not sponsored by the U.S. Air Force, or any individual, group, committee, or company, and does not imply any obligation on the part of the participants. It is being accomplished solely to provide data to be presented at the AIAA Conference, Computers in Aerospace, 31 Oct - 2 Nov 1977, Los Angeles, California.

  
RICHARD H. THAYER

  
JOHN H. LEHMAN

MEMO OF UNDERSTANDING

I make the following stipulations under which this survey can be used: (Please sign each stipulation you wish to make as precondition to submitting this survey. Line through those paragraphs which do not apply.)

This survey with company, department, project and other identifying markings, and with all answers marked "CONF" deleted can be duplicated and provided to the TC members at their request.

\_\_\_\_\_  
Signature of Submitter

This survey can only be used to provide statistical data and cannot be released to the TC members for their use in any but a composite statistical or summary form. Following publication of final report both this form and the survey must be destroyed by shredding, pulping, or similar means.

\_\_\_\_\_  
Signature of Submitter

I authorize the release of the firm name in a list of participants to be included as an addendum to the final report. The desired name, title, etc., is:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
Signature of Submitter

A SURVEY OF MANAGEMENT TECHNIQUES AND PROCEDURES  
EMPLOYED IN SOFTWARE DEVELOPMENT PROJECTS

INSTRUCTIONS

Each survey packet comprises three parts. The number of packets provided will, in most cases, match the number of projects to be reported on plus one spare. If more forms are required you may copy or call.

PART ONE of the survey deals with defining the total organization and the overall management structure, requirements, and philosophy, and is intended to be answered by top management. It provides the backdrop against which the individual projects are to be viewed. Normally, only one copy of PART ONE should be completed per mailing, but each packet contains PARTS ONE, TWO, and THREE for the sake of uniformity and the chance that, in some instances, additional PART ONES would be called for.

A PART TWO is to be completed for each project reported on, and is intended to be completed by the project manager. (It is assumed the project is completed or almost completed) If those methods now often referred to as Modern Programmer Productivity Techniques (top down design, structured programming, et al.) are being used in whole, or in part, in your development activities, you should consider selecting a representative sample of before and after projects in completing the survey.

PART THREE consists of general questions not related to any specific project, and is also intended to be completed by a project manager. One PART THREE is included in each packet on the assumption that each project will be reported on by a different project manager. If one manager reports on more than one project, he or she would only complete PART THREE one time.

The dynamic nature and infinite diversity of the entire field of Data Processing has kept the jargon from becoming universally defined. For this reason we have attempted to avoid terms that might have more than one meaning. If questions appear vague or imprecise, feel free to call for clarification. Or, if you prefer, rewrite the question to ask what you believe the point to have been, or to relate it to your particular environment.

The answers provided for each question are not the universal set of possible responses, so, if you believe selecting one of the canned replies would be misleading please select "other" or "comment" and explain. If more space is required, write in the margins indicating the number of the question being answered. If a question defies

answering either through complexity, non-relevance to your environment, or excessive research feel free to leave it blank or enter an appropriate comment. If you write "CONF" in the left margin adjacent to any question, that response will be treated as confidential/proprietary data as described under "Rules and Conditions..", attachment 1 to the basic letter.

If possible, avoid direct reference to specific firms, projects, and people. Each set of questionnaires has been numbered in order that we might keep related responses together and facilitate accounting. Base numbers have been selected at random and no algorithm has been employed that would facilitate pairing firms with forms.

We very much appreciate the time and effort you're putting into this. Your time, effort, and candor are essential to the success of our joint effort.

Please return the completed surveys in the return envelope provided or mail to:

Colonel Richard H. Thayer  
SM-ALC/ACD  
McClellan AFB, CA 95652

A SURVEY OF MANAGEMENT TECHNIQUES AND PROCEDURES  
EMPLOYED IN SOFTWARE DEVELOPMENT PROJECTS

PART TWO (Modified)

SECTION 1 - PROJECT IDENTIFICATION

INTRODUCTION. PART TWO of this survey pertains to the management of a specific, individual, software development project and is intended to be answered by the Project Manager. It is assumed that the project being reported on is complete or almost complete.

THE IDENTIFICATION NUMBER ASSIGNED THIS FORM IS \_\_\_\_\_.

Please return completed form in envelope provided or mail to:

Colonel Richard H. Thayer  
SM-ALC/ACD  
McClellan AFB, CA 95652

1. What was/is your position in relation to the project you are reporting on? (Originally narrative)

- a. Project manager [ ]
- b. Software project manager [ ]
- c. Project manager's supervisor (Program manager) [ ]
- d. Technical director or Technical advisor [ ]
- e. Project individual [ ]
- f. Corporate officer [ ]
- g. Customer [ ]
- z. Other: \_\_\_\_\_ [ ]

PROGRAM IDENTIFICATION

2. In what applications/functional area(s) did this [software] project fall? (added)

- a. Commercial/business, such as inventory control, payroll, accounting and finance, etc. [ ]
- b. Data acquisition/retrieval [ ]
- c. Scientific, such as engineering calculations, data reductions, etc. [ ]
- d. Simulation or modeling applications [ ]
- e. Process control to include embedded computer systems [Manley, 1974] [ ]
- f. Command and control systems [ ]
- g. Management information systems [ ]

- h. Communication systems, message switching [ ]
  - i. Computer systems, such as software monitors, compilers, operating systems and other system software [ ]
  - z. Others: \_\_\_\_\_ [ ]
3. The project was:
- a. A new software development [ ]
  - b. A continuation of a previously completed software development [ ]
  - c. A major modification of an existing software system [ ]
  - z. Other: \_\_\_\_\_ [ ]
4. If the project was a major modification did it involve:
- a. Transferring existing software to a different computer [ ]
  - b. Rewriting application software [ ]
  - c. Writing a new operating system [ ]
  - y. Project was not a major modification to an existing system [ ]
  - z. Other: \_\_\_\_\_ [ ]
5. The software product was designed for:
- a. Commercial off-the-shelf computer hardware [ ]
  - b. Commercial off-the-shelf operating system [ ]
  - c. Modified commercial off-the-shelf computer hardware (added) [ ]
  - d. Modified commercial off-the-shelf operating system [ ]
  - e. Special purpose computer [hardware] system (added) [ ]
  - f. Special purpose operating system [ ]
  - z. Other: \_\_\_\_\_ [ ]

#### COMMERCIAL HARDWARE IDENTIFICATION

6. If the software system was being developed for commercial [computer] hardware, was selection and delivery of the commercial hardware part of the overall project? (added)
- a. Yes [ ]
  - b. No [ ]
  - c. No, furnished by user (added) [ ]
  - y. System was not developed for commercial off-the-shelf computer hardware [ ]
  - z. Comment: \_\_\_\_\_ [ ]

7. If off-the-shelf [computer] hardware was used, in what mode of operation did the production system run? (added)

- a. Batch [ ]
- b. Remote batch/remote job entry terminal (RJET) [ ]
- c. Interactive processing [real time] (added) [ ]
- d. Transaction processing [ ]
- e. Stand alone [ ]
- y. System was not developed for commercial, off-the-shelf computer hardware [ ]
- z. Other: \_\_\_\_\_ [ ]

8. If the target (production) computer for this software capability was an off-the-shelf commercial system:

- a. Give manufacturer, make, and model \_\_\_\_\_ [ ]
- b. Give operating system employed \_\_\_\_\_ [ ]
- y. Host computer was not a commercial computer [ ]
- z. Comment: \_\_\_\_\_ [ ]

9. If the host (development) computer for this software capability was an off-the-shelf commercial system:

- a. Give manufacturer, make and model \_\_\_\_\_ [ ]
- b. Give operating system employed \_\_\_\_\_ [ ]
- y. Host computer was not a commercial computer [ ]
- z. Comment: \_\_\_\_\_ [ ]

#### SPECIAL PURPOSE HARDWARE IDENTIFICATION

10. If the software system was developed for special purpose hardware, was the hardware development part of the overall project?

- a. Yes [ ]
- b. No [ ]
- y. System was not developed for special purpose hardware [ ]
- z. Comment: \_\_\_\_\_ [ ]

11. If the software system was developed for special purpose hardware what type was this?

- a. Embedded central processor [ ]
- b. Special terminals such as those employed in command and control and airborne systems, etc. [ ]
- c. Special systems such as radar sensors, or process control devices, trainers, etc. [ ]

- y. System was not developed for special purpose hardware [ ]
  - z. Other: \_\_\_\_\_ [ ]
12. If a host (development) commercial hardware system was used in developing this special purpose capability:
- a. Give manufacturer, make, and model \_\_\_\_\_ [ ]
  - b. Give operating system employed \_\_\_\_\_ [ ]
  - c. System was developed on special purpose computer [ ]
  - y. System was not developed for special purpose hardware (added) [ ]
  - z. Comment: \_\_\_\_\_ [ ]

#### CUSTOMER IDENTIFICATION

13. The customer or user was: [Taken partly from Computer Decisions Subscription Application form, Jun 1977 Issue]

- a. In-house to my company or major division [ ]
  - b. Within my parent organization [ ]
  - c. A manufacturer of computer hardware [ ]
  - d. A manufacturer of other than computer hardware [ ]
  - e. A "software house" [ ]
  - f. An engineering service and technical support organization [ ]
  - g. The Government: federal (non-military), federal (military), state, county, municipal [ ]
  - h. A university or educational institution [ ]
  - i. A computer service bureau, time-sharing service bureau [ ]
  - j. An ADP consultant and/or education service [ ]
  - k. Financial: banking, insurance, real estate, securities, credit [ ]
  - l. In the wholesale or retail trade [ ]
  - m. In medical or legal services [ ]
  - n. In transportation services [ ]
  - o. Utilities: communications, electric, gas [ ]
  - p. Foreign government (added) [ ]
  - z. Other: \_\_\_\_\_ [ ]
14. Was the customer purchasing the software system for other users?
- a. Yes [ ]
  - b. No [ ]
  - z. Comment: \_\_\_\_\_ [ ]



15. Are (is) there:

- a. Multiple users of the system [ ]
- b. Only one user [one or more locations] (added) [ ]
- z. Comment: \_\_\_\_\_ [ ]

#### CONTRACT IDENTIFICATION

16. Under which of the following contract types or agreements was the software system developed? [AFPR, 1976]

- a. Firm fixed price [ ]
- b. Fixed price with economic price adjustment [ ]
- c. Fixed price incentive [ ]
- d. Firm fixed price level of effort [ ]
- e. Cost [ ]
- f. Cost sharing [ ]
- g. Cost plus incentive fee [ ]
- h. Cost plus award fee [ ]
- i. Cost plus fixed fee [ ]
- j. Time and materials [ ]
- k. Labor-hour [ ]
- l. Basic ordering agreement [ ]
- y. No contract was used (added) [ ]
- z. Other: \_\_\_\_\_ [ ]

17. If the contract had an incentive clause [for software], what was the incentive based on? (added)

- a. Reduced [or meets] cost (added) [ ]
- b. Early [or meets] delivery (added) [ ]
- c. Increased performance (explain how it was measured) \_\_\_\_\_ [ ]
- y. Contract did not have an incentive clause [ ]
- z. Other: \_\_\_\_\_ [ ]

#### COST AND SCHEDULE IDENTIFICATION

18. What was the total cost of the project to the customer? (If exact amount not available, please give a range or explain)

\$ \_\_\_\_\_

19. How much of the total cost (estimated) was attributable to the production of software, including machine time, programmer salary, [management of software development, overhead related to software], and other ADP operating expenses? (added)

\$ \_\_\_\_\_

20. This project began (first assignment) in \_\_\_\_\_  
(month, year) and ended, [or will end] (sign off) in \_\_\_\_\_  
(month, year). (added)

#### SOFTWARE IDENTIFICATION

21. In what language was this data system programmed? If more than one language was used please indicate appropriate percentages.

- |  |       |    |
|--|-------|----|
| a. FORTRAN                                       | _____ | 71 |
| b. JOVIAL  | _____ | 72 |
| c. COBOL   | _____ | 73 |
| d. Assembler [(unspecified)] (added)             | _____ | 74 |
| e. CMS-2 (added)                                 | _____ | 75 |
| f. PL/1 (added)                                  | _____ | 76 |
| g. Higher order language [(unspecified)] (added) | _____ | 77 |
| z. Other: _____                                  | _____ | 78 |

22. In total, approximately how many lines of source code were written?

- |                         |       |
|-------------------------|-------|
| a. Executable           | _____ |
| b. Comments:            | _____ |
| c. Other non-executable | _____ |

#### COMPLEXITY IDENTIFICATION

23. Using Table 1 on the following page please estimate the complexity of the data system (from 12 to 60). All descriptions pertain to software only. The complexity rating: \_\_\_\_\_

#### DATA BASE IDENTIFICATION

24. Approximately how large a data base was the system designed for: (Fill in blank with number of bytes of data) \_\_\_\_\_

FACTORS	1	2	3	4	5
1. ORIGINALITY REQUIRED	NONE REPROGRAM ON DIFFERENT EQUIPMENT	MINIMUM MORE STRINGENT REQUIREMENTS	LIMITED MORE ENVIRONMENT NEW INTERFACES	CONSIDERABLE APPLY EXISTING STATE OF ART TO ENVIRONMENT	EXTENSIVE REQUIRES ADVANCE IN STATE OF THE ART
2. DEGREE OF GENERALITY	HIGHLY RESTRICTED SINGLE PURPOSE	RESTRICTED PARAMETERIZED FOR A RANGE OF CAPACITIES	LIMITED FLEXIBILITY. ALLOWS SOME CHANGE IN FORMAT	MULTI-PURPOSE FLEXIBLE FORMAT RANGE OF SUBJECTS	VERY FLEXIBLE ABLE TO HANDLE A BROAD RANGE OF SUBJECTS ON DIFFERENT EQUIPMENT
3. SPAN OF OPERATION	LOCAL OR UTILITY	COMPONENT COMMAND	SINGLE COMMAND	MULTI-COMMAND	DEFENSE DEPARTMENT WORLDWIDE
4. CHANGE IN SCOPE AND OBJECTIVE	NONE	INFREQUENT	OCASIONAL	FREQUENT	CONTINUOUS
5. EQUIPMENT COMPLEXITY	SINGLE MACHINE ROUTINE PROCESSING	SINGLE MACHINE ROUTINE PROCESSING EXTENDED PERIPHERAL SYSTEM	MULTI-COMPUTER STANDARD PERIPHERAL SYSTEM	MULTI-COMPUTER ADVANCED PROGRAMMING CAPABLE PERIPHERAL SYSTEM	MASTER CONTROL SYSTEM MULTI-COMPUTER AUTO CONTROL AND DISPLAY EQUIPMENT
6. PERSONNEL ASSIGNED	1-3	3-5	5-10	10-18	18 AND OVER
7. DEVELOPMENTAL COST	1-100K	10-50K	50-200K	200-500K	OVER 500K
8. CRITICALITY	DATA PROCESSING	ROUTINE OPERATIONS	PERSONNEL SAFETY	UNIT SURVIVAL	NATIONAL DEFENSE
9. AVERAGE RESPONSE TIME TO PROGRAM CHANGES	2 OR MORE WEEKS	1-2 WEEKS	2-7 DAYS	1-3 DAYS	1-24 HOURS
10. AVERAGE RESPONSE TIME TO DATA INPUTS	2 OR MORE WEEKS	1-2 WEEKS	1-7 DAYS	1-24 HOURS	9-48 MINUTES
11. PROGRAMMING LANGUAGES	HIGH LEVEL LANGUAGE	HIGH LEVEL AND LIMITED ASSEMBLY LANGUAGE	HIGH LEVEL AND EX-ASSEMBLY LANGUAGE	ASSEMBLY LANGUAGE	MACHINE LANGUAGE
12. CONCURRENT SOFTWARE DEVELOPMENT	NONE	LIMITED	MODERATE	EXTENSIVE	EXHAUSTIVE

TABLE 1 - Level of Project Complexity

SECTION 2 - REQUIREMENT SPECIFICATIONS,  
INPUT CONDITIONS, AND ENVIRONMENT

REQUIREMENT SPECIFICATIONS

25. Who prepared the requirement specifications?
- a. The customer [ ]
  - b. An organization affiliated with the customer, but not the customer himself [ ]
  - c. Your organization, e.g., a two-step procurement, an unsolicited proposal, etc. [ ]
  - d. An outside consulting firm [ ]
  - e. A third contractor, e.g., an integrating contractor [ ]
  - y. None prepared (added) [ ]
  - z. Other: \_\_\_\_\_ [ ]
26. If your organization prepared the requirement specifications did the customer participate?
- a. Yes [ ]
  - b. No [customer did not participate] (added) [ ]
  - c. No, customer was source (added) [ ]
  - y. Not applicable, your organization did not prepare specifications (added) [ ]
  - z. Comment: \_\_\_\_\_ [ ]
27. On a scale of 1 to 7, with 1 being little more than the name of the system, and 7 being complete specifications down through preliminary design, how detailed were the specifications provided?
- 
28. Was it necessary to rewrite the specifications before proceeding with design?
- a. Yes (specify percent rewritten) \_\_\_\_\_ % [ ]
  - b. No [specifications were adequate] (added) [ ]
  - c. Yes, however specifications never rewritten (added) [ ]
  - d. Yes, rewritten concurrent with design (added) [ ]
  - y. Not applicable, requirement specifications were never written (added) [ ]
  - z. Comment: \_\_\_\_\_ [ ]
29. If it was necessary to rewrite the specifications, what was the reason? (originally narrative)
- a. Errors in specification [ ]

- b. Specifications were ambiguous, incomplete, and/or inconsistent ☐
  - c. Change in scope of project ☐
  - d. Change in requirements of project ☐
  - e. Change in hardware design ☐
  - f. Normal way of doing business ☐
  - g. Customer and/or developer became better informed ☐
  - y. Was not necessary to rewrite specifications or requirement specifications were not prepared ☐
  - z. Other: \_\_\_\_\_ ☐
30. The specifications were prepared:
- a. Using top-down (Hierarchy of Function) techniques ☐
  - b. Using structured design/flow techniques ☐
  - c. In phases, with design and coding started before the requirement specification was completed ☐
  - d. In a formal requirement language (describe) \_\_\_\_\_ ☐
  - e. In such a manner as to facilitate tracking the development of software from requirements through coding and tie each delivered software module to some part of the requirements (approximately \_\_\_\_\_ % of the requirement could be tracked). ☐
  - f. In precise, measureable terms to aid in development of acceptance testing (approximately \_\_\_\_\_ % of the requirements could be measured). ☐
  - g. According to MIL-STDs (added) ☐
  - y. Specification never prepared/none (added) ☐
  - z. Comment: \_\_\_\_\_ ☐

#### DOCUMENTATION REQUIRED BY THE CONTRACT/CUSTOMER

31. The following is a list of documentation that may be required by a software development contract. Check each document required in the project and add required documentation not contained in the list. [DOD Manual 4120.17M, (Dec 1972)]

- a. Object Listing/Deck/Tape ☐
- b. Source Listing/Deck/Tape ☐
- c. Functional description--initial definition of a project which provides the ultimate user with a clear statement of the operational capabilities to be developed (also sometimes called requirements specifications). ☐

- d. Data requirements document--prepared by both system and user personnel when a data collection effort by the user group is required to generate and maintain system files. [ ]
- e. System/subsystem specification--prepared for system personnel, as detailed as possible, concerning the environment and design elements, in order to provide maximum guidance to the program design effort; also defines system subsystem interfaces. [ ]
- f. Program specifications--prepared for programmers; contains considerable detail for the purpose of guiding program development. [ ]
- g. Data base specification--prepared for programmers in sufficient detail to permit program coding and data base generation by the programming group. [ ]
- h. Users Manual--to present general and specific information on how a specific computer program will be used [(includes positional handbook for remote input terminals)]. (added) [ ]
- i. Computer Operations Manual--contains precise detailed information on the control, requirements and operating procedures necessary to successfully initiate, run, and terminate the subject system. [ ]
- j. Program Maintenance Manual--contains general and specific information for computer personnel responsible for the maintenance of the computer programs. [ ]
- k. Test and Implementation Plan--contains an orderly schedule of events and lists of material necessary to affect testing and delivery of a complete data processing system. [ ]
- l. Test Analyst Report--describes the status of the computer program system after test and provides a presentation of deficiencies for review by staff and management personnel. [ ]
- m. Software development plan (added) [ ]
- n. Software standards and requirements (added) [ ]
- o. Management reports (added) [ ]
- p. Interface control (added) [ ]
- q. Budget (added) [ ]
- r. Progress Reports (added) [ ]
- s. Error/discrepancy report (added) [ ]
- t. Program change requests/status (added) [ ]
- u. Version description (added) [ ]
- v. Software product/output specifications (added) [ ]

- y. Documentation not required (added) [ ]
- z. Other: \_\_\_\_\_ [ ]

### SPECIFIC CUSTOMER REQUIREMENTS

32. Which of the following were specified by the customer?
- a. A specific computer (this was \_\_\_\_\_) [ ]
  - b. Storage limitations (these limitations were \_\_\_\_\_) [ ]
  - c. Speed constraints (explain \_\_\_\_\_) [ ]
  - d. A specific language (this language was \_\_\_\_\_) [ ]
  - e. His participation in the design function [ ]
  - f. His participation in the coding function [ ]
  - g. Prioritized requirements [ ]
  - h. Development under life-cycle costing concepts [ ]
  - i. Development under design-to-cost concepts [ ]
  - j. Development under modern programming techniques [ ]
  - k. Portability [ ]
  - l. Human engineering [ ]
  - m. Security [ ]
  - n. Safety [ ]
  - o. MIS-S-52779 [ ]
  - p. Modified MIL-S-52799 (how modified) \_\_\_\_\_ [ ]
  - q. Types of review [ ]
  - r. Frequency of review [ ]
  - s. Input data [ ]
  - t. Output requirements [ ]
  - u. Test plan/procedure [ ]
  - v. A particular reliability figure to attain (if so, what method of measuring software reliability did the customer specify?) \_\_\_\_\_ [ ]
  - w. A maintainability goal to attain (if so, what method of measuring software maintainability did the customer specify?) \_\_\_\_\_ [ ]
- \_\_\_\_\_
- y. Customer did not specify (added) [ ]
- z. Comment: \_\_\_\_\_ [ ]

- aa. A followup maintenance contract (time in months \_\_\_\_\_) [ ]
- bb. Customer training [ ]
- cc. A warranty of the software for a period of time (give [ ]  
time in calendar months) \_\_\_\_\_

GENERAL

33. If you could affect the method by which requirements were specified, or were able to initiate research into improving the requirements specification function, what action would you take?

