

digital INTEROFFICE MEMORANDUM

TO: List

DATE: April 4, 1973

FROM: David Stone

DEPT: Software Engineering 12-2

EXT : 3741

SUBJ: Software Engineering Budget Plan - FY73-FY75

The attached information is the basis for a consolidated Software Engineering spending plan for the next two fiscal years. While data has been collected about all parts of Software Engineering expenses, particular emphasis has been placed on PDP-11 software development plans. A new mechanism for funding the majority of PDP-11 software is proposed - the creation of a pool of shared PDP-11 software development dollars against which proposals can be made for projects intended to benefit more than one market area. The PDP-11 data is presented using my judgement as to which projects will be shared. In general, operating systems, languages, and support expenses fall into this category. This plan is a recommendation and a first draft; relevant inputs have been collected where possible, but in the interests of timely distribution some guesses were made. Careful review and suggestions are solicited.

TABLE OF CONTENTS

	<u>PAGE</u>
A SHARED PDP-11 PROGRAMMING PROPOSAL	2
GRAPH OF ANNUAL SOFTWARE ENGINEERING EXPENSE BY MARKET AREA FISCAL YEAR 1972 - FISCAL YEAR 1975	4
SOFTWARE ENGINEERING BUDGET PROJECTION	5
QUARTERLY SPENDING RATE ANALYSIS	6
SUMMARY OF SHARED PDP-11 SOFTWARE DEVELOPMENT FISCAL YEAR 1974	7
CHART OF SUPPORT PROJECTS VERSUS GOALS	11
APPENDIX SHOWING MARKET AREA BUDGET SUMMARIES AND PER-PROJECT BUDGET SUMMARIES FOR SHARED PDP-11 PROJECTS	A1

A SHARED PDP-11 PROGRAMMING PROPOSAL

The Problems

Although steps have been taken to unify PDP-11 planning, they have not yet resulted in a coherent corporate strategy to create the most profitable products in an effective way. Support costs are increasing geometrically, products are proliferating, uniform corporate policies are lacking and our customers are unable to move their work from one product to another with ease (and in many cases can't transfer data between multiple systems in any reasonable way). The current product line funding structure for software exacerbates these problems by encouraging unnecessary product differentiation and making shared development hazardous.

New Directions

There have been three major shifts in DEC philosophy over the past year which bear directly on this proposal.

- The emergence of software as a product.
- The sharing of software products across product lines and vice-presidential areas.
- The increasing centralization of corporate engineering resources.

Each of these new directions exerts pressures on the way in which we perform the development process and has contributed to the problems cited. A modification to that development process is proposed.

Goals

1. Create a unified corporate software product plan, especially in the PDP-11 area; ensure good corporate visibility of overall plans.
2. Produce fewer, higher quality, more profitable software products and services through an improved development process and reduced support costs.
3. Perform software product development for basic systems products which ensures:
 - . covering and penetrating selected market areas
 - . building less components but combining them into the same or a greater number of products
 - . allowing facile inter-system communication
 - . creating a simple way for customers to upgrade from one product to another

4. Ensure consistency between corporate hardware and software development plans.
5. Incorporate proven, cost-effective technology into the software product development process.
6. Save money where possible without compromising product quality.

The Mechanism

To accomplish the above goals, I believe that two types of corporate action are necessary:

1. Create a shared PDP-11 software development budget pool related in some clear way to the relevant product line statements,

and
2. Create a mechanism for proposing, reviewing, and approving Software Engineering development projects to be funded from the shared pool.