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---

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## SECTION 3 - PLANNING

PLANNING AND SCHEDULING

34. Who did the planning before the project was assigned to a group or individual for accomplishment?

- a. A [permanent] planning group set up for this purpose (added) [ ]
- b. An ad hoc planning group (added) [ ]
- c. A steering committee which established costs and schedules [ ]
- d. An on-going project (added) [ ]
- e. Program manager was picked, and he did the initial planning [ ]
- f. A staff function [ ]
- y. No planning accomplished (added) [ ]
- z. Other: \_\_\_\_\_ [ ]

35. In planning for this project did/was:

- a. The project manager use a formal planning guide? [ ]
- b. The customer actively participate in the planning function? [ ]
- c. A work breakdown structure (WBS) employed in planning the software development? (approximately how many levels) \_\_\_\_\_ [ ]
- d. The project divided into separate phases for the purpose of planning? [ ]
- y. None (added) [ ]
- z. Comment: \_\_\_\_\_ [ ]

36. What tools were used in planning the project?

- |                       |     |                      |     |
|-----------------------|-----|----------------------|-----|
| a. PERT               | [ ] | f. Milestone (added) | [ ] |
| b. Modified PERT      | [ ] | g. CSCS (added)      | [ ] |
| c. [CPM] (corr)       | [ ] | h. WBS (added)       | [ ] |
| d. GANTT              | [ ] | y. None              | [ ] |
| e. Workloading charts | [ ] | z. Other: _____      | [ ] |

37. What method was used in estimating the cost and schedule for the project?

- a. A formula [top-down] (added) [ ]

- b. Estimates based on a similar project [ ]
- c. Provided by somebody who had a knack for estimating correctly [ ]
- d. Bottom-up aggregating (added) [ ]
- e. Cost and/or schedule were dictated (added) [ ]
- f. Simulation model [ ]
- g. Crystal ball (or similar means) [ ]
- y. Cost and schedule not estimated (added) [ ]
- z. Other: \_\_\_\_\_ [ ]

38. If the formula approach [and/or other estimating technique] was used what were the elements or variables considered? (added) [Olsen, 1977]

- |   |   |
|---|---|
| a. Computer time [ ]  | n. Number of modules (sub routines) [ ]                 |
| b. Documentation [ ]  | o. Lines of code (added) [ ]                            |
| c. Training [ ]   | p. Size of program (added) [ ]                          |
| d. Travel [ ]   | q. Requirement specific-action completeness (added) [ ] |
| e. Site preparation/construction [ ]                          | r. Customer support (added) [ ]                         |
| f. Ratio management & overhead to programmers [ ]             | s. Historical data (added) [ ]                          |
| g. Key punch [ ]  | t. Availability of support software (added) [ ]         |
| h. Office supplies [ ]  | u. Calendar period (added) [ ]                          |
| i. Office space [ ]   | v. Size of data base (added) [ ]                        |
| j. Personnel equipment, i.e., desks, pencils, paper, etc. [ ] | w. Experience (newness) with system (added) [ ]         |
| k. Programmer proficiency [ ]                                 | y. Not used [ ]   |
| l. Program complexity/function [ ]                            | z. Other: _____ [ ]                                     |
| m. Tester proficiency [ ]                                     | _____   |

39. After the original software development plan and schedule were determined and submitted for review by senior management and/or customer was:

- a. The delivery data shortened by senior management ☐
- b. The delivery data shortened by the customer ☐
- c. The delivery data lengthened by senior management ☐
- d. The delivery date lengthened by the customer ☐
- e. The delivery data originally dictated (added) ☐
- f. The requirements changed to match schedule (added) ☐
- g. Resources reduced (added) ☐
- y. No change (added) ☐
- z. Comment: \_\_\_\_\_ ☐

40. In the process of software system development which of the following planning documents were prepared?

- |  |  |
|--|--|
| a. Project management <input type="checkbox"/> | k. Data conversion <input type="checkbox"/>          |
| b. Resource require- <input type="checkbox"/>  | l. Change control <input type="checkbox"/>           |
| ments  |  |
| c. Organization <input type="checkbox"/>       | m. Configuration manage- <input type="checkbox"/>    |
| d. Staffing <input type="checkbox"/>           | ment (added)   |
| e. Training <input type="checkbox"/>           | n. Review & reporting <input type="checkbox"/>       |
| f. Test <input type="checkbox"/>               | o. Product assurance <input type="checkbox"/>        |
| g. Software develop- <input type="checkbox"/>  | (added)  |
| ment   | p. Work Breakdown Structure <input type="checkbox"/> |
| h. Phase and/or <input type="checkbox"/>       | (added)  |
| delivery                                       | q. Budget (added) <input type="checkbox"/>           |
| i. Documentation <input type="checkbox"/>      | y. None <input type="checkbox"/>                     |
| j. Implementation <input type="checkbox"/>     | z. Other: _____ <input type="checkbox"/>             |
|  | _____  |

41. From project inception through delivery of the completed system, approximately what percent of the time was spent by all personnel in planning for software? \_\_\_\_\_

42. In a further breakdown of planning activities, approximately what percentage of the time was spent on each of the following? (Should approximate 100%)

- a. Organizational planning \_\_\_\_\_
- b. Staff planning \_\_\_\_\_
- c. Developing Control procedures \_\_\_\_\_

- d. Administration planning \_\_\_\_\_ %
  - e. Quality assurance planning \_\_\_\_\_ %
  - f. Developing an overall project management plan \_\_\_\_\_ %
  - g. Design standards (added) \_\_\_\_\_ %
  - h. Test planning (added) \_\_\_\_\_ %
  - i. Document and configuration management planning (added) \_\_\_\_\_ %
  - y. None (added) [ ]
  - z. Other: \_\_\_\_\_ [ ]
43. The system was:
- a. Delivered to the user as an entity [ ]
  - b. Delivered to the user in phased increments [ ]
  - z. Other: \_\_\_\_\_ [ ]
44. Was every major software module designed in total before any coding was started?
- a. Yes [ ]
  - b. No (percent of design completed when coding started \_\_\_\_\_ %) [ ]
  - z. COMMENT: \_\_\_\_\_ [ ]

#### QUALITY ASSURANCE (QA) PROGRAM PLAN

45. A QA program was:
- a. Applied informally [ ]
  - b. Applied formally and documented separately [ ]
  - c. Applied formally and documented as part of the project management plan [ ]
  - y. Not applicable to [or used on] this project (added) [ ]
  - z. Comment: \_\_\_\_\_ [ ]
46. In which of the following areas were formal [and/or] documented QA standards applied and were these company-wide standards or standards developed specifically for this project? (added) [Boeing, 1976]

	<u>A</u> Company-Wide Standards	<u>B</u> Local to Project
a. Documentation	[ ]	[ ]
b. Work breakdown structure (WBS) code	[ ]	[ ]
c. Scheduling	[ ]	[ ]

	<u>A</u> Company-Wide Standards	<u>B</u> Local to Project
d. Performance measurement	[ ]	[ ]
e. Requirement analysis	[ ]	[ ]
f. Preliminary design	[ ]	[ ]
g. Detail design	[ ]	[ ]
h. Coding	[ ]	[ ]
i. Test planning	[ ]	[ ]
j. Software verification	[ ]	[ ]
k. Reviews and audits	[ ]	[ ]
l. Configuration management	[ ]	[ ]
m. Discrepancy reporting and correction	[ ]	[ ]
n. Software acceptance	[ ]	[ ]
y. No formal [or documented] QA standards (added)	[ ]	[ ]
z. Other: _____	[ ]	[ ]

47. Which of the "modern programmer practices" given below were used in the software development project?

- a. Program manager authority--both technical and administrative responsibility for project [Black, 1977] [ ]
- b. Reviews--formal milestone reviews at the end of each phase [Black, 1977] [ ]
- c. Unit development folders--capture of working materials for each identified item to facilitate end item development, testing, documentation [Ingrassia, 1976] [ ]
- d. Design discipline and verification--top-down design, formal design representation, completion of design, and deliberate verification of design prior to code [Black, 1977] [ ]
- e. Program modularity--definitions/restrictions on data interfaces between modules, adherence to parent/child relationships between modules. [Black, 1977] [ ]
- f. Naming conventions--structured names for modules and/or data items [Black, 1977] [ ]
- g. Structured forms--use of Dijkstra forms as supportable in your programming language [1972] [ ]
- h. Structured walkthroughs--deliberate peer reviews of code for each module [Weinberg, 1971] [ ]

- i. Structured analysis--a formal description of the users requirements [Yourdon, 1976] ☐
- j. Structured design--building system from small, highly independent, single purpose modules [Yourdon, 1976] ☐
- k. Chief programmer teams--a development organization around a programmer of great ability [Baker, 1972] ☐
- l. HIPO--a documentation technique [IBM, 1975] ☐
- m. Support libraries and facilities--use of automated or proceduralized design, coding and configuration management acceptance testing [Black, 1977] ☐
- n. Phased testing--defined and formalized unit, functional, and acceptance testing. [Black, 1977] ☐
- o. Configuration management/change control--creation and control of baselines and procedures for problem reporting and resolution. [Black, 1977] ☐
- y. None of the above (added) ☐
- z. Other: \_\_\_\_\_ ☐

48. Which of the below listed documentation types were used in the project? If a single document covered more than one area, check each area accounted for. The intent of this question is to determine which areas were covered by documentation not the actual document form. [See Section 2 for definitions]

- a. Functional description ☐
- b. Data requirements document ☐
- c. System/subsystem specification ☐
- d. Program specifications ☐
- e. Data base specifications ☐
- f. Users manual ☐
- g. Computer operations manual ☐
- h. Program maintenance manual ☐
- i. Test analyst report ☐
- j. Test plans (added) ☐
- k. Interface control (added) ☐
- l. Training course (added) ☐
- m. Version description (added) ☐
- n. Software development plan (added) ☐
- y. None (added) ☐
- z. Other: \_\_\_\_\_ ☐

49. Which software tools/aids were selected for use on this project?

- a. Structured pre-compilers [ ]
- b. Automatic flowcharters [ ]
- c. Library monitors [ ]
- d. Macro programming capabilities [ ]
- e. On-line capabilities [ ]
- f. On-line debugging [ ]
- g. Automatic test case generators [ ]
- h. Simulators or drivers (added) [ ]
- i. Batch debugging aids (added) [ ]
- j. Standards auditors (added) [ ]
- y. No software tools/aids employed [ ]
- z. Other: \_\_\_\_\_ [ ]

50. Which test tools/techniques/methods were selected for use on this project? [Hartwick, 1977]

- a. Comparators--used to compare the code of one program version to that of another for coding errors [ ]
- b. Editors--analyze source code [ ]
- c. Flowcharting--show the logic structure of a program [ ]
- d. Logic/Equation generators--translates assembly language programs into a machine-independent microprogramming language and builds the microprogramming statements into networks to analyze the flow of control and reconstruct arithmetic statements [ ]
- e. Program structure analyzers--analyze program paths under input control [ ]
- f. Correctness Proofs--establishes that a given program performs a desired function and halts [ ]
- g. Symbolic Program Executions--decompose source code by logically executing it [ ]
- h. Initialization Tests--the performance of all initialization operations is tested to assure that all indicated initialization operations are performed and that correct values of all initialized quantities result [ ]
- i. Interaction Test--all quantities, variables, and system conditions obtained from other modules are examined to determine the sensitivity of the module under test to their possible values or states [ ]

- j. Arithmetic Test--the precision of arithmetic calculations is checked to discover where insufficient precision is attained or incorrect arithmetic calculations are performed [ ]
- k. Timing Analysis--the longest and shortest possible execution times for all tests are determined to establish the execution time requirements for the module and to identify potential timing problems [ ]
- l. Branch Logic Test--the correct branching decision paths for each branch and each closed-loop test case are checked. The branch decision paths that are not exercised in any of the normal test cases are identified and their correctness demonstrated by special test cases [ ]
- m. Comparison of system output with manual output the system will replace (added) [ ]
- n. Real world simulation (added) [ ]
- y. None (added) [ ]
- z. Other: \_\_\_\_\_ [ ]

#### GENERAL

51. If you had total control of the planning function within your organization, or were able to initiate research into how to improve the planning function, what actions would you take?

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52. If it were in your power to make changes in the way technical decisions are made concerning programming techniques, test procedures, documentation standards, etc., what action would you take?

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## SECTION 4 - ORGANIZATION

DEFINITIONS [Heyel, 1973]

Line Organization--A line organization has a direct line of responsibility and control from the chief executive or general manager to intermediate line executives, to foreman and supervisors, to workers. A line or operating organizational unit is one that is actually doing the work that represents the primary mission of the larger organizational unit. Examples are aircraft manufacturing, radar construction and installation, supply and transportation of spare parts, building and launching a MARS lander, teaching in a university, etc.

Staff Organization--A staff organization is given responsibility and authority over special activities, such as inspection, employment, purchasing, legal, engineering, automatic data processing (ADP), etc. A staff or service organizational unit is any unit which is helping the line do its work, but is only responsible for the special activity not the final product of the larger organizational unit.

Matrix Organization--A matrix organization is built around specific projects. A manager is given the authority, responsibility, and accountability for completion of the project. The line or staff organizations provide qualified personnel when needed, who return to their parent organization when their task is done. The project manager usually does not have authority or responsibility to hire, discharge, train, or promote personnel. This is the responsibility of the line or staff manager.

Project Organization--A project organization is similar to a matrix organization except that the personnel are permanently assigned to the organization. The manager is also given the authority, responsibility and accountability for completion of the project. However, the manager must meet his goals within the resources of his organization. The manager usually has responsibility to hire, discharge, train, and promote personnel within his project organization.

PREORGANIZATIONAL FUNCTION

53. To which organization within the firm was this software development project first assigned:

- a. A line organization under the authority of the senior ADP manager [ ]
- b. A line organization outside the authority of the senior ADP manager [or no senior ADP manager] (added) [ ]
- c. A staff organization under the authority of the senior ADP manager [ ]
- d. A staff organization outside the authority of the senior ADP manager [or no senior ADP manager] (added) [ ]
- z. Other: \_\_\_\_\_ [ ]

54. Which organization was responsible for determining the initial budget, delivery schedule, resource requirements, computer availability, etc., [for software]? (added)

- a. The organization to which the project was initially assigned [ ]
- b. A line organization under the authority of the senior ADP manager [ ]
- c. A line organization outside the authority of the senior ADP manager [or no senior ADP manager] (added) [ ]
- d. A staff organization under the authority of the senior ADP manager [ ]
- e. A staff organization outside the authority of the senior ADP manager [or no senior ADP manager] (added) [ ]
- z. Other: \_\_\_\_\_ [ ]

When this project was initially assigned:

- a. The ultimate project manager participates in determining the schedule, budget figures, etc. [ ]
- b. The planning, budgeting, and allocation of resources was done by a special staff established for this function. (give name \_\_\_\_\_) [ ]
- c. An ad hoc group was set up to handle the initial assignment until a permanent group was established [ ]
- z. Comment: \_\_\_\_\_ [ ]

#### PROJECT MANAGEMENT ORGANIZATION

56. To which organization was the [software] project assigned for development? (added)

- a. The organization to which the project was initially assigned [ ]
- b. The organization responsible for determining initial budget, schedule, etc. [ ]
- c. A line organization under the authority of the senior ADP manager [ ]
- d. A line organization outside the authority of the senior ADP manager [or no senior ADP manager] (added) [ ]
- e. A staff organization under the authority of the senior ADP manager [ ]
- f. A staff organization outside the authority of the senior ADP manager [or no senior ADP manager] (added) [ ]
- z. Other: \_\_\_\_\_ [ ]

57. The software development was organized under [the following project types]: (added)

- a. A project organization [ ]
- b. A matrix organization [ ]
- c. A project manager with administrative authority while the actual development work was done by line and staff organizations [ ]
- y. Not organized under a project [type] organization (added) [ ]

58. In this project:

- a. Software development was handled within the ADP environment with functional analysts or prospective users being assigned or attached to the development team [ ]
- b. ADP specialists were detailed or assigned to the functional user for the duration of the development effort [ ]
- c. The functional user employed "analysts" who developed specifications, designs, algorithms, etc., which were then presented to the software development team for implementation [ ]
- d. The ADP function was done by the functional analyst/user (i.e., ADP was not a separate function) (added) [ ]
- e. The functional analysis was done by the ADP personnel (i.e., there was not a separate user analysis) (added) [ ]
- y. None of the above (added) [ ]
- z. Other: \_\_\_\_\_ [ ]

#### SOFTWARE ENGINEERING PROJECT TEAM

59. How many positions [(filled and unfilled)] supported the project? (added) \_\_\_\_\_

60. Was the [software] project organization divided into teams each headed by a technical leader? Note: In a small project organization with diverse activities it would be possible to have one-person teams. (added)

- a. Yes [ ]
- b. No [ ]
- z. Comment: \_\_\_\_\_ [ ]

61. Which types of teams were employed in software development [(for the purpose of this question an engineer is considered an analyst)] (added)

- a. Combined [functional] analysts-programmer team (added) [ ]
- b. Separate software [functional] analysis team (added) [ ]

- c. Separate programmer team [ ]
  - d. Separate test team [ ]
  - e. Separate integration team [ ]
  - f. Separate interface team [ ]
  - g. Separate product acceptance team (added) [ ]
  - y. Did not employ teams [ ]
  - z. Other: \_\_\_\_\_ [ ]
62. Which of the following functions were internal to the project management organization?
- a. Administration [ ]
  - b. Project control [ ]
  - c. Program support librarian [ ]
  - d. Product/quality assurance (added) [ ]
  - e. Configuration management (added) [ ]
  - y. No functions of this type were integral in the project management organization [ ]
  - z. Others: \_\_\_\_\_ [ ]
63. To whom did the test team report?
- a. The project manager [ ]
  - b. Other than project manager (added) [ ]
  - y. Did not employ a [separate] test team (added) [ ]
  - z. Other: \_\_\_\_\_ [ ]
64. How many individual teams were assigned to the project?
- \_\_\_\_\_
65. The teams were organized under:
- a. A chief programmer [Baker, 1972] [ ]
  - b. A lead programmer (a senior experienced programmer) [ ]
  - c. Task leader/work leader/project leader (added) [ ]
  - d. Lead engineer/systems engineer/analyst (added) [ ]
  - y. Did not use teams [ ]
  - z. Others: \_\_\_\_\_ [ ]

66. Were any of the positions in the development organization referred to by the following titles? [Titles taken from Yourdon, How to Manage Structured Programming, 1976, and Brooks, Mythical Man-Month, 1975]

- |                               |     |
|-------------------------------|-----|
| a. Chief programmer           | [ ] |
| b. Back-up programmer         | [ ] |
| c. Program support librarian  | [ ] |
| d. Surgeon                    | [ ] |
| e. Administrator              | [ ] |
| f. Editor                     | [ ] |
| g. Co-Pilot                   | [ ] |
| h. Programming clerk          | [ ] |
| i. Tool smith                 | [ ] |
| j. Tester                     | [ ] |
| k. Language lawyer            | [ ] |
| l. Software architect         | [ ] |
| m. Software engineer (added)  | [ ] |
| n. Technical director (added) | [ ] |
| y. None of the above (added)  | [ ] |
| z. Other: _____               | [ ] |

#### GENERAL

67. Which of the many forms of project organization do you feel contributes the most to the success of the project?

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68. If you had it within your power to make one change in the way the project was organized, what action would you take, or if you had the resources available to undertake research in any area of project organization, which aspect would you explore?

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## SECTION 5 - STAFFING

PROJECT MANAGER

69. What was the source of the project manager?

- a. New hire from another company [ ]
- b. New hire from school [ ]
- c. Transfer from another project [ ]
- d. Transfer from within company other than project [ ]
- e. Promoted from within project (added) [ ]
- f. The project manager was appointed or selected for this project by \_\_\_\_\_ [ ]

y. Did not have a project manager (added) [ ]

z. Other: \_\_\_\_\_ [ ]

70. How many years experience did the project manager have in the following areas?

a. Functional area of project \_\_\_\_\_ Yrs

b. Data processing \_\_\_\_\_ Yrs

y. No experience [no project manager] (added) [ ]

z. Comment: \_\_\_\_\_ [ ]

71. How many years of prior experience did the project manager have in the following areas and capacities?

		<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
		<i>Functional Area</i>	<i>Analyst/Programmer</i>	<i>Team Chief</i>	<i>Project Manager</i>
<u>Capacity</u>	<u>Area</u>	<u>Yrs</u>	<u>Yrs</u>	<u>Yrs</u>	<u>Yrs</u>
a.	Commercial/Business	___	___	___	___
b.	Scientific	___	___	___	___
c.	Simulation	___	___	___	___
d.	Process control (to include embedded computer systems)	___	___	___	___
e.	Command and control	___	___	___	___
f.	Mgt information system	___	___	___	___
g.	System software	___	___	___	___
h.	Real time applications	___	___	___	___
i.	Data communications	___	___	___	___
j.	Computer operations	___	___	___	___
y.	No experience/no project manager (added)	___	___	___	___
z.	Other: _____	___	___	___	___

72. In which programming languages and at what level of proficiency could the project manager program?

	<u>HIGH</u>	<u>AVERAGE</u>	<u>LOW</u>
a. FORTRAN	[ ]	[ ]	[ ]
b. JOVIAL	[ ]	[ ]	[ ]
c. COBOL	[ ]	[ ]	[ ]
d. Assembler [(unspecified)] (added)	[ ]	[ ]	[ ]
e. CMS-2 (added)	[ ]	[ ]	[ ]
f. PL/1 (added)	[ ]	[ ]	[ ]
g. HOL [(unspecified)] (added)	[ ]	[ ]	[ ]
y. None/no project manager (added)	[ ]	[ ]	[ ]
z. Other: _____	[ ]	[ ]	[ ]

73. The age of project manager at the beginning of the project was \_\_\_\_\_ years.

74. Was the project manager ever a Chief Programmer [As defined by Baker, 1972]?

- a. Yes [ ]
- b. No [ ]
- y. No project manager (added) [ ]
- z. Comment: \_\_\_\_\_ [ ]

75. Did the project manager receive training in any of the following areas prior to (or early in) the project development cycle?

- a. Functional area of project [ ]
- b. General data processing [ ]
- c. Modern programming techniques [ ]
- d. Project management [ ]
- e. General management [ ]
- f. Programming languages (give language \_\_\_\_\_) [ ]
- y. None/no project manager (added) [ ]
- z. Other project related area \_\_\_\_\_ [ ]

76. Highest education level attained by the project manager was:

- a. Less than high school [ ]
- b. High school [ ]
- c. AA degree or two years of college [ ]



- d. Between 2 and 4 years of college [ ]
- e. BS/BA degree [ ]
- f. Masters degree [ ]
- g. Master degree plus 30 hours or doctoral candidate [ ]
- h. PHD (or equivalent) [ ]
- y. Did not have a project manager (added) [ ]
- z. Other: \_\_\_\_\_ [ ]

77. If the project manager attended college, his major or speciality was:

- |                            |     |   |     |
|----------------------------|-----|---|-----|
| a. Computer Science        | [ ] | f. Business   | [ ] |
| b. Mathematics             | [ ] | g. Liberal Arts                                     | [ ] |
| c. Engineering             | [ ] | y. Did not attend/<br>no project<br>manager (added) | [ ] |
| d. Physics (added)         | [ ] | z. Other: _____                                     | [ ] |
| e. General Science (added) | [ ] |   |     |

#### THE SOFTWARE DEVELOPMENT STAFF

78. List the number of positions authorized by category over the life of the project, and list next to that the actual number of individuals who occupied these positions (e.g., if one project manager position was designated, but during the course of the project that position was occupied by three individuals at different times the answer would be: [1] [3]).

	<u>Position</u>	<u>A</u> <u>Authorized</u>	<u>B</u> <u>Occupied by</u>
a.	Project manager	[ ]	[ ]
b.	Asst project manager (added)	[ ]	[ ]
c.	Functional analyst/[engineer] (added)	[ ]	[ ]
d.	Data processing analyst	[ ]	[ ]
e.	Programmer	[ ]	[ ]
f.	Support librarian	[ ]	[ ]
g.	Secretary	[ ]	[ ]
h.	Administrator	[ ]	[ ]
i.	User/Customer (if part of the development team)	[ ]	[ ]
y.	None (added)	[ ]	[ ]
z.	Other: _____	[ ]	[ ]

79. What was the source (by percent) of the programmer/analyst staff?

- a. New hire from another company \_\_\_\_\_ %
- b. New hire from school \_\_\_\_\_ %
- c. Transfer from another project \_\_\_\_\_ %
- d. Transfer from other than another project \_\_\_\_\_ %
- e. ADP staff (added) \_\_\_\_\_ %
- f. Subcontractor (added) \_\_\_\_\_ %
- z. Other: \_\_\_\_\_ [ ]

80. At what level was the programmer support librarian?

- a. Clerk/programmer technician [ ]
- b. Junior programmer [ ]
- c. Senior programmer [ ]
- y. Did not use programming support librarian [ ]
- z. Other: \_\_\_\_\_ [ ]

81. The chief programmers were:

- a. Senior programmers [ ]
- b. Functional area experts [ ]
- c. Specially trained for task [ ]
- y. Did not use chief programmers [ ]
- z. Other: \_\_\_\_\_ [ ]

82. What was the education level of the programmer/analyst (by percent)?

- a. Less than high school \_\_\_\_\_ %
- b. High school \_\_\_\_\_ %
- c. AA degree or two years of college \_\_\_\_\_ %
- d. Between 2 and 4 years of college \_\_\_\_\_ %
- e. BS/BA degree \_\_\_\_\_ %
- f. Masters degree \_\_\_\_\_ %
- g. Masters degree plus 30 hours or Doctorate candidate \_\_\_\_\_ %
- h. PHD (or equivalent) \_\_\_\_\_ %
- z. Other: \_\_\_\_\_ %

83. What percent of the programmer/analyst staff were originally computer operators who moved directly from machine operation to programming? \_\_\_\_\_ %

84. Did these former operators make successful programmers?  
(originally narrative)

- a. Yes, excellent [ ]
- b. Yes, good/average [ ]
- c. Yes, fair [ ]
- d. No, poor [ ]
- y. Did not use ex-operators as programmers [ ]
- z. Comment: \_\_\_\_\_ [ ]

#### STAFF SUPPORT

85. Were the following services provided from within the project management resources, or supplied by a staff function within the company? (Indicate by inserting "W" for within the project resources, "O" for outside the project resources, ["B" for both]) (added)

- |                             |                       |
|-----------------------------|-----------------------|
| a. Personnel _____          | f. Training _____     |
| b. Accounting _____         | g. Typing _____       |
| c. Budgeting _____          | y. None (added) _____ |
| d. Computer Operation _____ | z. Other: _____       |
| e. Travel Arrangement _____ |                       |

#### TRAINING

86. Was the project manager responsible for identifying training requirement of the development team members?

- a. Yes [ ]
- b. No [ ]
- y. There was no training requirement or no project manager (added) [ ]
- z. Other: \_\_\_\_\_ [ ]

87. Training requirements generated as a result of the project were satisfied from which of the following sources? (Insert 0 for methods/sources not employed and rank order the remaining methods/sources with 1 being the most important.)

- a. On the job training \_\_\_\_\_
- b. Classes conducted by project team members \_\_\_\_\_
- c. Classes conducted by company cadre \_\_\_\_\_
- d. Classes conducted by the system user \_\_\_\_\_
- e. Classes conducted by independent training consultants \_\_\_\_\_

f. Classes conducted by hardware/software vendors \_\_\_\_\_

g. Classes conducted by colleges/universities \_\_\_\_\_

y. None (added) \_\_\_\_\_

z. Other: \_\_\_\_\_

88. What percent of the personnel assigned to the project received additional training in the programming language selected? \_\_\_\_\_

89. What percent of the personnel assigned to the project required additional training on the operating system that was used? \_\_\_\_\_

GENERAL

90. If it were within your power to make any changes, or initiate any research in the area of staffing, what would you consider the most fruitful area for modification or study?

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## SECTION 6 - CONTROL

PROJECT CONTROL

91. Which of the following automated or manual systems were used for project control?

- |                  |     |                               |     |
|------------------|-----|-------------------------------|-----|
| a. PERT          | [ ] | g. Graphs/Rate Charts (added) | [ ] |
| b. Modified PERT | [ ] | h. Workloading                | [ ] |
| c. [CPM] (corr)  | [ ] | i. Milestone tracking         | [ ] |
| d. GANTT Charts  | [ ] | y. No project control         | [ ] |
| e. CSCS (added)  | [ ] | z. Other: _____               | [ ] |
| f. WBS (added)   | [ ] |                               |     |

92. Was a work breakdown structure code used in the control of system development?

- |                   |     |
|-------------------|-----|
| a. Yes            | [ ] |
| b. No             | [ ] |
| z. Comment: _____ | [ ] |

REPORTING

93. Which manual reporting procedures were used in project monitoring and management? At what level did they originate, and how high did they go? How often were they aggregated, condensed, or edited as they moved through the chain?

		<u>A</u>	<u>B</u>	<u>C</u>
	<u>REPORT TITLE</u>	<u>LOWEST ORIGINATOR</u>	<u>HIGHEST RECIPIENT</u>	<u>NO. OF AGGS/EDTS</u>
a.	Weekly/monthly Activity	_____	_____	_____
b.	Project Status	_____	_____	_____
c.	Significant Chg	_____	_____	_____
d.	Cost vs Performance (added)	_____	_____	_____
e.	_____	_____	_____	_____
f.	_____	_____	_____	_____
y.	None/Unknown (added)	_____	_____	_____
z.	Other: _____	_____	_____	_____

94. Which automated reporting systems were used in project monitoring and management?

	<u>A</u> LOWEST <u>ORIGINATOR</u>	<u>B</u> HIGHEST <u>RECIPIENT</u>
a. Manhour by Activity (e.g., code, flow diagram, etc.)	_____	_____
b. Manday by Task (e.g., prepare users guide, design data base, etc.)	_____	_____
c. None/Unknown	_____	_____
z. Other: _____	_____	_____

95. In monitoring system development, system software was used to;

- a. Count compiles per module [ ]
- b. Count lines of code produced [ ]
- c. Check for adherence to coding conventions [ ]
- d. Check for use of standard data element names [ ]
- e. Perform manhour/cost accounting (added) [ ]
- f. Check performance (added) [ ]
- g. Monitor changes (added) [ ]
- y. Did not use software to monitor system development [ ]
- z. Other: \_\_\_\_\_ [ ]

96. List productivity indexes such as lines of code, program errors, sources of errors, turn arounds required per completed task, etc., that were employed in monitoring performance. (Originally narrative)

- a. Lines of code (per unit of time) [ ]
- b. Modules compiled (per unit of time) [ ]
- c. Program errors [ ]
- d. Computer time used [ ]
- e. Documented pages [ ]
- y. Did not use productivity indexes [ ]
- z. Other: \_\_\_\_\_ [ ]

97. Specific standards employed during the course of the project were developed, adapted, or directed by:

	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
<u>Standard</u>	<u>Project Manager</u>	<u>Company</u>	<u>User</u>	<u>Was None</u>
a. Data names	[ ]	[ ]	[ ]	[ ]
b. Coding	[ ]	[ ]	[ ]	[ ]
c. Programming	[ ]	[ ]	[ ]	[ ]
d. Documentation	[ ]	[ ]	[ ]	[ ]
e. Testing	[ ]	[ ]	[ ]	[ ]
f. Management report	[ ]	[ ]	[ ]	[ ]
g. Configuration control (added)	[ ]	[ ]	[ ]	[ ]
h. Quality assurance (added)	[ ]	[ ]	[ ]	[ ]
y. No standards (added)	[ ]	[ ]	[ ]	[ ]
z. Other: _____	[ ]	[ ]	[ ]	[ ]

98. Which of the following were recognized as distinct phases in the development effort? [AFR 300-15, 1978]

a. System definition	[ ]
b. Requirements definition	[ ]
c. Preliminary design (added)	[ ]
d. Detail design (added)	[ ]
e. System design	[ ]
f. Module design	[ ]
g. Coding	[ ]
h. Module test	[ ]
i. Subsystem integration	[ ]
j. System integration	[ ]
k. System test	[ ]
l. Acceptance (added)	[ ]
m. Validation (added)	[ ]
n. Operation	[ ]
o. Maintenance (added)	[ ]
y. Development was not divided into [recognized] phases (added)	[ ]
z. Other: _____	[ ]

ASSIGNMENT OF WORK

## 99. Task assignment.

	<u>Frequency</u>	<u>ALWAYS</u>	<u>MOST OF THE TIME</u>	<u>ABOUT 1/2 OF TIME</u>	<u>LESS THAN 1/2 OF TIME</u>	<u>SELDOM</u>	<u>NEVER</u>
<u>Action</u>							
a. Were task assignments to the <u>project teams</u> given in writing?		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
b. Were required completion dates included with each written team task assignment?		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
c. Were written team task assignments prepared in such a way that the relationship of the task to the next higher level task was clearly delineated?		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
d. Were task assignments given to <u>individual team members</u> in writing?		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
e. Were required completion dates included with each individual team member's written task assignment?		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
f. Were individual team members written task assignments prepared in such a way that the relationship of the task to the next higher level task was clearly delineated?		[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
y. No Team (added)							[ ]
z. Comment: _____							[ ]



100. Were task work time estimates provided at the time of task assignment or did individual team members provide time estimates after reviewing this assignment?

- a. Time and task assigned [ ]
- b. Time and task assigned with verification or modification of time allotted being provided by individual team member as a matter of procedure [ ]
- c. Individual team member provided the time estimate for each task assigned [ ]
- y. No effort was made to determine time requirements for individual tasks [ ]
- z. Other: \_\_\_\_\_ [ ]

101. At what intervals were task assignments made to individual team members?

- a. Every 5 work days [ ]
- b. Every 10 work days [ ]
- c. Every month [ ]
- d. As tasks were developed and defined [ ]
- e. As resources became available to work on the task [ ]
- y. Task assignment not made to individual team members (added) [ ]
- z. Other: \_\_\_\_\_ [ ]

102. Were procedures used in which programmers or analysts bid on specific tasks in the development projects (e.g., "I'll write the edit program for \$1,217.12")?

- a. Yes [ ]
- b. No [ ]
- z. Comment: \_\_\_\_\_ [ ]

103. If bidding as described above was employed, how successful was it?

- a. Very [ ]
  - b. Moderately [ ]
  - c. Unsuccessful [ ]
  - y. Not employed [ ]
  - z. Useful only under the following condition(s) [ ]
- \_\_\_\_\_

FORMAL REVIEWS

104. The following formal reviews were conducted as a requirement of the software development effort. [AFR 300-15, 1978]

- |    |                                  |     |
|----|----------------------------------|-----|
| a. | Systems requirements review      | [ ] |
| b. | Systems design review            | [ ] |
| c. | Preliminary design review        | [ ] |
| d. | Critical design review           | [ ] |
| e. | Formal qualifications review     | [ ] |
| y. | No formal reviews were conducted | [ ] |
| z. | Other: _____                     | [ ] |

105. CONCERNING REVIEWS

- |    | <u>Frequency</u>   |     | <u>ALWAYS</u> | <u>MOST OF THE TIME</u> | <u>ABOUT 1/2 OF TIME</u> | <u>LESS THAN 1/2 OF TIME</u> | <u>SELDOM</u> | <u>NEVER</u> |
|----|--|-----|---------------|-------------------------|--------------------------|------------------------------|---------------|--------------|
|    | <u>Action</u>  |     |               |                         |                          |                              |               |              |
| a. | Was formal documentation provided in advance of each review?                                 | [ ] | [ ]           | [ ]                     | [ ]                      | [ ]                          | [ ]           | [ ]          |
| b. | Did reviews take place on schedule?  | [ ] | [ ]           | [ ]                     | [ ]                      | [ ]                          | [ ]           | [ ]          |
| c. | Were the review proceedings formally documented?   | [ ] | [ ]           | [ ]                     | [ ]                      | [ ]                          | [ ]           | [ ]          |
| d. | Did top management attend formal reviews?  | [ ] | [ ]           | [ ]                     | [ ]                      | [ ]                          | [ ]           | [ ]          |
| e. | Did the customer/user attend formal reviews?   | [ ] | [ ]           | [ ]                     | [ ]                      | [ ]                          | [ ]           | [ ]          |
| f. | Was an independent review team used (independent of project manager)?                        | [ ] | [ ]           | [ ]                     | [ ]                      | [ ]                          | [ ]           | [ ]          |
| g. | Did the project manager attend the formal reviews?   | [ ] | [ ]           | [ ]                     | [ ]                      | [ ]                          | [ ]           | [ ]          |
| h. | What was the title, position and affiliation of the chairperson of the formal reviews? _____ |     |               |                         |                          |                              |               |              |
| y. | There were no formal reviews (added)   | [ ] |               |                         |                          |                              |               |              |

CONFIGURATION MANAGEMENT

106. Was a software configuration management system employed?
- a. Yes (give title/name: \_\_\_\_\_) [ ]
  - b. No [ ]
  - z. Comment: \_\_\_\_\_ [ ]
107. The system was base lined after: [AFR 300-15, 1978]
- a. System requirements review [ ]
  - b. System design review [ ]
  - c. Preliminary design review [ ]
  - d. Critical design review [ ]
  - y. Did not base line system (added) [ ]
  - z. Other: \_\_\_\_\_ [ ]
108. Were formal configuration control boards employed?
- a. Yes [ ]
  - b. No [ ]
  - z. Comment: \_\_\_\_\_ [ ]
109. Give title, position and affiliation of chairperson of [software] Configuration Control Board. (added) \_\_\_\_\_
- 

INFORMAL REVIEWS AND WALK-THROUGHS

110. How often were "informal" reviews conducted between the project manager and his supervisor?
- a. Daily [ ]
  - b. Weekly [ ]
  - c. Monthly [ ]
  - d. As required [ ]
  - y. There were no informal reviews [ ]
  - z. Other: \_\_\_\_\_ [ ]
111. Walk-throughs [as defined by Weinberg, 1971] were used for:
- a. Design reviews [ ]
  - b. Coding reviews [ ]
  - y. Did not use walk-throughs [ ]
  - z. Other: \_\_\_\_\_ [ ]

112. How often were walk-throughs scheduled?

- |            |                          |                 |                          |
|------------|--------------------------|-----------------|--------------------------|
| a. Daily   | <input type="checkbox"/> | d. As required  | <input type="checkbox"/> |
| b. Weekly  | <input type="checkbox"/> | y. Not used     | <input type="checkbox"/> |
| c. Monthly | <input type="checkbox"/> | z. Other: _____ | <input type="checkbox"/> |

113. Who normally attended walk-throughs?

- |                                       | <u>A</u><br><i>DESIGN</i> | <u>B</u><br><i>CODING</i> | <u>C</u><br><i>OTHER</i> |
|---------------------------------------|---------------------------|---------------------------|--------------------------|
| a. Peer Programmers or analysts       | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> |
| b. Programmer or analyst trainees     | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> |
| c. Programmer or analyst's supervisor | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> |
| d. Project manager                    | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> |
| e. Standards monitor                  | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> |
| f. Top level manager                  | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> |
| g. User/customer                      | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> |
| h. Quality Assurance (added)          | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> |
| i. Lead/System engineer (added)       | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> |
| j. Test personnel (added)             | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> |
| y. Did not use walk-throughs          | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> |
| z. Other: _____                       | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> |

114. Were walk-through minutes/records kept?

- |                           | <u>A</u><br><i>DESIGN</i> | <u>B</u><br><i>CODING</i> | <u>C</u><br><i>OTHER</i> |
|---------------------------|---------------------------|---------------------------|--------------------------|
| a. Yes                    | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> |
| b. No                     | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> |
| y. Walk-throughs not used | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> |
| z. Other: _____           | <input type="checkbox"/>  | <input type="checkbox"/>  | <input type="checkbox"/> |

GENERAL

115. If it were within your power to make any changes in the method or procedures followed in controlling this project what would these changes be, or, if you had resources available to undertake research in the area of planning, which aspect would you explore?

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## SECTION 7 - DIRECTING/MONITORING

RESPONSIBILITY AND AUTHORITY OF THE PROJECT MANAGER

116. Enter the number of positions (by category described) directly involved in this development project.

- a. Full time, report to project manager\_\_\_\_\_.
- b. Full time, report outside project manager's orgn\_\_\_\_\_.
- c. Full time, outside contractor/consultant\_\_\_\_\_.
- d. Full time, customer\_\_\_\_\_.
- e. Part time, report to project manager\_\_\_\_\_.
- f. Part time, report outside project manager's orgn\_\_\_\_\_.
- g. Part time, outside contractor/consultant\_\_\_\_\_.
- h. Part time, customer\_\_\_\_\_.

117. The project manager was responsible for:

- a. Technical quality [ ]
- b. Hire and fire assigned personnel (within firm policy) [ ]
- c. Evaluate performance of individual personnel [ ]
- d. Administration, budget, etc. [ ]
- e. Allocating computer resources [ ]
- f. Allocating non-computer resources [ ]
- g. Meeting schedule commitments [ ]
- h. Negotiating specification changes with customer [ ]
- i. Making a profit (i.e., operating within a budget) [ ]
- z. Other:\_\_\_\_\_ [ ]

118. The title and position of the project manager's supervisor was:

\_\_\_\_\_  
\_\_\_\_\_

119. The span of control of the project manager's supervisor (including the project manager) was\_\_\_\_\_persons.

120. The title, position, and number of people reporting directly to the project manager was:

	<u>A</u> <u>TITLE</u>	<u>B</u> <u>POSITION</u>	<u>C</u> <u>NUMBER</u>
a.	_____	_____	_____
b.	_____	_____	_____
c.	_____	_____	_____
d.	_____	_____	_____
e.	_____	_____	_____
f.	_____	_____	_____
g.	Project manager's span of control is _____ persons.		
y.	None/Unknown (added)	[ ]	[ ]

121. Indicate the reviews the project manager attended and the capacity in which he attended.

	<u>A</u> <u>Reviewer</u>	<u>B</u> <u>Reviewee</u>	<u>C</u> <u>Observer</u>
a.	Formal [management] reviews (added)	[ ]	[ ]
b.	Walk-throughs	[ ]	[ ]
c.	Budget reviews (added)	[ ]	[ ]
d.	Technical reviews (added)	[ ]	[ ]
y.	Did not attend/there were no reviews (added)	[ ]	[ ]
z.	Other: _____	[ ]	[ ]

122. The project manager was expected [by corporate management] to be: (added)

a.	A technical supervisor	[ ]
b.	A non-technical supervisor	[ ]
c.	Project administrator [only] (added)	[ ]
y.	None of the above (added)	[ ]
z.	Comment: _____	[ ]

MANAGEMENT AND MANAGEMENT TECHNIQUES

123. In the conduct of this project did the company or project manager make a conscious effort to apply any of the following management techniques?

	<u>A</u> <u>Company</u>	<u>B</u> <u>Proj</u> <u>Mgr</u>
a. Management by objectives [Drucker, 1954]	[ ]	[ ]
b. Job enrichment [Herzberg, 1977]	[ ]	[ ]
c. [Motivation] theories [Maslow, 1943] (corr)	[ ]	[ ]
d. Suggestion program	[ ]	[ ]
e. Incentive and/or bonus program	[ ]	[ ]
f. Participative management	[ ]	[ ]
g. Management by exception	[ ]	[ ]
y. None of the above (added)	[ ]	[ ]
z. Others: _____	[ ]	[ ]
124. In using management by objectives the objectives were:		
a. Set by the project manager <u>without</u> input from the team member		[ ]
b. Set by the project manager <u>with</u> input from the team member		[ ]
c. Periodically reviewed		[ ]
y. Did not use management by objectives		[ ]
z. Comment: _____		[ ]
125. The project manager:		
a. Issued instructions to his subordinates in writing		[ ]
b. Delegated technical decisions to his direct subordinates (Team chiefs)		[ ]
c. Had an "open door" policy		[ ]
d. Employed <u>quality</u> standards defining what was expected of each programmer/analyst		[ ]
e. Employed <u>quantity</u> standards defining how much each programmer/analyst should accomplish		[ ]
f. Monitored progress with the aid of a control board and/or control room		[ ]
g. Had a separate office to insure privacy		[ ]
h. Had a personal secretary		[ ]



126. How did the union contract affect the responsibility and authority of the project manager?

- a. Limited his ability to hire and fire his staff [ ]
- b. Required clearance from the union prior to taking certain management actions [ ]
- c. Union helped motivate team personnel toward better performance [ ]
- d. Union labor standards retarded the project managers authority [ ]
- f. Union labor standards enhanced production [ ]
- g. Union labor standards retarded production [ ]
- h. Union membership had no recognizable affect on the project [ ]
- y. No team members were represented by a union [ ]
- z. Other: \_\_\_\_\_ [ ]

GENERAL

127. If you had it within your power to implement changes in the way this project was directed, or had the resources to devote to research in this area, what action would you take?

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## SECTION 8 - DELIVERABLES AND SUCCESSES

INTRODUCTION. This section of the survey presupposes that the project being reported on is complete or very nearly complete. The following question tests this supposition and provides qualifying data for the remaining inquiries.

128. This project is:

- a. 50% complete or less [ ]
- b. 51% to 75% complete [ ]
- c. 76% to 90% complete [ ]
- d. 91% to 98% complete [ ]
- e. 99% to 99.99% complete [ ]
- f. 100% complete and accepted by customer [ ]
- y. Cancelled/not deliverable (added) [ ]
- z. Comment: \_\_\_\_\_ [ ]

Rather than provide two sets of questions we ask you to restructure the question in your mind to relate them to present project status. In the question: "Was the project completed on or before schedule?" could be read "will the project be completed on or before schedule?" and the degree of forecast derived from your just stated position on the development continuum.

MEETS SCHEDULE

129. Was the project completed on or before schedule?

- a. Yes on schedule [ ]
- b. Yes, \_\_\_\_\_ months early, \_\_\_\_\_ % early [ ]
- c. No, \_\_\_\_\_ months late, \_\_\_\_\_ % late [ ]
- d. Yes, however specifications were reduced (added) [ ]
- y. Project not completed and/or no estimate available (added) [ ]
- z. Other: \_\_\_\_\_ [ ]

130. If not completed on time what was the major cause of slippage [ /cancellation]? (added)

- a. Change in requirement [ ]
- b. Change in method of design [ ]
- c. Bad initial estimate [ ]
- d. Unreasonable estimate, by either top management or the customer [ ]
- e. Limited authority over resources [ ]

- f. Excessive absences on the part of the project team members [ ]
- g. Poor management (added) [ ]
- y. Project was completed or is on schedule (added) [ ]
- z. Other: \_\_\_\_\_ [ ]
132. If project was late, what portion (in percent is attributable to change in requirements? \_\_\_\_\_)
133. What, if anything, could the project manager have done to improve his ability to meet the schedule? (Originally narrative)
- a. Restrict the number of changes [ ]
- b. Require formal system of changes [ ]
- c. Require a firm requirements baseline [ ]
- d. Conduct more reviews [ ]
- e. Receive more authority over project [ ]
- f. Made a better estimate of schedule [ ]
- g. Perform better planning [ ]
- h. Nothing [ ]
- i. Better direction and control [ ]
- j. Better and earlier requirement specifications [ ]
- y. Project was completed or is on schedule [ ]
- z. Other: \_\_\_\_\_ [ ]

#### MEETS COST

134. Was the project delivered within the original budget?
- a. Yes, on cost [ ]
- b. Yes, \$ \_\_\_\_\_ under cost, \_\_\_\_\_ % under cost [ ]
- c. No, \$ \_\_\_\_\_ over cost, \_\_\_\_\_ % over cost [ ]
- d. Yes, however specifications were reduced (added) [ ]
- y. Project not completed and/or no estimate available (added) [ ]
- z. Other: \_\_\_\_\_ [ ]
135. If not completed within the original budget, what was the cause of this slippage [/cancellation]? (added)
- a. Change in requirements [ ]
- b. Change in method of design [ ]
- c. Bad initial estimate [ ]

- d. Unreasonable estimate, by either the manager or the customer [ ]
- e. Limited authority over resources [ ]
- f. Excessive absences on the part of the project team members [ ]
- g. Poor management (added) [ ]
- y. Project was completed or is within cost (added) [ ]
- z. Other: \_\_\_\_\_ [ ]

136. If project exceeded cost estimates, what portion of the overrun (in percent) was caused by a change in requirements? \_\_\_\_\_ %

137. What, if anything, could the program manager have done to improve his ability to meet the budget? (Originally narrative)

- a. Restrict the number of changes [ ]
- b. Require formal system of changes [ ]
- c. Require a firm requirements baseline [ ]
- d. Conduct more reviews [ ]
- e. Receive more authority over project [ ]
- f. Made a better estimate of costs [ ]
- g. Perform better planning [ ]
- h. Nothing [ ]
- i. Better direction and control [ ]
- j. Better and earlier requirement specifications [ ]
- y. Project was completed or is within cost [ ]
- z. Other: \_\_\_\_\_ [ ]

#### MEETS REQUIREMENTS

138. Did the delivered software meet the requirements as originally specified by the customer?

- a. Yes [ ]
- b. No [ ]
- y. No requirements specified [and/or project not completed] (added) [ ]
- z. Other: \_\_\_\_\_ [ ]

139. Did the customer accept the delivered system as meeting specified requirements in total, or did he identify exceptions?

- a. Accepted system in total as meeting specified requirements [ ]

- b. Identified exceptions [ ]
- y. No requirements specified [and/or project not completed] [ ]
- z. Other: \_\_\_\_\_ [ ]

140. How was it determined that the system met the requirements specified? (Originally narrative)

- a. Qualification/field test [ ]
- b. System in operation [ ]
- c. Formal system/acceptance test [ ]
- d. Independent verification and validation [ ]
- e. Check against known answers [ ]
- f. Simulation [ ]
- g. System did not meet requirement specified [ ]
- y. No requirements specified and/or project not completed [ ]
- z. Comment: \_\_\_\_\_ [ ]

141. Why did the system not meet the required specification? (Originally narrative)

- a. Requirements changed [ ]
- b. Initial estimate bad [ ]
- c. Requirements ignored/customer accepted without correction (added) [ ]
- d. System met requirements specified [ ]
- y. No requirements specified and/or project not completed [ ]
- z. Comment: \_\_\_\_\_ [ ]

#### MEETS RELIABILITY STANDARDS

142. Did the delivered software meet the reliability standards originally specified?

- a. Yes [ ]
- b. No [ ]
- y. No standards specified [and/or project not completed] (added) [ ]
- z. Comment: \_\_\_\_\_ [ ]

143. Why did the delivered software fail to meet the reliability standards?

- a. Requirements changed (added) [ ]
- b. Not enough reviews and testing (added) [ ]
- c. \_\_\_\_\_ [ ]
- d. System met the specified reliability standards [ ]
- y. No standards specified [and/or project not completed] (added) [ ]
- z. Comment: \_\_\_\_\_ [ ]

144. Which, if any, of the following methods of measuring reliability of the delivered software system were used in the project? [Gilb, 1977]

- a. The finished system was "salted" with known bugs (after integration testing and before sign off). The system was then debugged for a fixed (given) period of time after which the ratio of found known bugs to found unknown bugs was judged equal to the ratio of unfound known bugs to unfound unknown bugs. [ ]
- b. Curves of errors found to time spent debugging were calculated. [ ]
- c. A software reliability error prediction model was employed. [ ]
- d. Special test drivers were employed to stress system (added). [ ]
- e. Reported errors per unit of time (MTBF) and system accepted when error rate reached acceptable level (added). [ ]
- y. No reliability measuring method was employed [and/or project not completed] (added). [ ]
- z. Other: \_\_\_\_\_ [ ]

#### MEETS RELIABILITY STANDARDS

145. Did the delivered software meet the maintainability standards originally specified?

- a. Yes [ ]
- b. No [ ]
- y. No standards specified and/or project not completed (added) [ ]
- z. Comment: \_\_\_\_\_ [ ]

146. Why did the delivered software fail to meet the maintainability standards?

- a. \_\_\_\_\_ [ ]
- b. \_\_\_\_\_ [ ]
- c. \_\_\_\_\_ [ ]
- d. Software met the specified maintainability standards [ ]
- y. No standards specified [and/or project not completed] (added) [ ]
- z. Comment: \_\_\_\_\_ [ ]

147. Which, if any, of the following methods of measuring the maintainability of the delivered software were used in the project? [Gilb, 1977]

- a. Measured the time to repair the first "N" number of bugs reported (after integration testing and just before sign off). The average time to find a bug became the mean time to repair (MTTR). [ ]
- b. "Salted" the finished code with known bugs. The average time to find and repair the known bugs became the mean time to repair (MTTR). [ ]
- c. Cost to maintain program per unit of time and accepted when cost reached an acceptable level (added) [ ]
- y. No maintainability measures were employed and/or project not completed (added) [ ]
- z. Other: \_\_\_\_\_ [ ]

#### MEETS USABILITY REQUIREMENTS

148. Was the delivered system usable? If so, how was this determination made? (Originally narrative)

- a. Yes, system is in production [ ]
- b. Yes, system is in use [ ]
- c. Yes, independent verification and validation [ ]
- d. Yes, field or qualification testing [ ]
- e. Yes, customer was satisfied [ ]
- f. Unknown, has not been determined [ ]
- g. No, user was not satisfied [ ]
- y. No, the system was not delivered/cancelled [ ]
- z. Other: \_\_\_\_\_ [ ]

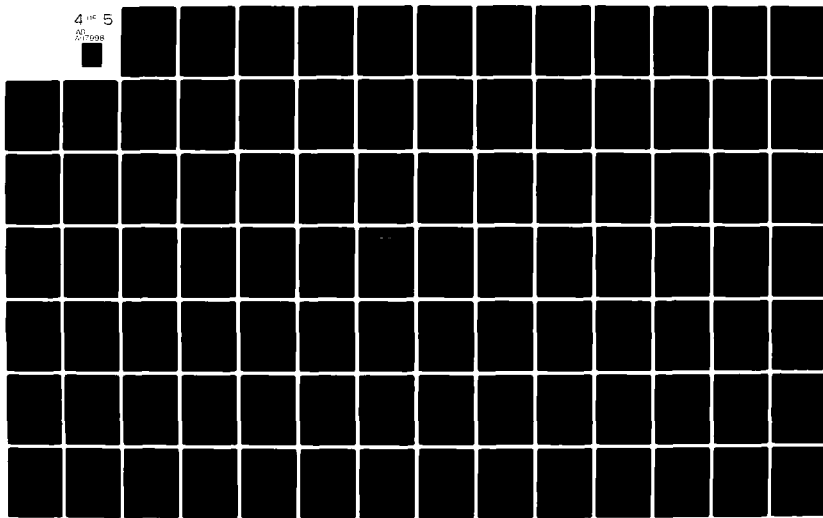
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SACRAMENTO AIR LOGISTICS CENTER MCCLELLAN AFB CA SERV--ETC F/6 22/2  
RESULTS OF A SURVEY SOFTWARE DEVELOPMENT PROJECT MANAGEMENT IN --ETC(U)  
DEC 79 R H THAYER, J H LEHMAN  
SM-ALC/MME-TR-79-54-VOL-2

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GENERAL

149. What was the period of the final product warranty?

- |              |     |                    |     |
|--------------|-----|--------------------|-----|
| a. 1 year    | [ ] | d. 6 or more years | [ ] |
| b. 2 years   | [ ] | y. No warranty     | [ ] |
| c. 3-5 years | [ ] | z. Other: _____    | [ ] |

150. What was the approximate production rate (lines of code per day) for the entire project?

- |                               |       |
|-------------------------------|-------|
| a. Average programmer/analyst | _____ |
| b. Best programmer/analyst    | _____ |
| c. Worst programmer/analyst   | _____ |
| z. Comment: _____             | [ ]   |

151. How many lines of code were produced per page of documentation?

152. What was the cost per line of code? \$ \_\_\_\_\_

153. Was software development the pacing factor (critical path) on the project?

- |   |     |
|---|-----|
| a. Yes, hardware was developed ahead of software            | [ ] |
| b. No, software was developed ahead of hardware             | [ ] |
| c. Yes, project was almost all software                     | [ ] |
| d. No, hardware and software delivered together (added)     | [ ] |
| e. Varied, hardware and software alternated (added)         | [ ] |
| y. Project not completed/there was no pacing factor (added) | [ ] |
| z. Other: _____   | [ ] |

154. What percent of production [calendar time] was spent in the following areas? (added)

- |                                  |         |
|----------------------------------|---------|
| a. Requirement specification     | _____ % |
| b. Preliminary design            | _____ % |
| c. Detail design                 | _____ % |
| d. Programming/unit testing      | _____ % |
| e. Integration testing           | _____ % |
| f. System testing                | _____ % |
| y. Project not completed (added) | [ ]     |
| z. Comment: _____                | [ ]     |

155. If the project used on-line, interactive programming for program development, was it:

- a. A highly effective development tool [ ]
- b. Effective in some cases [ ]
- c. Of limited utility [ ]
- d. A drain on hardware resources [ ]
- e. A nice toy [ ]
- y. On-line, interactive program was not used/unknown [ ]
- z. Other: \_\_\_\_\_ [ ]

156. If your experience reflects that on-line, interactive programming was an effective tool, in which situation was it most effective? (Check or rank order)

- a. During development of code [ ]
- b. To try short length of code for possible use (simulation approach) [ ]
- c. During debugging [ ]
- d. During testing [ ]
- e. Not an effective tool [ ]
- y. Did not use on-line, interactive programming/unknown [ ]
- z. Other: \_\_\_\_\_ [ ]

157. If your experience reflects that on-line, interactive programming was an effective tool what do you feel the improvement in programmer productivity over conventional (batch) software development was?

- a. Not an improvement [ ]
- b. 1.5:1 improvement [ ]
- c. 2:1 improvement [ ]
- d. 3:1 improvement [ ]
- e. 5:1 improvement [ ]
- y. Did not use on-line, interactive programming/unknown [ ]
- z. Other: \_\_\_\_\_ [ ]

158. Overall, how well do you think that this project met the project managers major goals: to deliver on time, within budget, and meeting the requirement of the system, where the final software product is reliable, maintainable, and usable?

- |                   |     |                 |     |
|-------------------|-----|-----------------|-----|
| a. Extremely well | [ ] | e. Poor         | [ ] |
| b. Very well      | [ ] | f. Failed       | [ ] |
| c. Good           | [ ] | z. Other: _____ | [ ] |
| d. Fair           | [ ] | _____           |     |

159. Give some lessons learned from this project.

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INTRODUCTION. This part of the survey contains questions that are general in nature and pertain to software development projects as a whole, and were designed to be answered by the project manager.

(These questions were originally 1, 2, 3, 4, and 25 of Section Three)

160. Place the following objectives of a project manager in order of importance. (Enter number 1 through 6 in the space provided) The project should:

- |                       |     |  |     |
|-----------------------|-----|--|-----|
| a. Be within budget   | [ ] | f. Be usable                             | [ ] |
| b. Be on schedule     | [ ] | g. Depends on contract incentive (added) | [ ] |
| c. Meets requirements | [ ] | h. Varies with job (added)               | [ ] |
| d. Be maintainable    | [ ] |  |     |
| e. Be reliable        | [ ] |  |     |

161. It is reported in literature that: 1 support librarian, plus 2 programmers can do the work of 3 programmers. Do you believe this?

- |  |     |
|--|-----|
| a. Yes   | [ ] |
| b. No  | [ ] |
| c. Do not know, insufficient data/experience (added) | [ ] |
| z. Other: _____                                      | [ ] |

162. If you believe the support librarian does relieve the programmer/analyst of unnecessary tasks, but do not believe the ration is 2 to 1, what ratio do you consider more accurate?

- |            |     |   |     |
|------------|-----|---|-----|
| a. 1 to 1  | [ ] | f. Varies, according to skill level (added) | [ ] |
| b. 3 to 1  | [ ] | g. Do not believe/do not know (added)       | [ ] |
| c. 4 to 1  | [ ] | y. Believe 2 to 1                           | [ ] |
| d. 5 to 1  | [ ] | z. Other: _____                             | [ ] |
| e. 10 to 1 | [ ] |   |     |

163. What actions are customarily taken by the project manager when it is discovered that a project is behind schedule?

- |  |     |
|--|-----|
| a. Wring hands   | [ ] |
| b. Assign more personnel to the project                          | [ ] |
| c. Renegotiate schedule with customer                            | [ ] |
| d. Renegotiate schedule with manager                             | [ ] |
| e. Quit  | [ ] |
| f. Say nothing to top management hoping to make up schedule time | [ ] |

- g. Reduce projects goals (added) [ ]
- h. Realign manpower (added) [ ]
- i. Use overtime (added) [ ]
- j. Replan the project (added) [ ]
- k. Varies, depends on situation (added) [ ]
- y. Nothing (added) [ ]
- z. Other: \_\_\_\_\_ [ ]

164. Please furnish any additional comments or statement concerning this survey or the science of software engineering project management.

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APPENDIX C  
COMMENTS ON AND ABBREVIATIONS USED IN  
THE REDUCTION OF ANSWERS

INTRODUCTION

The purpose of this Appendix is to present comments on specific questions, relationships between questions and their answers, procedures used in contriving missing answers, and to list and describe the abbreviations and codes used in this report. In addition, since a few of the questions were poorly written and/or in general misunderstood, some comments along these lines will also be reported here.

To conserve space and to provide a means of using a computer for analysis, all answers were abbreviated and/or coded (abbreviations and codes will be called just codes for the balance of this report). Because of space limitations and to assist in ease of processing, all alphanumeric codes were restricted to exactly three characters. The use of codes also had an additional advantage; it effectively disguised the answers so that the participants continue to remain anonymous.

The authors did not comment on all the questions and answers. If the authors have a comment, discussion, or observation on a question, their comments immediately follow the question number. Codes will immediately follow comments. If there are no comments, the codes will follow the question number. If the authors have no comment or codes concerning a given question, the question number will be passed by.

Four types of codes were used. The first type was general, applies to all questions, and will be defined after this introductory section. The second type was applicable to only one answer and appears after the question number in this section. The third type of code was general across two or more questions (e.g., FOR for FORTRAN; GPC for general purpose computer), and was listed once the first time it is used. Therefore, all Type Two and Three codes were defined after the question number in which they first appear. The code was separated from its explanation by a dash (--).

The fourth code type applied to questions 33, 51, 52, 67, 68, 90, 115, 127, 159 and 164 only. These questions were strictly narrative in nature



and did not lend themselves to multiple choice. To code these questions, all narrative sentences were broken into phrases generally containing a verb and object. These phrases were then given a code. The codes indicate whether the phrase concerned a planning, organizational, staffing, control, etc., function.

The authors attempted to use codes that were easy to recognize (mnemonic) to reduce the amount of flipping between appendixes.

The letters a through z indicated the sub-parts of the questionnaire. Parts a through w were general questions. Part x was used to indicate the entire question was not answered (ie., skipped). Part y was used primarily to show "none" of the answers applied or the questions were "not applicable". Part z was used for "other" answers.

TYPE ONE CODES

The code "YES" on the listing opposite a question (Sub-parts a through w) indicated that the surveyee "checked" the answer without comment and the answer is "yes" or "true". If a given question has a "blank" for an answer this indicates that the surveyee answered "no", or that the answer is "false" (this cannot be assumed if the surveyee did not answer at least one part in a multiple-part question).

Sometimes a pseudo question, Sub-part x, was created to indicate that the surveyee did not provide an answer to a given question because he: 1) did not understand the question, 2) felt it did not apply to his project or organization, or 3) just did not feel like answering it. This was done so that the reader would not read a "no" when the correct answer was unknown to the authors. Sometimes the surveyee wrote in "unknown" otherwise it was coded "MIS" by the authors.

When answered, Sub-part y was coded "NON" to mean that the whole question was answered "no" or "none". The answer to Sub-part y was frequently supplied by the authors, therefore, one of the "C" codes was used (see later discussion). Sub-part z was coded "OTH" to mean that the surveyee wrote in another answer and the authors were not able to use it any other way (see discussion Appendix B).

As an added note, answers to Sub-parts a through w and z, Sub-part x and Sub-part y are mutually exclusive.

Several of the questions are multi-part. It is assumed that if a surveyee answered any one part of the multi-part question "yes" or "true" then all parts of the questions were answered. Any answers that were not checked were "no" or "false".

Other Type One codes are listed below. These codes were frequently used when the surveyee did not answer a question but made some comment in the margin. Other times these codes were used as the appropriate answer to a narrative question.

CFU -- Confusing, vague, don't understand

DEL -- Deleted by authors as revealing the participant

DIS -- Disagree with question as written, not true statement

D/K -- Don't know

INF -- Infinite, continuous  
 N/A -- Not applicable (on this project), didn't use  
 NEG -- Negative, non-contributory  
 NON -- No, none, or false  
 NOS -- No solution (yet), hard to solve  
 N/S -- Not specified/not selected  
 OTH -- Other  
 UNK -- Unknown (also included "?" as an answer)  
 VAR -- Variable  
 MIS -- Question not answered (supplied by authors)  
 YES -- Yes or true

Upon occasion the authors felt it necessary to either answer the question for the surveyee, or change his answer. In the interest of honest reporting, the following codes indicate whether or not the answer was changed/contrived and the reason. These change codes were C01, C02, C03, and C04. C01 has the highest probability that the changed answers reflect the true answer, C02 next highest probability, C03 next, and C04 the lowest probability.

The change codes follow:

C01 -- This answer was supplied by the authors and the answer chosen was based on an answer to a different question, e.g., if the surveyee answered Question 3 with any answer but c, and he did not answer Question 4, answer 4y was provided by the authors as C01. Again, if the surveyee answered Question 46A but not 46B, answer 46By was coded C01 by the authors.

C02 -- These answers were manufactured by the authors by compartmentalizing answers provided originally in narrative form, i.e., multiple choice answers were formulated after all the answers were supplied by the participants. These answers were originally in narrative type questions or answers provided under "comments" or "other." An exception to this was when the participant wrote in "none" or another negative comment because a "none of the above" type answer was not supplied by the authors. When this happens a "none" answer is manufactured but coded C01.

C03 -- These answers redirected by the authors from the one given by the surveyees as "other" or "comment" to one of the existing answers which the authors felt was equally as good as the one placed in "comment", e.g., in Question 2 one of the answers placed under "other" was "airborne computer." The authors deleted the "other" answer and substituted code C03 in answer 2e. This was done to reduce the number of possible answers while still retaining as much

accuracy as possible. C03 was also used to answer a question that was redundant, i.e., the question appeared more than one time and was only answered once. The unanswered question was answered by the authors as C03, e.g., if Question 34e was checked but 55a was not, answer 55a was coded C03 by the authors.

C04 -- These answers were redirected by the authors from a supplied answer to another answer. This was only done with utmost caution. It was done only if the supplied answer was not reasonable and there was reason to believe it was incorrect.

TYPE TWO AND TYPE THREE CODES

These Sections reflect the specific codes and comments concerned with each question and are ordered by the question number. If there is no code or comment necessary for a given question, it is skipped.

## SECTION 1 - PROJECT IDENTIFICATION

3-4. Question 4 is dependent on Question 3. If the participant answered Question 3a, b, or z and did not answer Question 4, answer 4y was coded C01.

5-12. Questions 6 through 9 are dependent on the answer to Question 5. If Question 5 was answered 5c through 5z (any or all) and Questions 6, 7, 8 or 9 were not answered, answer y was coded C01. Questions 10 through 12 are also dependent on the answers to Question 5. If Question 5 was answered 5a and/or 5b and Questions 10, 11 or 12 were not answered, answer y was coded C01.

8. Answers to Question 8a were divided into a1, a2, a3, and a4. Answers to Question 8b were divided into b1, b2, b3, and b4. Answers a3, a4, b3 and b4 were only used if two machines and/or operating systems were reported.

The following codes were used for answers 8a1, 8a3, 8b1, and 8b3 (manufacturer) if the manufacturer was given:

CDC -- Control Data Corporation

DEC -- Digital Equipment Corporation

GEC -- General Electric Corporation

HCS -- Harris Computer Systems

HIS -- Honeywell Information Systems

HPK -- Hewlett-Packard Corporation

IPM -- International Business Machines

INH -- In-house

LIT -- Litton Corporation

SDC -- Systems Development Corporation

SEL -- System Engineering Laboratory

UNI -- Sperry-Univac Corporation

ZER -- XEROX Corporation

The following code was used for Answers 8a2 and 8a4 (computer make and model) if the computer type was given:

GP# -- Number which follows "GP" was taken from the size class numbers reported under "General Purpose Computer Census", Computer-World (Jun 1978), a copy which follows this appendix.

The following codes were used for Answers 8a2 and 8a4 (computer make and model) if the computer type was not given or the code did not appear in the "General Purpose Computer Census":

GMI -- General purpose, mini-computer

SLG -- Special purpose, large computer

SMI -- Special purpose, mini-computer

The following codes were used for Answers 8b2 and 8b4 (type operating systems) if the type operating system was given. Many of the answers were abbreviated and not always completely understood by the authors. Answers are given as reported:

DVS -- DOSVS

GCO -- GCOS (GECOS)

IMS -- IMS

OSM -- OSMNT

OVT -- OSMVT

RPM -- RPM

RSX -- RSX

RTE -- RTE

RTM -- RTM

SCO -- SCOPE

SVS -- SYSIMS

SYM -- SYMON

SYS -- SYS II

The following codes were used for Answer 8b2 and 8b4 (type operating systems) if the name of the operating system was not given:

GOS -- General purpose operating system

SOS -- Special purpose (one of a kind) operating system

9. The codes used for the answers to this question were the same as for Question 8.

12. The codes used for the answers to this question were the same as for Question 8.

15. This question was not always clear to the participants. It was not clear to the participants how "one user at multiple locations" should be answered and their answer was written under "comments". The authors selected Answer 15b as being appropriate and coded it C03.

13, 16-17. Questions 13, 16, and 17 are related. Some participants checked 16e for an in-house project (Answer 13a or 13b), others wrote "none" under "Other", and other participants left the question blank. Therefore, the authors elected to insert a new answer, 16y, and coded it C01 if Question 16 was blank and the project was for an in-house customer.

If Question 16 was answered other than 16c and 16g and Question 17 was not, answer 17y was coded C01. The following code was used for answer 17c:

COM -- Comparison of output results against known answers.

18. The total cost of the project was reported in dollars according to the following method. The cost \$ d(1) d(2) d(3) ... d(N) can be represented by  $d(1) d(2) \times 10^{**R}$  where  $R=N-2$  and was coded on the listing as d(1) d(2) R.

19. The total cost of the software was reported using the same method as in Question 18.

20. The project's beginning and ending was expressed in months and years, with the beginning month being a number from 001 to 012 as answer a and the beginning year being the last two digits of the year as answer b; the ending month being a number from 001 to 012 as answer c and the ending year being the last two digits of the year as answer d. If the month was not given, Jun (006) was assumed.

22. The lines of source codes were reported using the same method as in Question 18.

24. The size of the data base was reported in words or bytes using the same method as in Question 18.

SECTION 2 - REQUIREMENT SPECIFICATIONS,  
INPUT CONDITIONS, AND ENVIRONMENT

25-30. Questions 25 through 30 are related. If Questions 25 through 30 generally indicated that requirement specifications were not prepared and Questions 25 through 30 were not answered, answer y was coded C03 (or N/A for Question 27).

26. If Question 25 was answered 25a and Question 26 was not answered, answer 26c was coded C01. If Question 25 was answered 25b or 25d through 25z and Question 26 was not answered, answer 26y was coded C01 or C03.

29. If Question 28 was answered 28b or 28y and Question 29 was not answered, answer 29y was coded C01 or C03.

30. Participants did not generally satisfactorily answer, nor apparently understand, Question 30d. However, if Question 30d was answered the code was used:

PDL -- Programming Design Language

31. Question 31 did not originally have a "Documentation not required" answer. Therefore, there was no way for the participant to indicate "none". If the participant was generally answering all the questions and he left Question 31 blank, answer 31y was coded C03.

32. Question 32 did not originally have a "Customer did not specify" answer. Therefore, there was no way for the participant to indicate "none". If the participant was generally answering all the questions and he left Question 32 blank, answer 32y was coded C03.

The codes to answer Question 32a1 and 32a2 was the same as for Question 8. Answers 32a3 and 32a4 were only used if two machines were reported.

The code to answer Question 32b was reported using the same method as in Question 18. Other codes were:

Percent number (%) -- percent of core used at specified time in development cycle (usually Critical Design Review).

PCT -- Percent used (unit unspecified).

The code to answer Question 32c was indicated in time to respond. Response time was reported in seconds using the same method as in Question 18, except the second position can be a minus sign for negative exponential.

Other codes were:

Percent Number (%) -- percent of available execution time

PCT -- Percent used (unit unspecified)

RTS -- Real time system

SRT -- System response or execution time (unit unspecified).



The following codes were used to answer Question 32d1. Answer to 32d2 was used only if two languages are reported.

AP1 -- AP-101  
ASS -- Unspecified Assembler  
CM1 -- CMS-2  
FOR -- FORTRAN  
HAL -- HAL/1  
JOV -- JOVIAL  
PL1 -- PL/1  
TAC -- TAC POL/TAC MOL

The following code was used to answer Question 32p.

Number -- Number of paragraph modified.

The following codes were used to answer Question 32v.

CCR -- Critical component reliability only  
HWR -- Hardware reliability specified only  
MTB -- Mean time between failures  
SAV -- Software system availability (up time)  
SET -- Software evaluation testing  
TSR -- Total system reliability/available.

The following codes were used to answer Question 32aa.

Number -- Time in months  
BOA -- Basic ordering agreement.

33. Codes for Question 33 can be found under Type Four codes.

## SECTION 3 - PLANNING

34-42, 55. Questions 34 through 42 and Question 55 are related. If Questions 34 through 42 generally indicated no planning was done and if any Question 34 through 42 was not answered, answer y was coded C01 if 36y or 40y was answered, otherwise C03 was used (Question 41 was coded N/A).

34. If Question 55a was answered and Question 34e was not answered, answer 34e was coded C03. If Question 55b was answered and Question 34a was not answered, answer 34a was coded C03. If Question 55c was answered and Question 34b was not answered, answer 34b was coded C03.

35. Question 35 did not originally have a "None" answer. Therefore, there was no way for the participant to indicate "none of the above". If the participant was generally answering all of these questions and he left Question 35 blank, answer 35y was coded C03.

36. There was a typo error in answer 36c. CEM should have been CPM (Critical Path Method).

37-39. Questions 37 through 39 are related. If Question 37 was answered 37b through 37y and Question 38 was not answered, answer 38y was coded C01 or C03. In addition, the answer "lines of code" was left out of the original possible choices. The authors felt that had this answer been provided more participants would have selected it. The answers that were based on size, i.e., length of the module, number of programs, number of instructions, etc., were lumped under "lines of code".

39. If Question 37 was answered 37e, and Question 39 was not answered, answer 39e was coded C01.

41. This question was slightly confusing. Some of the participants were not sure that the authors meant software only and total time. However, most of the answers appear to be reasonable.

42. Again, this question apparently was not clear since all of the planning activities did not always add up to 100 percent.

43-44. Questions 43 and 44 are related. If Question 43 was answered 43a and Question 44 was not answered, answer 44a was coded C01.

45-46. Questions 45 and 46 are related. If Question 45 was answered 45y and Question 46 was not answered, answer 46y was coded C01. This would have been a better question had we not specified only formal QA standards, but used instead either formal or documented QA standards. However, all of the participants appeared to answer with both in mind.

47. Question 47 did not originally have a "None of the above" answer; therefore, there was no way for the participant to indicate "none". If the participant was generally answering all the questions and he left Question 47 blank, answer 47y was coded C03.

31, 48. Questions 31 and 48 are related. Question 48 did not originally have a "None" answer, therefore, there was no way for the participant to indicate "none". If the participant was generally answering all the questions and he left Question 48 blank, answer 48y was coded C03. Also, Question 48 was so similar to Question 31 that if the participant did not answer Question 48 but he did answer Question 31, the same answers were used.

46-48. Questions 46 through 48 are related. If Questions 46, 47, and 48 were answered y and Question 49 was not answered, answer 49y was coded C03.

50. Question 50 did not originally have a "None" answer; therefore, there was no way for the participant to indicate "none". If the participant was generally answering all questions and he left Question 50 blank, answer 50y was coded C03.

51-52. Codes for Questions 51 and 52 can be found under Type Four codes.

## SECTION 4 - ORGANIZATION

53. This question was not always answered properly (e.g., many people filled in "project manager" under "other"). By referring to later questions, it was apparent they meant one of the multiple-choice answers, and it was changed by the authors and coded C03.

55, 34. Question 55 is related to Question 34. If Question 34a was answered and Question 55b was not, answer 55b was coded C03. If Question 34e was answered and Question 55a was not, answer 55a was coded C03. However, if Question 55 was answered the following code was used to answer Question 55b:

ACB -- Administration Control Board.

56. On several occasions the participant answered either Question 56a or b and one of Questions 56c through f. This was frequently redundant and the answers to Questions 56c through 56f were eliminated.

58. This question is related to Question 22, Part One. If this question was incompletely answered, Part One answers and participants comments were used to answer Question 58 (coded C03). Also, through hindsight and written comments, two more questions were added which appeared to make the answer set more complete.

59. Again, this question was not properly answered. The participants apparently did not understand the difference between authorized and assigned. However, if Question 78A was answered and Question 59 was not, the sum of answers to 78A was inserted.

60-65. Questions 61 through 65 are related to Question 60. If Question 60b was answered and Question 61 was not, answer 61y was coded C01. This question could have been improved by including engineers with analysts.

63. If Question 61d was considered to be a "no" or Question 60b was answered and Question 63 was not answered, answer 63y was coded C01.

64. If Question 120 was answered properly (and it often was not) and if Question 64 was not answered, the correct answer could be derived.

65. If Question 60b was answered and Question 65 was not, answer 65y was coded C01. There was a variety of answers written into this question. Apparently the title of "team chief" is not constant within industry. The more common ones that appeared to be similar were lumped under answer 65d (a new answer).

66. There were almost no answers to this question. Apparently project managers do not make use of some of these exotic titles. The only one constantly written in was "software engineering". In addition, since Question 66 did not originally have a "None of the above" answer there was no way for the participant to indicate "none". If the participant was generally answering all the questions and he left Question 66 blank, answer 66y was coded C03.

67-68. Codes for Questions 67 and 68 can be found under Type Four codes.

## SECTION 5 - STAFFING

68. Question 68 was duplicated. To avoid having to renumber all the questions from 68 on, the second Question 68 was renumbered 69f.

69-77. Questions 69 through 77, and 86 are dependent on Question 57. If Question 57 was answered 57y (no project manager) all y answers in Question 69 through 77 were coded C01 (N/A for Question 73).

If Question 69f was answered the following codes were used: (These same codes were used for Questions 93, 94, 105h, 109, 118, and 120).

Senior Corporate Officers

VPC -- Vice President, Data Processing

VPE -- Vice President, Engineering/Functional Area

VPG -- President or Vice President, General

Senior Management

MCP -- Senior Manager, ADP

MEN -- Senior Manager, Engineering/Functional Area

MGR -- Senior Manager, General (includes Division Manager)

MPA -- Assistant/Deputy Program Director

MPD -- Senior Program Director (as opposed to Project Manager)

Project Management

PEN -- Project Engineer

PMA -- Assistant Project Manager, Deputy Project Manager

PMC -- Project Manager, ADP/Computer

PME -- Project Manager, Engineering/Analyst

PMR -- Project Manager

PMS -- Project Manager, Subsystem

PMW -- Project Manager/Software

PTD -- Technical Director/Manager

First Line Supervisor

FAP -- Applications Supervisor

FEN -- Engineering Supervisor

FFS -- Fiscal Supervisor

FLS -- First Line Supervisors, General (includes group leaders, task leader, section head, technical leader, manager, supervisor, head, etc.)

FOS -- Operations Supervisor

FPC -- Project Control Supervisor

FSA -- Application Software Supervisor  
 FSD -- Software Development Supervisor  
 FSE -- System Engineer Supervisor  
 FSQ -- Software Quality Assurance Manager  
 FSR -- Software Requirements Supervisor  
 FSS -- System Software Supervisor  
 FSW -- Software Supervisor  
 FSX -- Systems Supervisor  
 FTC -- Team Chief  
 FTE -- Technical Supervisor  
 FTI -- Test and Integration Supervisor  
 FTM -- Test Supervisor  
 FVS -- Verification Supervisor

Lead ADP Personnel (includes Senior, Lead, Senior Project, Chief, etc., ADP personnel).

LPA -- Lead/Senior Programmer/Analyst  
 LSA -- Lead/Senior Analyst  
 LSP -- Lead/Senior Programmer

Lead Engineer/Functional Personnel (includes Senior, Lead, Senior Project, Chief, etc., Engineering/Functional personnel).

LSE -- Lead/Senior Engineer  
 LSW -- Lead Software Engineer

ADP Personnel

CAN -- Analyst  
 CDA -- Data Base Analyst  
 CDV -- Software Developer  
 CHP -- Chief Programmer  
 CMS -- Software Configuration Management  
 COP -- Computer operations  
 CPA -- Programmer/Analyst  
 CPJ -- Junior Programmer/Programmer Aid  
 CPR -- Programmer

Engineer/Functional Personnel

EAN -- Engineering Analyst  
 ECH -- Computer Hardware Engineer

EHW -- Hardware Engineer  
EIG -- Integration Engineer  
ENG -- Engineer/Functional/Designer  
ENJ -- Junior/Associate Engineer - Engineering Aid  
ENS -- System Engineer  
ENT -- Test Engineer  
ESW -- Software Engineer

Supporting Staff

SAC -- Accountant  
SAD -- Administration  
SAS -- Staff Assistant  
SEC -- Secretary/Typist  
SLI -- Support Librarian  
SMG -- Support Manager/Supervisor  
SOP -- Functional Operation  
SPC -- Project Control  
STS -- Testing

General (Unspecified Personnel)

WMT -- Member Technical Staff  
WOR -- Worker, Individual, Staff

Other Positions

OCU -- Customer  
OMA -- Mathematician  
OTH -- Other

72. The following codes were used to answer this question:

001 -- High  
002 -- Average  
003 -- Low

75. Since Question 75 did not originally have "None" for an answer there was no way for the participant to answer "none". If the participant was generally answering all the questions in this section and he did not answer Question 75, answer 75y was coded C03. However, if he did answer, the codes used to answer Question 75f are the same as used in Question 32d. Answer 75f was divided into two answers, 75f1 and 75f2, to accommodate two languages and used the same codes as Question 32d.

76-77. Questions 76 and 77 are related. If Question 76a or b was answered and Question 77 was not answered, answer 77y was coded C01. In addition, two new answers were provided for this question--physics and science (an oversight on the part of the authors).

78. This question confused many of the surveyees. However, the answers are included in hopes they will provide benefit to somebody.

80. If Question 78f was answered by a "none" and Question 80 was not answered, answer 80y was coded C01.

81. If Question 65a was answered by a "none" and Question 81 was not, answer 81y was coded C01.

83-84. The answers to both of these were derived from the written answers provided.

85. The following codes were used in answering this question:

BBB -- Both within and outside the project resources

OOO -- Outside the project resources

WWW -- Within the project resources.

86. If Question 57y was answered and Question 86 was not, answer 86y was coded C01.

90. Codes for Question 90 can be found under Type Four codes.



## SECTION 6 - CONTROL

91-94. Questions 92 through 94 were dependent on Question 91. If Question 91y was answered, those Questions 92 through 94 which were not answered were answered with a y and coded C01.

91. Again, as in Question 36, "CEM" was corrected to "CPM" and other systems were added. Several of those that were graphic in nature were lumped under the general type "graphics".

92. If Question 35c was answered "negative" and 92 was not answered, answer 92b was coded C03.

93-94. If Question 91y was answered and Question 93 was not, answer 93y was coded C01. If Question 91y was answered and Question 94 was not, answer 94y was coded C01.

If, however, Question 93 and/or 94 were answered the codes used in Question 69f were used.

99. If Questions 60, 61, or 65 indicated that teams were not used and if Question 99 was not answered, answer 99y was coded C01. The following codes were used in answering this question:

001 -- Always

002 -- Most of the time

003 -- About one-half of the time

004 -- Less than one-half of the time

005 -- Seldom

006 -- Never

99-101. If Questions 99d or 99e were answered "never" and Question 100 or 101 was not answered, answer 100y and 101y were coded C03.

102-103. Questions 102 and 103 are identical to Questions 20 and 21, Part One. If Question 20 was answered "no" and Questions 102 and 103 were not answered, answers 102b and 103y were coded C01.

104-105. Questions 104 through 105 are related. If Question 104 is answered 104y, and 105 is not answered, answer 105y was coded C01.

105. Question 105 was originally incorrectly numbered. Therefore, it was renumbered 105a through 105h, and 105y. If Question 105h was answered the codes used in Question 69f were used.

106, 108-109. Questions 106, 108, and 109 are related. If Question 106 is answered "no" and Question 108 and 109 are not answered, Question 108b was answered C01 and Question 109 was answered N/A.

106. There were almost no answers given to Question 106a; however, if answered, the following codes are used in answering this question:

CCS -- Configuration Control

CUS -- Customer supplied

HAC -- HAC system  
IHD -- In-house developed  
LIP -- LIP SVC  
MAN -- Manual  
SDM -- Software Development Manager  
SKD -- SKD  
483 -- MIL-STD-483

109. The codes used in answering this question were the same as for Question 69f.

110-114. The Questions 110 through 114 are related. If any of the questions are answered with a y, then those that are not answered will have y coded with a C01.

115. Codes for Question 115 can be found under Type Four codes.

## SECTION 7 - DIRECTING/MONITORING

118. If Question 118 was not answered sometime an answer could be derived from elsewhere in the survey. If Question 118 was answered the codes used are the same as for Question 69f.

119. This question was completely confusing to many people who apparently did not know a definition of the term "span of control". Span of control was meant by the authors to be the number of people that were under the direct supervision of the project manager. From the large numbers that appeared, apparently most people answered the total number of people that were under the project manager.

120. The codes used for answering 120A and 120B are the same as for Question 69f. If Question 120g was not answered it could sometimes be derived from answers to 120A, B and C.

121. Question 121 is dependent on Questions 104 and 110. If Question 104 and 110 answered 104y and/or 110y and Question 121 was not answered, answer 121y was coded C03.

123-124. Questions 123 and 124 are related. If the answer to Question 123 was "no" and 124 was not answered, answer 124y was coded C01. If Question 124 was answered 124a, b or c and Question 123 was not answered, answer 123Ba was coded C03.

123. Answer 123c had a typo. It was corrected from "moderation" to "motivation".

127. Codes for Question 127 can be found under Type Four codes.

## SECTION 8 - DELIVERABLES AND SUCCESSES

In general, Section 8 lacked one point of clarity. It was the authors' intent to talk only about software deliverables and successes. However, the word software was not always emphasized, and we believe that some of the answers involved the entire project, which could have been partly hardware and partly software. Where the project was all software, of course, the answers applied to software. In those incidences where software was the pacing factor, then we are sure the answers also applied only to software. Where the pacing factor was hardware, you could be led to believe that the problems were associated with hardware and not software. The authors leave it up to the reader's discretion to evaluate exactly what the answers mean.

128-149. Questions 128 through 149, 153 and 154 are related. If Question 128a, 128b or 128y was answered (or some comment to the fact there was insufficient data to complete this section) and Questions 129 through 149, 153 and/or 154 were not answered, answers y were coded C01 (Questions 132 and 135 were coded "N/A").

129-133. Questions 129 through 133 are related. If Question 129a was answered and Questions 130 through 133 were not answered, answer y was coded C01. (Question 130 was coded "N/A".)

129. Answers to Question 129b were divided into 129b1 and 129b2, and answers to Question 129c were divided into 129c1 and 129c2. Answers b1 and c1 are reported in number of months; answers b2 and c2 are given in percent.

130. If Question 130a was answered "negative" and Question 132 was not answered, answer 132 was coded "N/A".

131. This question has been deleted from this modified version of Part Two of the questionnaire. It was meant to have been deleted during the last typing because it duplicated Question 129, but it was left in by error.

134-137. Questions 134 through 137 are related. If Question 134a was answered and Questions 133 through 137 were not answered, answer y was coded C01 (Question 136 was coded "N/A").

134. Answers to Question 134b were divided into 134b1 and 134b2, and answers to Question 134c were divided into 134c1 and 134c2. Answers b1 and c1 are reported in dollars using the same method as in Question 18; answers b2 and c2 are given in percent.

135. If Question 135a was answered "negative" and Question 136 was not answered, answer 136 was coded "N/A".

138-141. Questions 138 through 141 are related. If Question 138y was answered, and Questions 139 through 141 were not, answer y was coded C01.

141. If Question 138a was answered and Question 141 was not, answer 141d was coded C01.

142-144. Questions 142 through 144 are related. If Question 142y was answered and Questions 143 and 144 were not, answer y was coded C01.

143. If Question 142a was answered and 143 was not, answer 143d was coded C01.

145-147. Questions 145 through 147 are related. If Question 145y was answered and Questions 146 and 147 were not, answer y was coded C01.

145. If Question 145a was answered and 146 was not, answer 146d was coded C01.

146. As stated, those questions that were originally narrative have been turned into multiple choice questions by taking the given answers and making them into logical groupings. There were too few answers to Question 146a to do this; therefore, it is left in its original narrative form.

155-157. Questions 155 through 157 are related. If Questions 155 through 157 indicate that on-line programming was not used in the development of this project and some or all of these questions were not answered, answers y were coded C01.

159. Codes for Question 159 can be found under Type Four codes.

### PART THREE

Questions 1, 2, 3 and 4, and 25 of Part Three are added to this report as Questions 160, 161, 162, 163, and 164.

161-162. Questions 161 and 162 are related. If Question 161a was answered and Question 162 was not, answer 162y was coded C01. If Question 161c was answered and Question 162 was not, answer 162g was coded C01.

164. Codes for Question 164 can be found under Type Four codes.

TYPE FOUR CODES

This section reflects the codes used to answer narrative or lessons learned type questions. With the exception of Question 164 all codes are listed by type rather than question.

Codes for Question 164.

- A01 Software engineering management is not different from R&D or prototype development of hardware.
- A02 It is an error to compare software development with the production phase of hardware.
- A03 Many questions are philosophic.
- A04 Software engineering is new.
- A05 Many approaches to software development management are valid.
- A06 Initial higher cost at the beginning of a project caused by using software engineering techniques will be offset by savings later on.
- A07 Software development is a tough management problem.
- A08 We do not know if the initial higher cost of software engineering techniques will be offset by savings later on.
- A09 Case studies of software development are required.
- A10 Cost and scheduling of a project are a problem.
- A11 Survey was too theoretical (orderly progress from beginning to end) for our project.
- A12 Requirement specifications required extensive modification before development.
- A13 We should expect some of the "art" of software development to always remain with us and accept it.
- A14 Survey was exhaustive and exhausting.
- A15 Good luck.
- A16 Too much emphasis upon quantification of subjective functions.
- A17 Most important function is visibility of progress and automated procedures.
- A18 Hope you get many returns.
- A19 I hope you do not find my answers too difficult to understand.
- A20 Many good ideas in Questionnaire, good job.
- A21 You should follow on answers with telephone interviews.
- A22 Survey was redundant and could be shortened.
- A23 Good judgement and experience is more important than cook book techniques and tools.

- A24 Survey was not too applicable to be answered by customer.  
A25 My answers to these questions came from my experience in developing command and control systems.  
A26 Data should be collected by interview.  
A27 Separating software development management from hardware development management in this survey is a mistake.

Codes for Questions 33, 51, 52, 67, 68, 90, 115, 127 and 159

How the narrative answers were coded. The first element of the code (one or two letters) is:

- R -- Requirement function (this is a sub-set of planning)
- P -- Planning function
- X -- Design, Code and Test function (this is a sub-function of planning)
- O -- Organizing function
- S -- Staffing function
- ST -- Training
- C -- Controlling function
- CV -- Reviews
- CW -- Walk-throughs
- CS -- Software standards
- CM -- Configuration management
- CT -- Test and verification
- C -- Directing function

The second element (when used) is a number in order to distinguish between otherwise identical codes, except "R" which is used to designate the surveyee suggested R&D is necessary.

Requirements

R1 Software requirement specifications (baseline) should have the following general attributes.

- a. Accomplish its intended function of specifying the requirements.
- b. A (more) formal project phase (function)
- c. Based on a (thorough/careful) analysis
- d. Correct
- e. Useable by the software developer
- f. (more) Complete
- g. Clear, readable and understandable
- h. Unambiguous and consistent
- i. (more) Specific and detailed
- j. Delivered on time (before beginning software design)
- k. Reviewed prior to use
- l. (more) Emphasized throughout the project
- m. Testable
- n. Compatible with other functions (hardware)
- o. Controlled and/or baselined
- p. Any attributes or method will be acceptable
- y. None required.

R2 Software requirement specifications should not (be/have):

- a. Include detail design
- b. Only describe the process

R3 Software requirement specifications should contain the following:

- a. A description of the user's operation
- b. Test requirements
- c. Detailed test plan

R4 Software requirement specifications should be developed jointly (or involve) personnel assigned to the following functions (this is also part of the organization function):

- a. Contractor
- b. Customer
- c. User
- d. Operator
- e. Programmer
- f. System engineer
- g. Software engineer



R7 Software requirement specifications should be developed through the use of:

- a. Top-down techniques
- b. Structured techniques
- c. Hierarchical techniques
- d. Incremental (phased) techniques
- e. Modular techniques
- f. Simulation techniques
- g. (more) Automated tools

R9 Miscellaneous lessons learned and/or comments concerning software requirements specifications.

- a. Agree on specifications between customer and developer.
- b. Make sure system design is feasible before beginning software design.
- c. If you want the software to be reliable, maintainable, etc., put it in the contract.
- d. More emphasis on reliability, maintainability and useability.
- e. Many people do not know how to write requirement specifications.
- f. MIL-STD-483 needs updating/improvement.

RR R&D in software requirement techniques should include:

- a. Developing a formal requirement methodology.
- b. How to do requirement specifications development through simulation.
- c. How to analyze requirement specifications.

Planning

P1 The planning function should have the following general attributes:

- a. Accomplish its intended function (correctly and cost effectively).
- b. Based on a (thorough/careful) analysis.
- c. (more) Specific and detailed.
- d. Delivered on time (early in project).
- e. (more) Fully documented.
- f. Reviewed prior to use.
- g. Reviewed throughout the project.
- h. (more) Emphasized throughout the project.
- y. None required.

P3 Planning should include (be improved in) the areas of:

- a. A development plan and procedures.
- b. Accurate cost and scheduling.
- c. Formalized and detailed testing planning.
- d. Training plan.
- e. A fall back position if problems develop.
- f. Prioritizing work load.
- g. Staff functions.

P4 Planning and the planning function should be developed jointly (or involve) personnel assigned to the following functions (this is also part of the organization function):

- a. Contractor.
- b. Customer.
- c. Project personnel.
- d. Software analyst.
- e. Programmer.

P5 The project and/or project manager should be provided with the following:

- a. More resources.
- b. Better availability of (additional) supporting resources.
- c. Better availability of (additional) computer support.
- d. Better availability of development and test tools and support software.
- e. Better availability of (additional) administrative support.
- f. Adequate direction and guidance.

- g. A means of determining computational efficiency.
- h. Access to existing in-house expertise.
- i. A formal support library system.

P8 In planning for a software development project, more time and effort should be allowed for the following project functions:

- a. The requirement specification phase.
- b. The planning phase.
- c. The software development phase.
- d. Cost and scheduling phase.
- e. The design phase.
- f. The programming phase.
- g. The test phase.
- h. Reviews.
- i. Documentation.
- j. All phases of the development.

P9 Miscellaneous lessons learned and/or comments concerning planning:

- a. Do not allow the planning function to be pre-empted by short range tasks.
- b. Determine, in advance, if the development facility will support the project.
- c. Do not use "seat of the pants" planning.
- d. The first time a system is built is always a problem.
- e. All resources should be in close proximity.
- f. Use vendor supplied OS.
- g. Do not let customer change schedule and software design without contractor agreement.
- h. Politics plays a more important role than technology.
- i. Have more than a few "super stars" on the team if you expect success.
- j. Estimate high; expect the worse.
- k. Scheduling around holidays caused delays.

PR R&D in the planning function should include:

- a. Improvements in sizing, cost and estimating methods (accuracy).
- b. A better method to assess impact of changes on cost and schedules.
- c. Determining (research in) software life-cycle costs.

- d. Review of on-going projects to determine empirical planning factors for evaluation (and disseminate the best factors).
- e. Standardize planning, reporting, estimating and measurement techniques.

Design, Develop, and Code

X1 The software development function should have the following general attributes:

- a. A (more) formal project phase.
- b. Correct.
- c. (more) Specific and detailed.
- d. Delivered on time.
- e. (more) Fully documented.
- f. Controlled and/or baselined.

X4 The software should be developed jointly by (or involve) personnel assigned to the following functions (this is also part of the organization function):

- a. User.

X7 Software should be developed through the use of:

- a. Project management system.
- b. Top-down techniques.
- c. Structured (development) techniques.
- d. Modular techniques.
- e. Appropriate (HOL) language techniques.

X9 Miscellaneous lessons learned and/or comments concerning software development.

- a. Consider all past experiences in planning a new project.
- b. Have all unproven software technologies accepted by a review team prior to use on project.
- c. Software development more a management problem than a technical problem.
- d. More emphasis on automated software design tools.
- e. Use industry standard software design techniques.
- f. System designers should have more knowledge of software during early design stage.
- g. Documentation and flow charting are very expensive.
- h. Average software designer fails to see use for discipline until job is near done.
- i. Project manager's approach should be validated.
- j. Team members should select development methods used.
- k. Use a common language where practical.

- l. Use self-annotating source lists.
  - m. Element requirement for flow charts (prior to code completion).
  - n. More desk checking is required.
  - o. Complete detail software design before beginning programming.
  - p. Do not freeze design before completion of coding.
- XR R&D in software development techniques should include:
- a. More design of (automated) design tools and aids.
  - b. Surveying and evaluating available software development tools and techniques.
  - c. Develop (and disseminate) design validation techniques.
  - d. Publish software design techniques standards.
  - e. Develop a system design language.
  - f. Research into software reliability: error types and solutions.

Organizing

01 The organizational structure (rules and authority lines) should accomplish the following:

- a. Be defined.
- b. Be enforced.
- c. Define the authority line (better).
- d. Define the responsibility (better).
- e. Define a single, leadership function.
- f. Define relationship between administration and technical personnel.

02 The role of ADP in the organization is to include:

- a. Combine all programmers and analysts into one group.
- b. Have the programmer and analyst report to the ADP manager.
- c. Assign software specialist to the senior manager staff.
- d. Have the ADP function report higher up in the project.

03 Require (or permit) the following organization structure and/or responsibilities:

- a. Software to be responsible to overall system requirements.
- b. Hardware to be responsible to overall system requirements.
- c. Program manager (with the authority to do the job).
- d. (more) Authority to the technical subordinates (less central authority to project manager).
- e. Software test team not under the project manager.
- f. Software testing under software project manager.
- g. A (large) technical staff.
- h. Senior management to participate in project.

04 Miscellaneous lessons learned and/or comments concerning organization structure:

- a. Interface at detail level with customer is costly and time-consuming.
- b. Interface with IV&V contractor is costly and time-consuming.
- c. Should not allow intermediate agencies between customer/user and the designer/programmer.
- d. Should not allow involvement of organizations and/or personnel who cannot contribute to the software development.

05 The organization structure (type) that is best suited for a software engineering project is:

- a. A formal organization.

- b. Tailored/adapted to the job.
  - c. Best suited to company environment.
  - d. Depends on size of project.
  - e. A functional organization.
  - f. A line organization.
  - g. A project (task) organization.
  - h. A matrix organization.
  - i. Organized under a project manager (with full authority).
  - j. Organized under a manager with (strong) technical responsibilities.
  - k. Organized under a manager with (complete) administrative responsibilities.
  - l. Organized under an ADP organizational function.
  - m. Not organized under an ADP organizational function.
  - n. Doesn't matter what type of organization.
  - y. The project was not organized.
- 06 Other special organization structures (types) used or should be used are:
- a. Special planning team.
  - b. Integrated programmer-analyst teams.
  - c. Project teams.
  - d. A standing review team.
  - e. Chief programmer teams.
  - f. Requirements analyst team.
  - g. Small design and/or programming teams.
  - h. (separate) Interface team.
  - i. (separate) Test teams.
  - j. (separate) Documentation team.
- 07 The software development project (teams) should have as members:
- a. Customers.
  - b. Managers.
  - c. Functional analysts.
  - d. Programmers.
  - e. Junior programmers/programmer aids.
  - f. Support librarian.
  - g. Lead (chief) programmers.



h. Back-up programmers.

i. Hardware vendors.

09 Miscellaneous lessons learned and/or comments concerning project organization types are:

- a. The project organization should have a permanently assigned staff.
- b. The matrix organization enables people to be removed for short periods of time without hurting project.
- c. The matrix organization improved the overall training program.

OR R&D in organizational functions should include:

- a. Research for planning for an organization.
- b. Research for a testing organization.
- c. How many support librarians are required on a project.

Staffing

S1 The staffing function should:

- a. Provide an adequate, qualified staff.
- b. Allow for early moving of personnel.
- c. Provide for an experience and skill mix.
- d. Identify quality of persons early.
- e. Have "open ended" training programs as "personnel buffers".
- f. Assign stronger technical personnel to head teams.
- g. Apply appropriate talent to the appropriate jobs.
- h. Use different level of programmers for different aspects of job.
- i. Have (more) permanently assigned staff.

S2 The staffing function should not (be/have):

- a. Remove personnel to put out brush fires.
- b. Build up the staff too fast.
- c. Have too many (high-level) people during initial design.
- d. Select software test team members from programmers who designed programs.
- e. Have a general lay-off (reduction-in-force) just prior to starting project.

S5 The project manager should (be/have):

- a. Managerially and technically qualified for the job.
- b. Good.
- c. Experience in programming techniques.
- d. Experience in management techniques.

ST The training function should (be/have):

- a. Provide adequate training.
- b. A (more) formalized, staffed training program (function).
- c. Better.
- d. Screen personnel for skills to eliminate on-the-job training.
- e. Identify training requirements early.
- f. Provide training in new design technologies.
- g. Provide training in basic programming and documentation.
- h. Provide training in application function.
- i. Provide training in documentation principals.

- j. Provide training in software acquisition.
- k. Provide training in management.
- l. Provide training in hardware used.
- m. A better training facility.

SR R&D in staffing should include:

- a. (Better) methods of evaluating background/experience (vs project requirement).
- b. A study of what factors influence proper mixture of skills.
- c. Different skills and specializations needed for a project.
- d. Investigation into what backgrounds leads to higher performance (production).
- e. How do you staff for a changing project?

Direction

- D1 The direction function should (be/have):
  - a. Applied properly to effect a successful delivery of the software system.
  - b. (More) formal.
  - c. Documented.
- D3 The direction/motivation function should (be/have):
  - a. Motivate programmers to be aware of their importance.
  - b. Motivate programmers to be aware of being a professional.
- D5 Management should promote good and/or improved communications (interface) between:
  - a. Customer (user) and developer.
  - b. System designers and analysts/programmers.
  - c. Management and technical personnel.
  - d. Programming and test personnel.
- D9 Miscellaneous lessons learned and comments:
  - a. Highly motivated inexperienced staff can constantly out perform less motivated senior staff.
  - b. Never believe anything a computer vendor says.
- DR A R&D in direction should include:
  - a. How to improve and maintain communications.
  - b. Survey present methods and use the best.

Control

- C1 The control function should (be/have):
- a. Provide exacting control and feedback over the project.
  - b. (More) formal function.
  - c. Enforce the use of controls already established.
  - d. Provide (better) project status visibility.
  - e. An automated means of monitoring software development.
  - f. Modularize work into definable tasks (WBS).
  - g. Control the requirement specification function.
  - h. Control project resources.
  - i. Software separate from hardware.
  - j. Include rate charting to monitor progress.
  - k. Record time vs activity.
- CV The review process should (be/have):
- a. Hold effective reviews.
  - b. (More) periodic/extensive.
  - c. Done at critical milestones in project.
  - d. Qualified staff is available for reviews.
  - e. Review requirement specification for accuracy.
- CW Walk-through should (be/have):
- a. Used as a peer review of the software.
  - b. (More) formal.
  - c. Used more extensively (scheduled).
- CS Software standards should (be/have):
- a. Developed for more functions.
  - b. Expanded to a greater detail.
  - c. Enforced.
  - d. Simplified.
  - e. Monitored.
  - f. Developed for software design.
  - g. Developed for programming (coding).
  - h. Developed for documentation.
  - i. Developed for debugging tools.
  - j. Not have a fixed number of lines of code per product.

- CM Software configuration management should (be/have):
- a. Provide control of software undergoing development.
  - b. (More) formally applied.
  - c. Flexible to accommodate required change.
  - d. Used (earlier).
  - e. Enforce strict adherence to baseline.
  - f. Formal document changes.
  - g. Control changes to baseline.
  - h. Restrict software change in requirement specifications to minor changes at the start of development.
- CT Test and verification functions should (be/have):
- a. More formally applied.
  - b. Emphasized.
  - c. Used.
  - d. Software error checking.
  - e. Incorporate traceability from requirement specification to final code.
  - f. Applied top-down.
- CR R&D required in control should include:
- a. The development of traceability techniques.
  - b. Research into monitoring a project.
  - c. Research into how to test delivered software.
  - d. Methods to automatic configuration management aids.
  - e. Research into (automatic) control techniques, tools and procedures.
  - f. Automatic status reporting without frequent inputs from project individuals.
  - g. How to measure software productivity.

# COMPUTERWORLD

THE NEWS WEEKLY FOR THE COMPUTER COMMUNITY  
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June, 1978

Dear Census Respondee,

The Computerworld Research staff would like to thank you for your cooperation in responding to our Worldwide Computer Installation Census. It is only through such continued cooperation that we are able to successfully monitor the growth trends of the computer industry.

As an expression of our appreciation, we are pleased to present the results of a census report prepared by the staff at our publishing affiliate, EDP INDUSTRY REPORT. This "real world" census is the product of a direct extrapolation upon our Worldwide Computer Installation data base.

We hope you will find the enclosed information extremely interesting. We look forward to hearing from you again next year.

Sincerely,

Computerworld Research Staff

## SMALL BUSINESS COMPUTER CENSUS

The categorization of certain computers as "minicomputers" is based on marketplace definitions as perceived by IDC. Minis are general-purpose in design but sold as tools, not just solutions; are available from the maker as complete systems, not just boards; are available to OEMs and usually discounted in volume buys; and are part of a family that has at least one product in the \$2,000-\$25,000 price range and comes with at least 4K RAM. Size classes are: (S) Supermini; (T) Traditional Mini; (M) Micromini.

AS OF JANUARY 1, 1978											
NAME OF MANUFACTURER	COMPUTER MODEL	PROCESSOR	NOTES	PURCHASE PRICE (\$1,000)	DATE OF FIRST INSTALLATION	NUMBER INSTALLED IN U.S.	NUMBER INSTALLED OUTSIDE U.S.	TOTAL NUMBER INSTALLED	ORDERS FOR 1978	INSTALLATION	INSTALLATION
Advanced Information	System 5000	Interdata 7/16	24	35	7/75	16	3	19	4	NA	NA
Perkin	System 4000	Interdata 5/32	29	78	7/78	NA	NA	NA	NA	NA	NA
American Management	AMS 3E/TC	Nova-1	16	1776	7/76	0	0	0	2	NA	NA
System, Inc.	OPS-14	POP-11/34	15	100	8/76	0	0	0	2	NA	NA
Anderson-Jacobson,	1400	AJ 1400	16	22	7/70	140	15	155	18	NA	NA
Inc.	1500	AJ 1500	20	25	7/77	40	0	40	NA	NA	NA
Applied Data	Event	Event	13	20	7/77	27	3	30	150	NA	NA
Communications	Resource/100	Nova 3/12	35	88	8/76	10	3	13	14	NA	NA
Applied Data	Resource/100	Nova 3/12	35	88	8/76	10	3	13	14	NA	NA
Professional, Inc.	DAL	Nova 2/10	38	40	8/75	1	2	3	1	NA	NA
Ball Computer Products	100	BPC 140	29	29	7/78	0	0	0	1,300	NA	NA
Basic/Four Corp.	150	BPC 1300, Microdata b	34	34	8/71	500	576	1,076	0	NA	NA
	400	BPC 1300, Microdata b	37	55	8/71	1,400	1,268	2,668	800	NA	NA
	500	BPC 1300, Microdata b	38	50	7/72	100	62	162	0	NA	NA
	600	BPC 1300, Microdata b	51	65	3/75	100	308	408	0	NA	NA
	910	BPC 1320	51	68	1/78	3	0	3	350	NA	NA
	700	BPC 1320	115	20	7/77	10	38	48	150	NA	NA
Basic Timekeeping, Inc.	4000/15	BTL 4020	36	40	7/76	214	4	218	100	NA	NA
	4000/25	BTL 4020	36	42	7/76	217	8	225	100	NA	NA
Bladen Corp.	1000/1	1000/1	10	60	11/77	48	7	55	NA	NA	NA
Binary Data Systems	1000-1	Nova-1	95	120	1/76	70	0	70	4	NA	NA
	1000-2	Novel Nova-1	120	170	8/76	4	1	5	10	NA	NA
	1000-3	Novel Nova-1/2	120	170	8/76	4	1	5	10	NA	NA
Burroughs Corp.	5600	5600	20	67	3/73	2,400	1,650	4,050	1,500	NA	NA
	5700	5700	22	32	3/77	200	170	370	0	NA	NA
Business Controls	System 90	POP-4/6	23	40	7/71	100	0	100	30	NA	NA
Computerworld	System 80	POP-11/34/63/60/77	45	75	8/73	22	0	22	15	NA	NA
Business Systems	Adviser II	Computer Auto.	35	45	7/76	1	3	4	NA	NA	NA
Probus, Inc.	Adviser III	Computer Auto.	45	45	7/76	1	3	4	NA	NA	NA
Cascade Data, Inc.	80/20, 30, 40	Concept	25	45	7/75	10	0	10	NA	NA	NA
	Concept II	Concept	25	45	8/75	200	15	215	30	NA	NA
	Concept III	Concept	27	47	7/78	0	0	0	0	NA	NA
	Concept IV	Concept	18	27	8/78	0	0	0	0	NA	NA
Century Computer	C-100	C-100, 100	31	45	7/75	150	10	160	NA	NA	NA
Corp.	C-700	C-200, 100	38	55	8/76	40	10	50	NA	NA	NA
	C-800	C-400	27	40	4/77	100	20	120	NA	NA	NA
	C-1000	C-400	40	40	8/77	15	0	15	NA	NA	NA
Cincinnati Milacron	DMH III	C-200	12	22	7/73	180	48	228	0	NA	NA
	George-40	CIF/2200B	16	30	7/77	1	1	2	1	NA	NA
	George-60	CIF/2200B	16	36	7/76	1	1	2	1	NA	NA
	George-70	CIF/2200B	26	35	7/76	345	120	465	150	NA	NA
	George-80	CIF/4400	43	60	12/74	1	1	2	1	NA	NA
	Star	CIF/2200B	22	35	7/76	1	1	2	1	NA	NA

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## GENERAL-PURPOSE COMPUTER CENSUS

Counts in the General-Purpose Computer Census are based on the best information available to IDC -- but are estimates nevertheless. Computer makers, as a rule, do not directly supply this type of data. General-purpose computers -- as characterized by IBM's 370, 303X and competitors -- comprise the bulk of digital computers by value. They are primarily character or byte oriented and programmed in higher-level language.

Instead of being pegged to constantly shifting average values, size classes are based on currently marketed IBM products and other manufacturers' models that compete with them, e.g., a computer in Size Class 7 would compete with an IBM 3033 or 168. (Other classes can be checked under IBM's column.) Note that many mainframe manufacturers also offer smaller systems that are included in the Small Business Computer Census. An "x" in the last column means none on order from the original manufacturer.

		AS OF JANUARY 1, 1978		NUMBER OF		NUMBER OF		TOTAL	
MANUFACTURER	MODEL	SIZE CLASS	INSTALLED	ON ORDER	INSTALLED	ON ORDER	NUMBER OF	WORLDWIDE	
IBM									
370/158			1,177	74	1,251		1,251	1,251	
370/159			1,177	74	1,251		1,251	1,251	
370/160			1,177	74	1,251		1,251	1,251	
370/161			1,177	74	1,251		1,251	1,251	
370/162			1,177	74	1,251		1,251	1,251	
370/163			1,177	74	1,251		1,251	1,251	
370/164			1,177	74	1,251		1,251	1,251	
370/165			1,177	74	1,251		1,251	1,251	
370/166			1,177	74	1,251		1,251	1,251	
370/167			1,177	74	1,251		1,251	1,251	
370/168			1,177	74	1,251		1,251	1,251	
370/169			1,177	74	1,251		1,251	1,251	
370/170			1,177	74	1,251		1,251	1,251	
370/171			1,177	74	1,251		1,251	1,251	
370/172			1,177	74	1,251		1,251	1,251	
370/173			1,177	74	1,251		1,251	1,251	
370/174			1,177	74	1,251		1,251	1,251	
370/175			1,177	74	1,251		1,251	1,251	
370/176			1,177	74	1,251		1,251	1,251	
370/177			1,177	74	1,251		1,251	1,251	
370/178			1,177	74	1,251		1,251	1,251	
370/179			1,177	74	1,251		1,251	1,251	
370/180			1,177	74	1,251		1,251	1,251	
370/181			1,177	74	1,251		1,251	1,251	
370/182			1,177	74	1,251		1,251	1,251	
370/183			1,177	74	1,251		1,251	1,251	
370/184			1,177	74	1,251		1,251	1,251	
370/185			1,177	74	1,251		1,251	1,251	
370/186			1,177	74	1,251		1,251	1,251	
370/187			1,177	74	1,251		1,251	1,251	
370/188			1,177	74	1,251		1,251	1,251	
370/189			1,177	74	1,251		1,251	1,251	
370/190			1,177	74	1,251		1,251	1,251	
370/191			1,177	74	1,251		1,251	1,251	
370/192			1,177	74	1,251		1,251	1,251	
370/193			1,177	74	1,251		1,251	1,251	
370/194			1,177	74	1,251		1,251	1,251	
370/195			1,177	74	1,251		1,251	1,251	
370/196			1,177	74	1,251		1,251	1,251	
370/197			1,177	74	1,251		1,251	1,251	
370/198			1,177	74	1,251		1,251	1,251	
370/199			1,177	74	1,251		1,251	1,251	
370/200			1,177	74	1,251		1,251	1,251	
370/201			1,177	74	1,251		1,251	1,251	
370/202			1,177	74	1,251		1,251	1,251	
370/203			1,177	74	1,251		1,251	1,251	
370/204			1,177	74	1,251		1,251	1,251	
370/205			1,177	74	1,251		1,251	1,251	
370/206			1,177	74	1,251		1,251	1,251	
370/207			1,177	74	1,251		1,251	1,251	
370/208			1,177	74	1,251		1,251	1,251	
370/209			1,177	74	1,251		1,251	1,251	
370/210			1,177	74	1,251		1,251	1,251	
370/211			1,177	74	1,251		1,251	1,251	
370/212			1,177	74	1,251		1,251	1,251	
370/213			1,177	74	1,251		1,251	1,251	
370/214			1,177	74	1,251		1,251	1,251	
370/215			1,177	74	1,251		1,251	1,251	
370/216			1,177	74	1,251		1,251	1,251	
370/217			1,177	74	1,251		1,251	1,251	
370/218			1,177	74	1,251		1,251	1,251	
370/219			1,177	74	1,251		1,251	1,251	
370/220			1,177	74	1,251		1,251	1,251	
370/221			1,177	74	1,251		1,251	1,251	
370/222			1,177	74	1,251		1,251	1,251	
370/223			1,177	74	1,251		1,251	1,251	
370/224			1,177	74	1,251		1,251	1,251	
370/225			1,177	74	1,251		1,251	1,251	
370/226			1,177	74	1,251		1,251	1,251	
370/227			1,177	74	1,251		1,251	1,251	
370/228			1,177	74	1,251		1,251	1,251	
370/229			1,177	74	1,251		1,251	1,251	
370/230			1,177	74	1,251		1,251	1,251	
370/231			1,177	74	1,251		1,251	1,251	
370/232			1,177	74	1,251		1,251	1,251	
370/233			1,177	74	1,251		1,251	1,251	
370/234			1,177	74	1,251		1,251	1,251	
370/235			1,177	74	1,251		1,251	1,251	
370/236			1,177	74	1,251		1,251	1,251	
370/237			1,177	74	1,251		1,251	1,251	
370/238			1,177	74	1,251		1,251	1,251	
370/239			1,177	74	1,251		1,251	1,251	
370/240			1,177	74	1,251		1,251	1,251	
370/241			1,177	74	1,251		1,251	1,251	
370/242			1,177	74	1,251		1,251	1,251	
370/243			1,177	74	1,251		1,251	1,251	
370/244			1,177	74	1,251		1,251	1,251	
370/245			1,177	74	1,251		1,251	1,251	
370/246			1,177	74	1,251		1,251	1,251	
370/247			1,177	74	1,251		1,251	1,251	
370/248			1,177	74	1,251		1,251	1,251	
370/249			1,177	74	1,251		1,251	1,251	
370/250			1,177	74	1,251		1,251	1,251	
370/251			1,177	74	1,251		1,251	1,251	
370/252			1,177	74	1,251		1,251	1,251	
370/253			1,177	74	1,251		1,251	1,251	
370/254			1,177	74	1,251		1,251	1,251	
370/255			1,177	74	1,251		1,251	1,251	
370/256			1,177	74	1,251		1,251	1,251	
370/257			1,177	74	1,251		1,251	1,251	
370/258			1,177	74	1,251		1,251	1,251	
370/259			1,177	74	1,251		1,251	1,251	
370/260			1,177	74	1,251		1,251	1,251	
370/261			1,177	74	1,251		1,251	1,251	
370/262			1,177	74	1,251		1,251	1,251	
370/263			1,177	74	1,251		1,251	1,251	
370/264			1,177	74	1,251		1,251	1,251	
370/265			1,177	74	1,251		1,251	1,251	
370/266			1,177	74	1,251		1,251	1,251	
370/267			1,177	74	1,251		1,251	1,251	
370/268			1,177	74	1,251		1,251	1,251	
370/269			1,177	74	1,251		1,251	1,251	
370/270			1,177	74	1,251		1,251	1,251	
370/271			1,177	74	1,251		1,251	1,251	
370/272			1,177	74	1,251		1,251	1,251	
370/273			1,177	74	1,251		1,251	1,251	
370/274			1,177	74	1,251		1,251	1,251	
370/275			1,177	74	1,251		1,251	1,251	
370/276			1,177	74	1,251		1,251	1,251	
370/277			1,177	74	1,251		1,251	1,251	
370/278			1,177	74	1,251		1,251	1,251	
370/279			1,177	74	1,251		1,251	1,251	
370/280			1,177	74	1,251		1,251	1,251	
370/281			1,177	74	1,251		1,251	1,251	
370/282			1,177	74	1,251		1,251	1,251	
370/283			1,177	74	1,251		1,251	1,251	
370/284			1,177	74	1,251		1,251	1,251	
370/285			1,177	74	1,251		1,251	1,251	
370/286			1,177	74	1,251		1,251	1,251	
370/287			1,177	74	1,251		1,251	1,251	
370/288			1,177	74	1,251		1,251	1,251	
370/289			1,177	74	1,251		1,251	1,251	
370/290			1,177	74	1,251		1,251	1,251	
370/291			1,177	74	1,251		1,251	1,251	
370/292			1,177	74	1,251		1,251	1,251	
370/293			1,177	74	1,251		1,251	1,251	
370/294			1,177	74	1,251		1,251	1,251	
370/295			1,177	74	1,251		1,251	1,251	
370/296			1,177	74	1,251		1,251	1,251	
370/297			1,177	74	1,251		1,251	1,251	
370/298			1,177	74	1,251		1,251	1,251	
370/299			1,177	74	1,251		1,251	1,251	
370/300			1,177	74	1,251		1,251	1,251	
370/301			1,177	74	1,251		1,251	1,251	
370/302			1,177	74	1,251		1,251	1,251	
370/303			1,177	74	1,251		1,251	1,251	
370/304			1,177	74	1,251		1,251	1,251	
370/305			1,177	74	1,251		1,251	1,251	
370/306			1,177	74	1,251		1,251	1,251	
370/307			1,177	74	1,251		1,251	1,251	
370/308			1,177	74	1,251		1,251	1,251	
370/309			1,177	74	1,251		1,251	1,251	
370/310			1,177	74	1,251		1,251	1,251	
370/311			1,177	74	1,251		1,251	1,251	
370/312			1,177	74	1,251		1,251	1,251	
370/313			1,177	74	1,251				

## EDP INDUSTRY REPORT

## APPENDIX D

## NARRATIVE AND CANDID (CLEAR TEXT) ANSWERS TO SELECTED QUESTIONS

INTRODUCTION

This section deals with actual, unaltered, answers provided to a series of narrative response questions, specifically, Questions 33, 51, 52, 67, 68, 90, 115, 127 and 159 of Part Two and Question 25 of Part Three (which has been renumbered 164 of Part Two) and answers that were provided to questions which were not multiple choice, specifically 1, 8, 9, 12, 28, 29, 69f, 83, 84, 93, 94, 96, 105h, 109, 118, 120, 133, 137, and 148. Also, gratuitously included, at the end of this section are relevant excerpts from correspondence the authors had with respondents and prospective respondents during the course of survey development and circulation.

The narrative response questions asked for opinions on how (or if) the surveyee would have done things differently had he to do them over again (lessons learned), or what form of research he would wish to see undertaken with an eye toward improving the lot of the project manager. Other non-multiple choice questions asked for answers for which the authors could not provide a possible set of answers because of the wide variety of possible answers.

Each discernible response, whether included in the following pages or not, has also been analyzed and coded to facilitate entry into the computer data base. Since this reduction of comment to code destroyed some of the richness of prose, the authors felt it worthwhile to include this "verbal" section in the report.

The answers as they appear in the following pages have been "cleaned up" to assure anonymity from the standpoint of author, firm, and project. Identical or nearly identical responses have been eliminated as have incomplete (incompleteable) sentences and one worders. With the exception of the "clean up" and correction of the most obvious spelling and punctuation errors, those responses included in the following pages are as received. Though they do not in every instance answer the question asked, they do relate to the subject. As an aside, we make no claim to total understanding of every response.

QUESTION 1 What was/is your position in relation to the project you are reporting on?

ANSWERS

The following answers are the various titles of personnel who answered the questionnaire (grouped as to their relationship to the project).

a. Project Manager

Project manager

Project leader

Project engineer

Section manager

Task manager

Responsible for computers system hardware and software

b. Software Project Manager

Data processing manager

Manager of software engineering

Manager of software development

Software development group leader

Central computer subsystem manager

Software manager

Responsible for the computer activities

Programming supervisor/mechanization lead engineer

Technical director and director computer programming

Group leader

Software design manager

Manager, data processing and software

Group leader - software development

Group leader - systems design

Lead software supervisor

Assistant, standard software development

Project manager for software

Associate program manager

Group supervisor

c. Project Manager's Supervisor

Supervisor of project manager

d. Project Individual

Analyst

Software engineer

Special assistant to the project officer

Technical advisor for software acquisition

Technical supervisor

e. Corporate Officer/Staff

Director

Director, quality assurance

z. Other Independent technical advisor

Project historian

QUESTIONS 8, 9, and 12 If the target (production) and/or host (development) computer for this software capability was an off-the-shelf commercial system give: a. manufacturer, make and model, and b. operating system employed.

ANSWERS

The first column gives the question number answered.

<u>Question</u>	<u>Manufacturer</u>	<u>Make and Model</u>	<u>Operating System</u>
9	IBM	370-125	DOS-VS
12	IBM	370-125	DOS-VS
8	LEC	System III	LEC MPOS
9	LEC	System III	LEC MPOS
9	ROLM	1603	None
12	ROLM	1603	None
8	IBM	370/158, 168	VS
9	UNIVAC	1110	EXEC 8
8	UNIVAC	9480	None
8	CDC	System 17	
9	CDC	System 17	
8	Raytheon	704	
9	Raytheon	704	
8	Varian	V76	VORTEX II
9	Varian	V76	VORTEX II
12	Varian	V76	VORTEX II
9	NANODATA	QM4	As provided
	DEC	PDP-10	
12	NANODATA	QM4	As provided
	DEC	PDP-10	
8	CDC	7600/7700	SCOPE
9	CDC	7600/7700	SCOPE
8	Honeywell	316	
9	CDC	6600	SCOPE 4.0
12	CDC	6600	SCOPE 4.0
8	DEC	11/20, 11/40	In-house
9	DEC	11/20, 11/40	In-house
8	IBM	370	
9	IBM	370	
8	IBM		DOS
9	IBM		DOS
8	CDC	3800	SYMON
8	SEL	8500/8600	RTM (modified)
9	SEL	8500/8600	RTM (modified)

<u>Question</u>	<u>Manufacturer</u>	<u>Make and Model</u>	<u>Operating System</u>
8	CDC	7700	SCOPE
9	CDC	7700	SCOPE
8	IBM	360/67	TSS
9	IBM	360/67	TSS
12	CDC	175	NOS
12	IBM	370-158	
12	CDC	6600	
	IBM	360/65	
8	DATA CRAFT	6024/4	DATA CRAFT
9	DATA CRAFT	6024/4	DATA CRAFT
12	DATA CRAFT	6024/4	DATA CRAFT
8	SCC	660	
9	SCC	660	
12	SCC	660	
8	XEROX	SIGMA-5	XDS
	INTERDATA	70	RBM
8	IBM	AP-101	Special purpose
9	IBM	360/75	OS/360
12	IBM		
8	Harris	Slash 5	
	IBM	360/370	
9	Harris	Slash 5	
	IBM	360/370	
12	Harris	Slash 5	
	IBM	360/370	
9	CDC	CYBER 72	
12	CDC	CYBER 72	
9	IBM	370-75	EOS
12	IBM	370-75	EOS
8	UNIVAC	1108	
12	UNIVAC	1108	
8	XEROX	SIGMA 5	RBM
9	XEROX	SIGMA 5	RBM
8	Hewett-Packard	2100	RTE
9	Hewett-Packard	2100	RTE
9	IBM	370/168	OS 21.6
8	INTERDATA	8/32	OS 32 MT
9	INTERDATA	8/32	OS 32 MT
8	Hewett-Packard	21 MX	RTE-11
9	Hewett-Packard	21 MX	RTE-11

<u>Question</u>	<u>Manufacturer</u>	<u>Make and Model</u>	<u>Operating System</u>
9	IBM	370-158	
8	UNIVAC	1108	EXEC 8
9	UNIVAC	1108	EXEC 8
8	IBM	360/75	OS (modified)
9	IBM	360/75	OS (modified)
8	UNIVAC	1108	EXEC 8
9	UNIVAC	1108	EXEC 8
8	IBM	370/168	SYS-IMS
9	IBM	370/168	SYS-IMS
8	CDC	6500	SCOPE 3.4
9	CDC	6400	SCOPE 3.4
12	CDC	6500/6400	SCOPE 3.4
8	CDC	CYBER 73	SCOPE
9	CDC	CYBER 73	SCOPE
8	CDC	3800	SYSTEM II B
9	CDC	3800	SYSTEM II B
8	IBM	360/65	OS/MVT with HASP
9	IBM	360/65	OS/MVT with HASP
8	DEC	PDP-11/45	RSX-110 VER 6A
9	Honeywell	6000	GCOS
8	UNIVAC	90/60	IMS-90
9	IBM	370-148	DOS/VS



QUESTIONS 28 and 29 In Question 28, it was asked - Was it necessary to rewrite the specifications before proceeding with design? And, if the answer was "yes", to specify the percent rewritten. Question 29 asked - If it was necessary to rewrite the specifications, what was the reason?

ANSWERS

The answer to Question 28 is placed in parenthesis before the answer to Question 29. The number is the percent of requirement specifications rewritten.

(20%) Clarification and resolve conflicts between specifications.

(Yes, it was necessary, but never done, design documents were changed.)  
Change of scope, inconsistency.

(Specifications were written along with design.)

(20%) Added scope.

(30%) Discussions with customer during their review of, or after, their approval of requirement specifications, resulted in major requirement changes, e.g., positive attendance reporting by optical sensing changed to excess reporting by batch.

(60%) Changes in hardware design and errors in specifications (80/20).

(60%) Clarifications and refinement of requirements.

(80%) Original requirements ambiguous and incomplete.

(50%) Changes in scope.

(Was reworked during design) Changes in the objectives and sequence to be employed in the system demonstration.

(95%) Normal and expected interaction of total system design.

(50%) Customers and internal project dialogue.

(20%) significant change traffic continued after design base-line frozen, all the way into qualification test. Resulting in about 20% change from original base-line design.)

(100%) Specifications absolutely unuseable - ambiguous, not testable.

(50%) Continuous Government redirection and program rescoping.

(50%) Customer requirements changed or expanded.

(15%) Refinement of performance of objectives.

(20%) Changing requirements and inconsistent specifications.

(50%) Lack of details; omitted many essential characteristics, especially interfaces.

(80%) To insure that the functional requirements were understood to permit further design.

(15%) Changing requirements.

- (10%) Increased system knowledge.
- (Small number of changes, but customer had some add-systems.)
- (25%) Customer direction, mistakes, too much use of preliminary requirements.
- (20%) System not fully understood.
- (30%) Maturity of the requirements (block update).
- (30%) To make the job [more] easily done or to overcome some difficulties which were identified later.
- (90%) Incorporate specifics in place of functional requirements.
- (25%) Changes directed by customer.
- (50%) [changed from] Manual to computerized procedure of testing.
- (100%) Additional technical insight.
- (20%) Consistency and change in tactics.
- (40%) System would not work.
- (40%) Changes in scope, errors, lack of customer expertise.
- (20%) Clarification and improvement.
- (75%) Lack of sufficient detail.

(20%, 2 phase operation - existing operating system installed in first phase - no change - new operating system with new bells and whistles required, requiring approximately 20% rewrite due to learning curve response.) Customer became familiar with capability and customized to fit his particular need.

(100%) Only very broad requirements were furnished by user.

(100%, New specifications were written after the first design failed!) Total system was inoperative due to system (both hardware and software) design flaws.

QUESTION 33 If you could affect the method by which requirements are specified, or were able to initiate research into improving the requirement specifications function, what action would you take?

ANSWERS

Define a formal "requirements phase" whose output would be a contractor/customer agreed upon baseline for design work.

I would add dynamic simulation capabilities to a package like CARA-URL/URA or PSL/PSA.

Make sure it is a joint commitment and effort by customer and developers.

The method is relatively unimportant, unless the customer wants to impose a design. Otherwise, any readable statement of the requirements will do, as long as it is clear and complete.

Insure accessibility of key people to review specifications as to accuracy.

Establish incremental requirements development compatible with total project development.

Joint contractor/customer preparation of requirement specifications of all ICDs for agreeing to cost or schedule.

A more complete and relatively unbiased study should be made of various proposed techniques being advocated.

If possible, the system definition should be firmed up early so that the changes at the start of software development are only minor adjustments rather than redirection of the effort.

MIL-STD-483 is dismal in that the Part 1(b5) specifications outline calls for too much detail and actually obscures requirements. For example: An equation is not a requirement but merely a shorthand statement of a relationship. Most people don't know how to write a requirement specification. The usual result is a description of the process.

Intense interface with user community. In this case, the system was procured by one branch for use by another. The second branch was not brought into the picture until the acceptance phase - disaster.

Institute formal requirements methodology, testable and analyzable.

Promote more implementer involvement in specifications writing and more structured specifications.

More vigorous application of structured design.

Expand the team concept (vendor and customer) so that complete understanding may be fostered on both sides.

Coding should not proceed until requirements are complete. Requirements should be more complete and should be written (in part) by end users (mission operations team) in conjunction with customer/engineer/programmers.

Develop traceability techniques.

Require complete set of specifications before initiating software design and implementation. Use HOL source code as primary design document.

With respect to mission software, requirements should be developed jointly with the customer prior to contract award. This is perhaps the best possible way to go.

Improve communications between systems design groups and software project.

Requirements should be known early enough to allow time for review.

Requirement specifications should be prepared by users/operators/development team. Keep teams small.

Invoke operation oriented description of performance requirements. Keep design detail out of requirement specifications.

More control to establish an earlier baseline.

Requirement specifications should be developed top-down with traceability at all levels.

Elimination of redundancy in documentations by making B-5 specifications first version of C-5 type specifications (Refer to MIL-Standard 490). Use Parnas' Hiding Assumptions list to define basis for choice of modules and for good user communications.

Involve software engineers early in the system definition and allow for more "up-front" simulation.

Insure that the user specifies the functions that the system must perform and that the developer obtains a full understanding of these required functions.

Improve organization of requirements hierarchy to facilitate top-down implementation.

I would revise MIL-STD-483 to limit Part 1 CPCI specifications to performance requirements and associated contractor/GFE interfaces, and include detail algorithm definition - equations (coding requirements) as a part of the Part 2 CPCI specifications.

More detailed system design specifications prior to start of software design.

Earlier system definition, and a software design freeze at some point during the development.

Would remove all intermediate agencies and monitoring functions from between the customer (user) and the analytical functional designer/programmer.

Requirements should be verified as to "testability" prior to release. Also, contractors should be allowed to participate during source selection in the requirement specifications process.

Top-down documentation, with baselines, formal change procedures, and more involvement.

Extend the period of requirements definition; automate the analysis of requirements statements for completeness and consistency.

A detailed requirement specifications should have included a great deal of analysis, trade-offs, simulation (perhaps) before being started. A formal SRR should then take place. CM should be employed for all changes to requirements (on going), thereafter, or in other words: 1. Emphasize completeness/thoroughness of first detailed requirement specifications, 2. Be flexible for constant requirement changes thereafter - which may impact schedule; however, CM/CCB will decide.

Insist on complete identification of requirements and establishment of configuration control over them prior to proceeding to the next phase of development.

QUESTION 51 If you had total control of the planning function within your organization, or were able to initiate research into how to improve the planning function, what actions would you take?

ANSWERS

Increase the planning phase - complete detail design, prior to code initiation. Require full system walk-throughs.

Initiate more detailed level of planning. Improve cost and schedule estimates.

Based upon empirical data, I would initiate research which would result in the development of highly accurate cost estimating methodology for all phases of software development.

Careful planning, correct design, periodic review and testing. Verification and documentation should be necessary actions to be taken.

Increase system designers awareness of software during system design (trade-off).

More concentration on staffing and skill mixes.

Place more emphasis on the requirements of supporting resources (computer utilization, size, speed, etc.). Scope the development facility as to its adequacy to support the application.

Stop customer from freezing the design before detail coding (programming) requirements are complete.

Better staff training - better communications with systems engineering.

Combine all analysts/programming activities under one control group.

I would organize a highly proficient planning team from management and technical personnel to develop project plans.

Place a senior software specialist on staff in top management to assist in decision making.

Start planning earlier.

Assure that system definition and implementation allow adequate design and development time.

Devote more effort to planning. Involve programmers/analysts to a greater degree. Require full documentation of plan. Continue to review plan as development proceeds.

Various activities must be prioritized before detailed action is undertaken.

Emphasize involvement and contribution of the "people doing the work" in the planning function.

Allow more time for planning.

Design tools for building emulators.

Analyze applicability of the University of Michigan System Design Language.

Survey available methods; apply most promising and weed out losers.

Allocate greater percentage of the time to planning.

Set up data base from all ongoing programs which would be available to new programs.

Reduce the number of people and increase the calendar time.

Set means to provide total access and communication with existing in-company experience.

Expand the coverage and contractual significance of the computer program development plan CPDP as defined in AFR 800-14. Insist that a CPDP be outlined during the competitive phase to assure a credible bid (fixed price plus incentive).

Require top level software design and module interface specifications prior to detail software design.

Early system definition and software design freeze.

Capture data from ongoing programs. Transfer knowledge/techniques among projects, i.e., standard planning, measurements, reporting and estimating techniques.

Complete detailed development plans and procedures early in the project.

Demand that validated project management procedures be employed.

More senior management personnel should be involved.

Collect software metrics on productivity and quality.

Increase user involvement in designing and testing phases.

QUESTION 52 If it were in your power to make changes in the way technical decisions are made concerning programming techniques, test procedures, documentation standards, etc., what action would you take?

ANSWERS

More emphasis on modern structured technique and automated tools.

Get dollars, survey available methods, apply most promising and weed out losers.

Study and evaluate variety of modern, automated techniques to be ready for appropriate application.

I would prevent outside "experts" from imposing their pet techniques and controls in areas where they are inappropriate, misguided, and costly.

Use more junior programmers for trivial aspects of the job.

More emphasis on phase design effort and better planning for testing. Development of more test aids such as program flow and structure analyzer and aids to the programmer for fixed point machines as long as we continue to use fixed point for flight equipment.

Review what's in general use and publish recommended methods as a standard. No such document currently exists.

More detailed plans must be made and reviewed before actual coding begins. Short range goals must not be allowed to dominate planning function.

Use standard industry techniques for flight software development.

More automated tools, more formal walk-throughs.

Pass all "technologies" through technical control panel for assessment prior to use on project.

Greater standardization throughout the project. More rigid monitoring and enforcement.

Have more desk checking.

Develop design validation techniques.

Select one able, right person (who has experience in programming techniques, as well as management) to be program manager. Give direction and guidance concerning objectives, procedures, schedules, etc. (other necessary actions). The program manager will take care of the rest.

Increase programmers' awareness of their importance, and the importance of their professional demeanor.

I would improve the entire spectrum of project standards to be enforced.

Structured programming concepts and chief programmer.

More top-down structured design.



Insist on a common language where practical. Include test requirements as an integral part of the requirement specifications.

Simplify the number of different standards in use.

I would give additional impetus to all aspects of testing, giving it equal status with other major phases of software development, allocating perhaps 40% of project budget to this activity. I would insist upon certain standards associated with documentation content, but relax format considerations.

Increased formalization of techniques. Too much "by the seat of the pants" planning, decision making takes place. Much of this is due to "the first time" problem - remaining due to an unstructured environment.

Select a simple set of rules for program organization and structure and concentrate on making programmers follow them.

Assure that past experience and techniques are considered. Document rationale for all decisions.

Set means to provide total access and communication with in-company experience.

Eliminate requirement for detailed flow charts prior to coding.

Use self annotating listings in lieu of flow charts.

More reviews, walk-throughs and configuration management procedures.

Follow more structured software development approaches. We are planning to do this for our FDC delivery.

QUESTION 67 Which of the many forms of project organization do you feel contributes the most to the success of the project?

ANSWERS

Best organization is dictated by the job to do, [and] the talents of specific people available.

Matrix.

Task oriented.

Single clear leadership role.

The lead programmer, single architect approach.

Direct control, multi-function, integrated program/analyst/manager teams.

Matrix, with strong technical leadership.

Each form has appropriate application under different conditions, constraints, and objectives.

Management by personnel who understand both technical and administrative areas.

Program manager and a technical manager.

Project organization.

Line organization.

A changing organization that adapts to the work being performed.

Line organization responsible for all programming functions.

Matrix organization for overall ADP organization - structuring and dedicating project teams to individual projects.

Chief programmer - acts as interface from line organization into the rest of the matrix.

Team organization.

Line organization with three independent sub-groups; requirements/analysis, programming/software system design, and test.

Mixing of disciplines at the lowest level.

Systems - subsystems by functional areas.

Matrix.

One in which the project manager has both programming and technical responsibilities with permanent assignment of personnel.

A project manager with full authority for the project. Use of a chief programmer subordinate to the project manager.

QUESTION 68 If you had it within your power to make one change in the way the project was organized, what action would you take, or if you had resources available to undertake research in any area of project organization which aspect would you explore?

ANSWERS

Better planning.

More planning.

Visibility of project status.

Doesn't really require any research. Matrix or functional will work equally well depending on the size of the project.

Implement the team approach with the programmers, back-up programmers, and librarians as identifiable entities.

The extent to which technical and administrative functions should be separated should be explored.

Permanently assigned staff for duration of project.

More technical staff direction.

Implement a separate test function at project initiation. Create a separate documentation function.

Would explore planning (scheduling) and testing organization.

Provide sufficient calendar time for each group to complete its task without overtime. Particular emphasis must go on requirements and specifications.

Metrics; so we talk less and know more.

I would spend the necessary amount of time thoroughly researching available empirical data to arrive at the most accurate possible methodology for estimation of software development cost (all phases).

Software activities report to higher level within project.

Use chief programmer teams.

Would place hardware and software totally subservient to system.

Include a separate software interface team (a group responsible for the top level software design).

Would employ separate software test team that is not under control of the software manager.

Program status/productivity measurement aids; automated configuration management aids.

Assign a thoroughly experienced project leader at the very beginning. Validation of proposed project management methods.

No changes in organization. There were some things the organization should have done differently.

Assign stronger technical personnel to lead task manager positions.  
I wouldn't have had a personnel cut just prior to the effort.

QUESTION 69f The project manager was appointed, or selected for this project by:

ANSWERS Grouped by relationship to project manager.

a. Senior ADP Manager

Senior ADP manager through experience  
 Assistant manager, engineering operations  
 Manager, software development laboratory  
 Senior ADP manager  
 Project reviewing authority  
 The project review authority as delegate of division general manager  
 Division general manager (V.P.)  
 ADP manager  
 Line manager  
 Manager two tiers up  
 Support organization manager with the approval and concurrence of the program manager  
 Line manager for software  
 Senior line ADP manager  
 Assistant director business systems development  
 Director of operations  
 Functional section chief  
 Department manager/Division manager  
 Department chief

b. Senior Non-ADP Manager

Director of development  
 Director of engineering  
 Avionics chief engineer  
 Director  
 Line organization  
 Department management  
 Department head  
 The avionics manager  
 Systems project engineer  
 Project engineer  
 Section chief

- c. Program Manager (as opposed to project manager)  
 Program manager  
 The program manager of the total project
- d. Senior Corporation Officer  
 Vice President  
 President  
 Senior management  
 Program Vice President  
 Upper management selection  
 Company general manager  
 The division vice president for Federal Systems  
 He was appointed by top level management  
 Assistant vice president  
 The line executive
- e. Customer  
 Customer  
 SPO chief
- f. Other  
 Ex officio  
 Agreement between line and staff management

QUESTIONS 83 and 84 Question 83 asks what percent of the programmer/analyst staff were originally computer operators who moved directly from machine operations to programming. Question 84 asks if the former operators make successful programmers.

ANSWERS The answer to Question 83 - the % of operators who became programmers - is in parentheses before the answer to Question 84.

(0%) Very, if they get the BA or BS required for the promotion.

(5%) The transition from operators to programmers was very successful, especially in the area of JCL procedures.

(0%) In scientific programming area there has been less chance for machine operators to become programmers. I haven't seen any.

(10%) Yes, the Best!!

(10%) Yes, and their familiarity with OPS problems and procedures was useful.

(0%) We have used this technique in other areas of the matrix organization - usually they work best in an operation-system maintenance function - i.e., recurring versus design.

(1%) One did.

(15%) Average in quality.

(0%) Avionics work emphasizes engineering skills, not programming skills.

(UNK) I remember one who turned out to be very good.

(4%) Yes, good/average.

(5%) Yes, but limited in scope.

(55%) 2 proficient  
1 mediocre  
2 incapable

(2%) Yes, their long experience as operators on these systems and their knowledge of policies help them.

(5%) Yes.

QUESTION 90 If it were within your power to make any changes, or initiate any research in the area of staffing, what would you consider the most fruitful area for modification or study?

ANSWERS

How to maintain/improve communications.

Experiment with more specialized staffing; i.e., with a number of more functional roles rather than a group of programmers/analysts.

Investigate what personnel backgrounds lead, or tend to lead, to high performance ADP personnel.

Use different categories of programmers with different levels of expertise for appropriate aspects of the project.

Have a sufficient number of "open ended" research and sustaining programs to serve as buffers for personnel so as to provide more flexibility in staffing.

Staff should not build up too fast. Pure, high-level people for initial design might be best.

Majority of the problems encountered involved outside pressures - such as removing personnel for short periods to handle brush fires - matrix organization has solved that problem. Matrix organization has also improved overall training program which now takes place in a functional area - eliminating much pressure from the individual projects.

Study the number of librarians required for a job of a particular size.

Need better method of evaluating background/experience vs project requirements.

Training in design techniques.

Add programmer aid or support librarian to the team.

More formal training in the engineering applications.

Training in new technologies.

Identify the quality and training requirement of persons to be hired early in project start-up.

I would like my team members to get well trained if anyone is in need of it.

Staffing for an evolving project, i.e., soft schedule.

Personnel screening techniques to minimize the on-the-job-training.

Replacing personnel.

Software staffing must include a cross section of personnel types. Hardware/Software background vs software only, experience vs youthful ideas, etc. - Study to determine the factors which most affect the proper mix for a given project.



The balance of young to old and experience to inexperience.

Participate in personnel selection.

When you are in trouble a programmer is not a programmer if he doesn't know anything about the hardware and/or software to be developed.

Back to the drawing board.

Measurement of productivity and correlation with selection factors.

QUESTION 93 Which manual reporting procedures were used in project monitoring and management? At what level did they originate, and how high did they go? How often were they aggregated, condensed, or edited as they moved up the chain?

ANSWERS

<u>Report Title</u>	<u>Lowest Originator</u>	<u>Highest Recipient</u>	<u>No. of Aggs/Edits</u>
Wkly Activity	Worker	Proj mgr	2
Proj status	Sect mgr	Proj mgr	1
Significant chg	Proj mgr	Proj mgr	-
Wkly Activity	Programmer	Proj mgr	3
Wkly Activity	Sect head	Proj mgr	1
Proj status	Proj mgr	President	2
Wkly Activity	Proj leader	DP Admin Chief	-
Proj status	Proj leader	DP Admin Chief	-
Wkly Activity	Anal/Prog	Gen mgr	2
Proj status	Mgr	Gen mgr	1
Wkly Activity	Programmer	Gen mgr	3
Proj status	Ld Prog/Anal	Gen mgr	3
Significant chg	Programmer	Proj mgr	3
Wkly Activity	Programmer	Division VP	1
Proj status	Sr Anal	Division Pres	3
Wkly Activity	Programmer	Proj mgr	1
Proj status	Proj mgr	Sr mgmt	1
Significant chg	Tech leader	Sr mgmt	1
Wkly Activity	Prog/Anal	Proj mgr	2
Proj status	Prog/Anal	Proj mgr	2
Significant chg	Tech leader	Proj mgr	2
Wkly Activity	Programmer	Proj mgr	0
Proj status	Proj mgr	Division mgr	2
Wkly Activity	Programmer	Proj engr	0
Proj status	Proj engr	Cust/Div mgr	2
Cost vs Performance Rpt	Fin Anal	Proj engr	0
Wkly Activity	Programmer	Software engr	0
Proj status	Software engr	Computer sys mgr	0
Wkly Activity	Branch Chief	Director	
Proj status	Branch Chief	Director	
Significant chg	Branch Chief	Director	
Wkly Activity	Gp leader	VP	4
Proj status	Proj engr	VP	3
Significant chg	Proj engr	VP	2

<u>Report Title</u>	<u>Lowest Originator</u>	<u>Highest Recipient</u>	<u>No. of Aggs/Edits</u>
Wkly Activity	Subsys mgr	VP	1-2
Proj status	Subsys mgr	Customer	2
Significant chg	As required		
Wkly Activity	Lead engr	Proj mgr	4
Proj status	Proj mgr SW	Proj mgr	2
Significant chg	Proj mgr SW	Proj mgr	2
Wkly Activity	WPM	Proj mgr	1
Proj status	WPM	Customer	2
Wkly Activity	Prog/Anal	Proj mgr	
Proj status	Prog/Anal	Proj mgr	
Significant chg	Prog/Anal	Proj mgr	
Wkly Activity	Programmer	Proj Officer	
Proj status	Programmer	Proj Officer	
Significant chg	Programmer	Proj Officer	
Wkly Activity	Proj mgr	Engr VP	4
Monthly status	Proj mgr	Division Pres	5
Proj status	Sect head	Proj leader	Wkly/Mo reported
Monthly CSCS/R	Funct engr	Proj mgr	
Wkly Activity	Team chief	Programmer	1
Proj status	Team chief	VP	2
Significant chg	Team chief	VP	2
Wkly Activity	Programmer	Proj mgr	0
Proj status	Chief Prog	Proj mgr	0-1
Wkly Activity	Staff	Program mgt	0
Proj status	Program mgt	Customer	0
Significant chg	Staff	Proj mgr	0
Proj status	Programmer	Program mgr	
Significant chg	Programmer	Program mgr	
Wkly Activity	Supvr (gp engr)	Proj mgr	2
Proj status	Prog Cont org	VP	1
Significant chg	Mgr	Proj mgr	2
Wkly Activity	Designer	Customer	
Proj status	Designer	Customer	
Significant chg	Designer	Sys prog mgr/cust	
Wkly Activity	Programmer	Dept head	
Proj status	Prog cont officer	Site director	
Significant chg	Funct dept head	Program mgt	
Wkly Activity	Gp leader	Program mgr	3
(wkly prog rpt)			
Proj status	Programmer	Gp leader	1

<u>Report Title</u>	<u>Lowest Originator</u>	<u>Highest Recipient</u>	<u>No. of Aggs/Edits</u>
Wkly Activity	Gp leader	Prog director	5
Proj status	Gp leader	Customer	6
(monthly rpt)			
Wkly Activity	Branch prog	Dept head	1
Proj status	Proj mgr	Dept head	0
Significant chg	Proj mgr	Dept head	0
Wkly Activity	Prog/Anal	Top mgr	3
Proj status	Prog/Anal	Top mgr	3
Wkly Activity	Individual	President	6
Proj status	Team leader	President	5
Wkly Activity	Chief prog	Proj mgr	1/wkly
Proj status	Proj mgr	President	
Wkly Activity	Gp head	Proj mgr	0
Proj status	Proj mgr	AVP	1
Significant chg	Proj mgr	AVP	1
Wkly Activity	Gp head	Program mgr	2
Proj status	Gp head	Program mgr	2
Significant chg	Individual	Sect head	1
Wkly Activity	Sect head	Program mgr	1
Proj status	Sect head	Program mgr	1
Significant chg	Sect head	Program mgr	1
Proj status	Cog engr/cog prog	Sect chief	
Significant chg	Cog engr/cog prog	Sect chief	
Proj status	Cog engr	Proj mgr	1
Wkly Activity	Gp leader	VP	1
Proj status	Proj mgr	VP	1
Significant chg	Proj mgr	VP	1
Wkly Activity	Team as input by individuals	Program mgr	1
Proj status	Team	DOD/ADP VP	3
Significant chg	Team	DOD/ADP VP	3
(schedule variance)			
Wkly/Mo Activity	Programmer	Proj mgr	0
Proj status	Prog mgr	Division mgmt	
Wkly Activity	Indiv contrib	Proj mgr	2
Proj status	Work unit ldr	Proj mgr	1
Significant chg	Work unit ldr	Proj mgr	1
Proj status	Proj mgr	Directorate	1
Wkly Activity	Branch	Director	
Proj status	Division	President	
Significant chg	Division	President	

<u>Report Title</u>	<u>Lowest Originator</u>	<u>Highest Recipient</u>	<u>No. of Aggs/Edits</u>
Wkly Activity	Task mgr	Dept mgr	1
Proj status	Task mgr	Division mgr	1
Significant chg	Task mgr	Division mgr	1

QUESTION 94 Which automated reporting systems were used in project monitoring and management?

ANSWERS

<u>System</u>	<u>Lowest Originator</u>	<u>Highest Recipient</u>
Manhour/Activity	Worker (time card)	Proj mgr
Manhour/Activity	Programmer	Proj mgr
Manhour/Activity	Lead programmer	Proj mgr
Manhour/Customer	Programmer	Next level above proj mgr
Manhour/Activity	Programmer	Proj mgr
Manhour/Activity	Prog analyst	Proj mgr
Manday/Task	Prog analyst	Proj mgr
Manhour/Activity	Accounting	Proj mgr
Manday/Task	Accounting	Proj mgr
Manhour/Activity	Fin analyst	Proj engr
Manday/Task	Fin analyst	Proj engr
Manhour/Activity	Software engr	Computer subsys mgr
Manhour/Activity	Engineer	Program mgr
Manday/Task	Engineer	Branch chief
Manhour by major activity		
Manday/Task	Individual	Cumulative to VP
Manhours/WBS Task	Computer report	Proj mgr
Manhours/Task	Prog/analyst	Proj mgr
Manhour/Activity	Functional engr	Proj mgr
Manhour/Activity	Individual	Prog cont org
Manhour/Activity	Programmer	Proj mgr
Manday/Task	Prog control officer	Prog mgr
Manhour by job charge (this is related to broad tasks such as programming, subsystem equipment design, etc.)	Programmer	Prog mgr
Manday/Task	Group leader	Proj engr
Manhour/Job charge	Programmer	Programmer
Manhour/Job charge	Programmer	Programmer
Manhour/Job charge	Programmer	Prog mgr

<u>System</u>	<u>Lowest Originator</u>	<u>Highest Recipient</u>
Manhour/Activity	Sr programmer	Dept head
Manday/Task		Prog mgr
Manhour/Activity	Time card, WBS	Proj mgr
Manday/Task	Team members	ADP VP
Cost data	Time cards by individual	Division mgr
Manhour/Activity	Individual	Staff
Person-Hour by Function	Integration	Proj mgr

QUESTION 96 List productivity indexes such as lines of code, program errors, sources of errors, turn arounds required per completed task, etc., that were employed in monitoring performance.

ANSWERS

Documented pages, threads, computer time used, problem reports/corrections, lines of code.

Lines of code - tracked; not absolute measures.

8 lines of code per day.

Productivity monitored at module level, since lines of code per module were constrained by standards. Complexity factors weighed in. Performance then evaluated on turn-around, correctness, efficiency.

Lines of code, number of compilable units.

Lines of source code, number of modules.

Lines of completed code/per manhour.

Lines of code, error reports, machine time utilization.

Program errors.

Lines of code, program errors, sources of errors, turn-arounds required per completed task.

Modules completed, lines of code.

We indeed use such indexes. We are currently establishing a data base of such indexes.

Lines of checked out and documented machine executable code per hour.

Lines of code.

Rate charting for module productivity.

Program errors and lines of code.

Dollars/lines of operational, documented software.

Unfortunately - none.

Did not use productivity indexes.

Lines of code.



QUESTION 105h What was the title, position, and affiliation of the chairperson of the formal reviews?

ANSWERS Grouped by relationship to project

- a. Project Manager
  - Manager ADP
  - Project manager
  - Computer subsystem manager
  - Data processing manager
  - Software manager
  - Group leader or project leader
  - Project manager or person appointed by him
  - SE/TD project manager
- b. Senior ADP Manager
  - Director
  - Director computer programming
  - Software program design manager
  - Department head
  - Director to chief
  - Department manager for software
  - Software division manager; reported to the program manager.
- c. Senior Non-ADP Manager
  - Director
  - System engineer for the system of which a given software product was part.
- d. Customer
  - Project engineer (customer)
  - Customer project manager
- e. Technical Director
  - Technical director
  - Technical leader
  - Systems engineer
  - Systems engineer, contractor Assistant Project Manager
  - Lead software engineer

f. Corporate Staff

Vice President and general manager

Management analyst, Integration/control office of mission group.

g. Varied

Varied - reviews generally chaired by prime contractor

Varied

Depends upon the level of the review

Varied from vendor representative to Director of Related Systems functions

h. Review Board

Design review board chairman, systems engineer

Review chairman

Director, Quality Assurance - Reporting to company president

QUESTION 109 Give title, position and affiliation of chairperson of Configuration Board.

ANSWERS Grouped by relationship to project

- a. Project Manager  
 Program manager  
 Project manager  
 Project leader  
 Project manager assigned a senior person  
 Project manager of project
- b. Software Project Manager  
 Computer subsystem manager  
 Software controller  
 System engineer for the system to which a given software product was a part
- c. System/Functional Project Manager  
 Manager, Systems Engineering (contractor)  
 Deputy for Operations, program office  
 Manager, avionics officer  
 System project engineer  
 Director of Engineering  
 Systems engineer for the system of which a given software product was a part  
 Systems Engineering manager
- d. Senior Technician  
 Chief engineer
- e. Corporation Staff  
 Mr. John Doe
- f. Configuration Management/Product Assurance  
 Software product assurance manager  
 Configuration management manager  
 Configuration control board representative  
 Program charge review board chairman
- g. Customer  
 Project engineer, customer  
 Joint customer-supplier chairmanship

QUESTION 115 If it were within your power to make any changes in the method or procedures followed in controlling this project what would these changes be, or, if you had resources available to undertake research in the area of planning which aspect would you explore?

ANSWERS

A standing review committee would be established for each project with critical points designated for technical reviews.

Don't apply - T-specifications or CSSR to software development project.

Allow time for an orderly approach to design and design reviews.

Establish definite packages of work and affect regular reviews with milestones.

Schedule walk-throughs. Hold additional formal reviews.

Provide more detailed breakdown of task and associated milestones, effort estimates, etc.

Complete top-down design with walk-throughs.

Keep records of time by activity. Document changes more formally.

More formal design reviews for different levels of software/engineering activities.

Formalize coding standards - loosen up on 50 lines of code per program.

Development of automated procedures would be of assistance.

More tools.

More effective ways to estimate impact (cost, schedule) on new change requests.

Formal configuration management, improved software library and link system.

Earlier configuration control, base-lined, software requirements.

More strict adherence to base-line with schedule modification (or at least review) for all changes beyond base-line.

Would minimize involvement of the agencies and departments who have the capability to restrain yet do not have potential to advance development (work) efforts.

Use walk-throughs.

Start CM procedures - for this project it started the second time around (design context) after four project managers had their chance to get it up.

Aids permitting automatic collection of development status data, without requiring frequent input from individual contributors.

Configuration management with change control, baselines, etc.

Institute formalized project control procedures including full range of documentation and management configuration control from concept through implementation and follow on maintenance.

QUESTION 118 The title and position of the project manager's supervisor was:

ANSWERS Grouped according to relationship to project manager

a. A Senior ADP Manager

Chief, Data Automation Branch  
 Chief, Digital Applications  
 Manager, Software Systems Development Department  
 Operations manager, project review authority  
 Operations manager, software systems operation  
 Chief, Scientific Applications Branch  
 Branch head, Programming Techniques Branch  
 Software Engineering Division leader  
 Four group engineers or supervisors in charge of software engineering, applications software systems and display, software and data systems test, and integration  
 Director - site facility  
 Department manager  
 Department head - systems programming  
 Director computer center  
 Director, software development  
 Department manager - third level supervisor  
 Assistant director - Business systems development  
 Director, Operations  
 Computer system officer

b. Senior Non-ADP Manager

Operations director  
 Director of development  
 Director of engineering  
 Assistant manager, Engineering Operations  
 Manager, Systems Analysis Department  
 Avionics chief engineer  
 Manager engineering  
 Considering the software group leader as project manager, his supervisor was Systems Group supervisor  
 Senior director  
 Chief engineer

- b. Senior Non-ADP Manager
  - Manager, Avionics Systems
  - Section manager
  - Program/Component manager
  - Department head
  - Avionics manager
  - Branch head
  - System project engineer
  - Project leader
  - Engineering project leader
  - Project engineer - development manager
  - Director
  - Engineering supervisor
  - Manager development engineering
  - Section chief
  - Section manager
- c. Program Manager (as opposed to project manager)
  - Program manager
  - SPO chief
  - Matrix - Program manager
  - Computer Laboratory Manager
- d. Corporation Officer
  - Program Vice President
  - Vice President
  - Vice President Federal Systems Divisions

QUESTION 120 This question reports the title and position of people reporting directly to the project manager. However, very few surveyees completed the POSITION answer of the Question. It was felt by the authors that this indicated that the title a person had was also his position.

ANSWERS This is the only place the clear text answers to Question 120A and 120B appear. The tabulation sheet "blurs" the different titles used by the project personnel. The answers to Question 120g appears in parenthesis under the last number.

<u>Title</u>	<u>Position</u>	<u>Number</u>
Mgr, Systems Engr	Section mgr	1
Mgr, Programming	Section mgr	2
Mgr, Integration & Test	Section mgr	1
		(4)
Technical Director		1
Section supervisor		1
		(2)
Technical Director		1
Manager		4
		(5)
Analyst		3
Programmer		7
Typist		1
Librarian		1
		(12)
Senior Prog/Analyst		5
Support Supervisor		1
Secretary		1
Programmers		12
		(20)
Systems engineers		5
Hardware engineers		22
Software engineers		3
		(30)
Senior project analyst		1
Programmer analyst		3
		(4)



<u>Title</u>	<u>Position</u>	<u>Number</u>
Project analyst (ours)	Chief programmer	3
Project analyst (ours)	Technical coordinator	1
Programmer/analyst (ours)	Team programmer/analyst	1
Analyst (cust)	Team programmer/analyst	4
Programmer (cust)	Team programmer	7
		(20)
Senior project analyst		2
		(17)
Associate engineer		4
Engineer		6
Senior engineer		2
		(12)
Senior engineer		4
Engineer		7
Associate engineer		3
Librarian		1
		(15)
Computer hardware		1
Avionics Interface hardware design		1
Computer SW designer		1
		(3)
Software engineering	Manager	20
Software development	Manager	35
Computer operators	Manager	30
Plans/controls	Manager	10
		(95)
Engineering specialist	Level 25	5
Engineering specialist	Level 27	2
		(8)

<u>Title</u>	<u>Position</u>	<u>Number</u>
SW development		1
SW Programmer/analyst		1
SW Configuration mgn		1
SW engineering		1
Administrator		1
		(5)
Senior analyst		1
Programmer		2
Engineer		2
		(5)
Task leader		2
Engineer		2
Programmer		2
		(6)
Assistant Project manager		8
Secretary		4
		(12)
Mathematician	Analyst/programmer	1
Mathematician	Administrator	1
Mathematician	Tester	1
		(4)
Head SW engr (ours)		1
Head SW engr (Contractor)		2
Programmers		3
Librarian		1
Analyst		1
		(8)
Managers		6
Deputy director		2
Staff assistants		4
		(12)
Technical director		1
Team chief		7
		(8)

<u>Title</u>	<u>Position</u>	<u>Number</u>
Program analyst		10 (10)
Engineers		25 (25)
Group engineer	SW engineering	1
Group engineer	Applications SW	1
Group engineer	Sys analysis & display SW	1
Group engineer	Data sys test & integration	1
Secretary	Secretary	1 (6)
Software requirements	Supervisor	6
Flight/Mission SW design	Supervisor	11
Automatic test equip SW design	Supervisor	10
Software product assurance	Supervisor	8 (35)
Manager - system		1
Manager - application		1
Manager - verification		1
Manager - program control		1 (350)
Data analysts		10 (10)
Programmer analysts		10 (10)
Junior programmer		1
Programmer		1
Asst Engineer/Programmer		1
Assoc Engineer/Programmer		1
Engineer/Programmer		2 (6)
Functional team leader		3
Programmers		7-9 (10-12)

<u>Title</u>	<u>Position</u>	<u>Number</u>
Analyst		6
Programmer		2
Lab integrator		4
Aircraft operations		3
		(20)
Design head		1
Programming head		1
Test team head		1
Chief analyst		1
		(4)
Project SW manager	Line supervisor	15
Test engineer	Line supervisor	15
System engineering	Line supervisor	10
		(50)
Senior engineer		4
Specialist		1
		(15)
Member Tech Staff		3
		(4)
Section heads		3
Group heads		8
Technical staff		3
Programmer/librarians		41
		(55)
Secretary		0
Programmers	Member tech staff	3 teams of 2, 3, 4 people each
Test/integrators	Member tech staff	3
Project manager	Member tech staff	1
		(15)

<u>Title</u>	<u>Position</u>	<u>Number</u>
Programmer/analysts		20
		(20)
Group leader		3
		(12)
Supervisor	Applications supervisor	1
Hardware analyst	HW evaluation & install	2
Data base analyst	Install data base design	2
		(35)
Gp leader - applications		1
Gp leader - systems programmer		1
Gp leader - HW engineer		1
Gp leader - Standard systems		1
		(approx 32)
Programmer		
Analysts		
Computer specialists		(100+)
Deputy Project manager		1
Task managers		6
Project secretary		1
		(8)
Deputy project manager		
SW Division manager		
Systems Engineer manager		
Operations manager		
		(50)
Computer specialist	GS-12	4
Computer specialist	GS-11	5
		(16)

<u>Title</u>	<u>Position</u>	<u>Number</u>
Senior programmer		1
Advisor programmer		1
Staff programmer		6
Senior associate programmer		4
Advisor analyst		2
Staff analyst		9
		(29)

QUESTION 127 If you had it within your power to implement changes in the way this project was directed, or had the resources to devote to research in this area, what action would you take?

ANSWERS

Greater delegation of authority, responsibility. Clearer assignment of responsibility.

Obtain a better match between the experience of the personnel and the requirements of the project.

Perform basic research in software lifecycle cost.

Less centralized control by the project manager.

Increase control/interaction with functional group developing the company proprietary software.

Delegate more to technical subordinates.

More resources devoted solely to highest level project management.

Would add more formality to the line organization.

Assume a knowledgeable and competent project manager was assigned during the entire project life.

QUESTION 133 What, if anything, could the project manager have done to improve his ability to meet the schedule?

ANSWERS

Insisted on a formalized system of changes.

Firmly establish methodology/design before implementation.

Have authority over all phases of the program, not just software.

Insisted on firm baseline.

Insist on firm baseline after the requirements phase.

Nothing - requirements changes are vehicle orientated not software.

Have a better estimate of the job initially.

Use basic management techniques and employ more \$ and people - early.

Better original estimate. Negotiate schedule change with each requirement change.

Restrict number of modifications and suggestions allowed.

Enforce structured code walk-through earlier.

Bid more manpower, in particular in software documentation to meet milestone - Progressive build up of the software product specification.

An earlier agreement on the definition of system requirements.

Improve support received from other organizations - on time delivery of target computer and hardware test beds.

Should have had formal documentation milestones/software management plan.

Stick with basic requirements except where a change is required to meet basic requirements. Changes to basic requirements should be reviewed for schedule impact instead of being done with much O.T.

Minimize number of changes and design objectives.

Overstaff initially to provide trained cadre for the accelerated schedule to come later.

Delay other projects.

Baseline requirements, improve computer access, enforce better design quality standards, enforce more structured programming standards.

Better monitoring and application of resources.

Better monitoring and testing.

Respond to the early warning signals with more aggressiveness and alacrity.

Improve test approach, better control of project resources, increased involvement of true user community, better control over all elements of the project (i.e., company developed proprietary package).



AD-A117 998

SACRAMENTO AIR LOGISTICS CENTER MCCLELLAN AFB CA SERV--ETC F/G 22/2  
RESULTS OF A SURVEY SOFTWARE DEVELOPMENT PROJECT MANAGEMENT IN --ETC(U)  
DEC 79 R H THAYER, J H LEHMAN  
SM-ALC/MME-TR-79-54-VOL-2

UNCLASSIFIED

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Little requirements or de-scope implementation.

Good software engineering techniques were not used the first time around.

Baseline requirements and ensure that the user is involved and documents the proper test procedures.

QUESTION 137 What, if anything, could the program manager have done to improve his ability to meet the budget?

ANSWERS

Provide more visibility to the impact of changes in order to reduce requests.

Better initial estimate. Firm establishment of methodology design before implementation.

Maintained lower staffing profile until requirements were more firm.

Realism on the part of the customer was an absolute necessity but was not a reality.

Better estimates, better style, better subcontract.

Nothing.

Better initial estimate.

Restrict number of modifications and suggestions allowed.

Freeze baseline.

Bid more realistically.

Bid correct cost in first place. (The program manager at the top can do as ours did. If he does not cut too deep, one element may overrun, but whole project would be on or under cost.) Apply modern software design techniques.

Phase staffing. Plan the staffing to be commensurate with the development activities.

Delete documentation requirements.

Take a harder approach with the customer to make his requirements more firm and more unified.

Allow contingency, indirect rate changes.

Baseline requirements and ensure that the user is involved in and documents the proper test procedures.

Limit requirements or de-scope implementation.

Update projections based on experience rather than wishes.

Closer review of design.

Better accounting procedures, baseline requirements, improve computer access, enforce better design quality standards, enforce more structured programming standards.

Earlier definition and freezing of requirements. More pressure on customers to supply requirements and limit them.

Act more aggressive toward demanding test plan earlier and to a more detailed level.

Improve test approach, better control of project resources, increased involvement of true user community. Better control over all elements of the project (i.e., company developed proprietary package).

Delayed staffing, thereby missing initial milestones which later proved to be misdirected.

QUESTION 148 Was the delivered system useable? If so, how was this determination made?

ANSWERS

Yes - After fleet training, system went into operation and replaced previous system.

It was deemed useable by a complete user evaluation and test at his site.

Yes - Company and customer demonstration during development phase.

Accepted by user as operational.

In operation, supporting system evaluation and fleet exercises since 1974.

Yes - test.

Presently being determined.

System has been used in demonstrations but not delivered to users.

Capable of performing task for which it was designed.

Technical and operational testing in the field.

System not yet delivered.

Not yet completed.

[it] Is in production; [it] is being used by non-computer types on daily basis.

Yes - operational field tests.

Not yet delivered.

Through use.

Real system tests using live data. Data evaluation showed system met requirements.

Ability to check out and fly the vehicle without conscious effort to "deal with" the problem.

Combined DT&E/IOT&E.

Flight test.

The user ran the system.

Demonstrating the use.

Passed the designed tests.

Independent testing by several agencies before delivery followed by monitoring of full use.

Yes, through testing by independent contractor and operational usage.

Yes - review of operational utilization.

No, did not respond fast enough to user demands.

Yes, demonstrated integrated operation in complete weapon delivery system.

It's still in use.

Availability factor to support active flight test programs.

Yes, it satisfies the user (requirements).

Yes, it was subjected to an operational test by the user.

Presently being used.

Yes, continued use by customer.

Flight test.

Satisfying the avionics integration requirements - hardware and software working together.

Through testing and verification.

Not determined.

Turn key system used for factory/depot testing designed for manufacturer, machine interface, etc.

Customer field tests.

Demonstration.

Through operation.

Field exercises in competition with another customer's systems.

Customer was satisfied.

Yes, used for both launches - but painfully!

System was usable, but not up to expectations of users.

The user group used for daily operations. Prior systems were scrapped day I.

Still in final system acceptance testing.

By the users "real" application, immediately after delivery.

Product test with user involvement.

The jury is still out.

QUESTION 159 Give some lessons learned from this project.

ANSWERS

Delegate responsibility and authority: maintain communications.

The interface with an IV and V contractor is much more time-consuming than estimated. Customer interface at a detailed level is costly.

Must have well defined, fall-back position to go to if problems develop. Must hold line on new suggestions and changes introduced.

Make sure development/test tools are ready; automate the process as much as possible.

Establish requirement clearly before designing; establish design clearly before programming. Give more attention to planning and effort/cost estimates. Need greater documentation of decisions, specifications, and design.

Careful building of requirement specifications to facilitate testing pays off, configuration control pays off, integrated engineering/programming team pays off.

Must have firm base line; good documentation of higher levels of effort must precede lower levels of effort.

Sound management (a la hardware projects) works well with software projects.

Streamline requirements before software development.

Good foresight and planning very essential.

Good management goes a long way. Do front end work well, get a good sub-contractor and good sub-contract. Develop good management visibility too.

You assume you know the project managers main goal!! in Question 158. [To deliver on time, within budget, and meeting the requirements of the system, where the final software product is reliable, maintainable, and useable.] If the contract has been properly written (an incentive contract), the project managers objective is to maximize profit! If he does, the customer should be happy because the contract will have steered the project manager and the customer wrote the contract! If there is no requirement that the software be reliable, maintainable and/or useable, the project manager should not have these as a major goal. On time, yes! Within budget, yes! Meeting requirements, yes! But more than that not necessary. Sometimes though, contracts are not written to reflect the true desires of the customer. Therefore, when project manager goes to maximize profits, the customer is not necessarily happy!!!

1. Documentation and flow charting more expensive than thought. 2. The average software designer fails to see the need for documentation or discipline until job is near completion. 3. Documentation, discipline, good configuration management, sound planning, detailed schedule commitments, software design standards, error tracking, top-down design and combined top-down/bottom-up testing pays off.

More strict monitoring and enforcement of standards and roles is needed.

Enhanced programmer professionalism is extremely important. Need better reporting mechanism. Need automated means of monitoring programming and design progress.

1. Require intense interface with user community.
2. Increase the planning phase.
3. Complete detail design prior to code initiation.
4. Require full system walk-throughs.
5. Increase formalization of planning.
6. Do not build test team from original project personnel to transition to a testing function.
7. Dedicate project teams to individual projects.
8. Implement a separate test function at project initiation.
9. Create a separate documentation function.
10. Have documentation performed by other than programmers.
11. Keep personnel on project for duration of project. Do not remove them even to put out brush fires.
12. Improve communication between lower level management and team member level.
13. Require everyone to comply with project controls.
14. Complete test plan.
15. Have better control of project resources.

1. Requirement maturity less than originally stated.
2. Development tool (including facility) inadequately specified.
3. Computer memory insufficient to satisfy the computation load.
4. Staffing plan not consistent with development activities.

1. Highly motivated inexperienced staff can consistently out perform less motivated senior staff.
2. Never believe anything a computer vendor says.

1. Keep software test in the software project team.
2. Use rate charting to monitor, include status - on manual basis.
3. Have good standards and conventions.
4. Develop support software early.
5. Have software project control facility and facility scheduling.
6. Keep close coordination between test and programming groups.

Use standard vendor supply operating system. Use of high level language, more walk-throughs, more formal specifications.

Be sure the system design is feasible and practical before beginning software design.

1. Independent test team essential.
2. Develop sizing/timing budget for modules and monitor and maintain.

Need aids and support librarians.

Proximity of laboratory, computer facility, test bed and people to each other is the key.

A detailed computer program development plan (CPDP) must be completed early (within 30 days after contract award).

Documentation must be developed during the computer program development. This takes manpower and time which was not planned and allocated.

Require that software is tested by a separate group.



Peer reviews should be used.

1. Politics plays a more significant role than pure technical consideration. 2. Even the presence of a few super stars on the team does not guarantee success.

Pick team carefully, insist on full range of documentation, employ configuration control, use walk-throughs, estimate high - expect the worst, develop accurate/reliable reporting techniques. Control the project.

Need to spell out specifications system, requirements with CM procedures, change control, baselines; more user involvement, product test plan by user.

Detail requirements definition; code walk-throughs; early test planning; extensive engineering documentation: very, very important.

Do not let customer dictate schedule, design and configuration without contractor concurrence and agreement.

Need to spell out specification requirements with configuration management procedures, change control, baseline, more user involvement, product test plan by user. Scheduling around holiday causes delay. "Programmer is a programmer is a programmer" isn't true. Extensive time away from home costly and hard on personnel with compensatory time higher than needed.

QUESTION 164 (Formerly Question 25 of PART THREE of original survey form) Please furnish any additional comments or statements concerning this survey or the science of software engineering project management.

ANSWERS

Hope you get many completions, hope you can digest this, good list of though items. Suggest followup interviews with selected submitters to get "personality" of company/project.

There appears to be an over emphasis upon quantifications of subjective functions. It is more important to define visibility methods and automated procedures to keep programmer ingenuity out of straight-forward program design.

Software engineering management differs very little from the R&D or prototype development of hardware. Unfortunately there is a tendency to compare software development, which has no real production (repetitive) phase with the production phase of hardware development. Software development is a design and test effort.

Many of the questions asked, especially in Part 3, are philosophic in nature. Software engineering is still at issue as a discipline. I believe that many approaches to managing software are valid, and that many problems result from [failures in]: 1) the application of uniform standards, and, more important, 2) the commitment to enforcing such standards. If this results in additional initial costs during the development of projects the savings will off-set that cost, many fold over the life of the system.

Software development is a very tough management problem. It isn't clear whether formal techniques are a significant aid, and, if so, whether they justify their overhead. Honest, published case studies addressing those questions are needed. Time and effort estimates, especially, are a problem. Software projects are chronically subject to cost overruns and schedule overruns, or alternatively, failure to fully meet objectives. How can this situation be overcome? I found it difficult to relate much of the survey to the particular project I was addressing. Primarily, this was because the survey presupposed orderly progress from a clear starting point to delivery. The project didn't (and probably couldn't have) gone that way.

Seems to be a universal difference between the way things are and the way they ought to be. Primary case in point is the extensive modifications necessary in most specifications subsequent to their initial development. This has a ripple effect on software development downstream. Until such time as the perfect specifications writer is born, some small part of the "science of software engineering" will remain an art, and hence, undefined and unmeasurable. We should probably accept that, and realize that all decisions cannot be made on the basis of 100 percent accurate information. The survey itself was exhaustive and exhausting. It will be interesting to see if general conclusions can be drawn from these questions, particularly from projects which do not necessarily "fit the mold". Good luck.

This data should be collected by interview instead of a standard form due to the varying organizations and projects.

The answers to this questionnaire are based on a by-gone project, and do not necessarily represent the way [we are] now managing and developing software.

I wonder how many souls had the patience to go through this questionnaire. Good luck!

The following are extracts from correspondence received by the authors from the Surveyees.

Correspondence Extract 1

We had a bit of a problem in trying to construct answers which would be meaningful and reflect the true state of affairs at our Division.

We are a Division of a Parent Company. Consequently, we can be viewed as a corporate entity, as a division, or as part of the total corporate entity. I chose to regard ourselves as the total entity for purposes of answering this questionnaire. The only exception to this is the answer to one question in which we have a corporate systems group which are used in evaluating any purchased software. This is a response to Question 32, Part I.

Another difficulty which I encountered was interpretation of whether the questions should be addressed only to what we call our data processing group who are responsible for the general divisional computer use. It is this group which generally writes the business programs, e.g., payroll, inventory, bill of materials. In addition our product involves the computer in essentially every case. Consequently, we have a large body of people who program computers for the product which we sell. In order to accommodate these two diverse activities I have had one questionnaire filled out by data processing to reflect activities for which they are responsible and the other filled out by different people dealing with the actual product. Typically we may refer to what they are doing as applications programming.

A further complication arises in that we have a group of software specialists who write special software in support of the applications programmers. These people write edits, debug routines, maintenance and test routines, library routines and the like. Their work gets very similar to the kinds of programs that we would generally be buying for the data processing group from outside sources.

As you can see we are somewhat complex and interpreting our data may be difficult for that reason.

Correspondence Extract 2

Just a note - thank you for the opportunity to respond. Some comments follow:

The questionnaire was very difficult to answer in some areas - interpreting/applying the question to our project was often frustrating.

The emphasis was on ADP - but I believe, for real-time systems - that the true significance has been missed. The thought is this: the engineering has now moved into the computer, rather than being realized as discrete logic, etc. Your "analysts" may be skilled, but it can't be done without the software-knowledgeable, system-knowledgeable engineer.

My encouragement to you on this survey and the consolidation of responses.

Correspondence Extract 3

As I told you in my phone call I am seriously concerned that the answers to this questionnaire may be misleading. The questionnaire seems to me to embody a number of assumptions about organization, personnel, staffing, work flow, responsibility, which are applicable to a traditional data processing center, but which are less appropriate - or even wrong - in the effective engineering uses of embedded computers. At least we do not do things these ways [. . . .]. I am concerned because the thrust of new DoD directives and policies is in the direction of concepts that frankly I consider obsolescent and inappropriate.

Correspondence Extract 4

Enclosed please find the completed survey forms. We apologize for our delay in responding, but the forms arrived while the primary respondents were on vacation.

. . . two programs [were] reported on.

[The first] project was characterized by the judicious introduction of advanced software techniques and very strong project management and reviewing practices. (As an example of the latter, the software was treated as hardware under the same configuration control system.)

In summary, the computer systems were delivered on schedule and slightly under budget. After two years of continuous use very few software errors have been detected.

The [second] project was one where almost no advanced software or management techniques were used, and yet the program culminated with a successful . . . test . . . within budget and on schedule.

In conclusion, we hope these responses reach you in time to be of use and we look forward to meeting with you and seeing the results of the overall survey at the AIAA Conference.

Correspondence Extract 5

In response to the referenced letter, we have enclosed three different completed copies of your software development questionnaire marked (A), (B) and (C). Each of the questionnaires was completed by different group supervisors in our Programming Development Section.

. . . Their responses are candid, their own and no higher level organizational image polishing has been applied.

Your questionnaire aroused much interest . . . and numerous copies of the questionnaire were distributed for evaluation, comment and discussion. Needless to say this Section has an excellent record, but they are continually seeking improved techniques for increasing the overall productivity of their software development teams. The persons completing the questionnaire believed that the exercise was fairly time-consuming, sort of soul-searching, but very worthwhile.

Correspondence Extract 6

I greatly regret the delay in providing the enclosed data which was promised to you for a much earlier date. In part, interestingly enough, this delay relates to the subject of the survey in that we have been examining our organization's approach to software development and are in the process of revamping both the organizational structure and the methods and procedures used in connection with the development of embedded software. We expect by this means to improve both the quality of our product and our efficiency in producing the high quality software our customer's require. Again, please accept my sincere apology for the extended delay. Thank you.

Correspondence Extract 7

I have struggled through the questionnaire and filled it out as best as possible. It seems to be aimed at the big project with lots of people, lots of management, documentation, configuration control, etc. These are all things which, in my judgement, guarantee failure and overruns (usually both). I have become convinced that the only way to manage complex software projects is with a small group (not more than ten) of competent people. If the project is large, it must be developed incrementally.

Telephone Call Extract 8

Mr. "Smith" called concerning the survey. He thought that the survey was super, well-liked by all of them at his organization, and he asked permission to use it as internal survey to determine how their developments were going. Apparently Mr. "Smith" and his Corporation need some means of keeping software project history. They view our survey as a means of doing this.

Correspondence Extract 9

Here it is at long last - warts and all. Good luck.

DATE  
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- 8