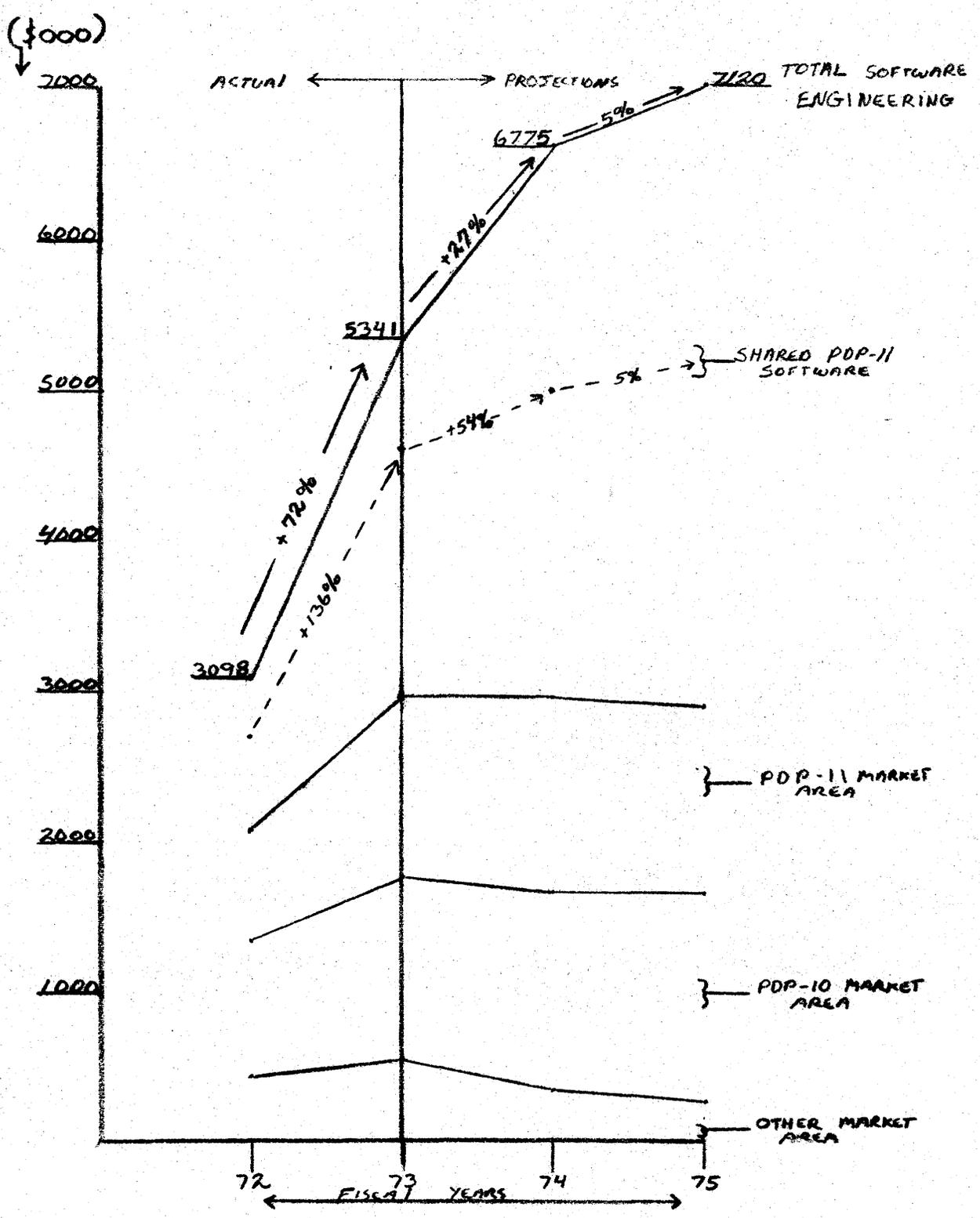
In addition, I believe that certain specific "general support" projects should be approved - projects which would be very difficult to justify to an individual product line, but which are clearly profitable to the corporation as a whole.

Financial Summary

To provide a reasonable basis for understanding the financial impact of this proposal, comparable data for fiscal years 1972 through 1975 are presented in the following graph. Detailed data for fiscal years 1973 through 1975 are attached as a separate appendix; the data are summarized at a number of levels to provide easier access to the information they contain. In essence, a total Software Engineering budget increase from \$5,341,000 (FY73) to \$6,775,000 (FY74) or 27% is proposed. The budget is broken into four areas:

1. PDP-11 Shared Development - the pool of shared money this proposal addresses (up 54% for FY74).
2. PDP-11 Market Area Development - the per-product line money for specifically single market products (up 7% for FY74).
3. DECsystem-10 Market Area Development (up 23% for FY74).
4. Other Market Areas (down 61% for FY74).

(The figures projected for FY75 are roughly equal to those for FY74.)



LEGEND

→ % INCREASE OF DEV SPENDING

---→ % INCREASE OF SHARED PDP-11 SPENDING

ANNUAL SOFTWARE ENGINEERING EXPENSE BY MARKET GROUP

SOFTWARE ENGINEERING BUDGET PROJECTION

FY73-FY75

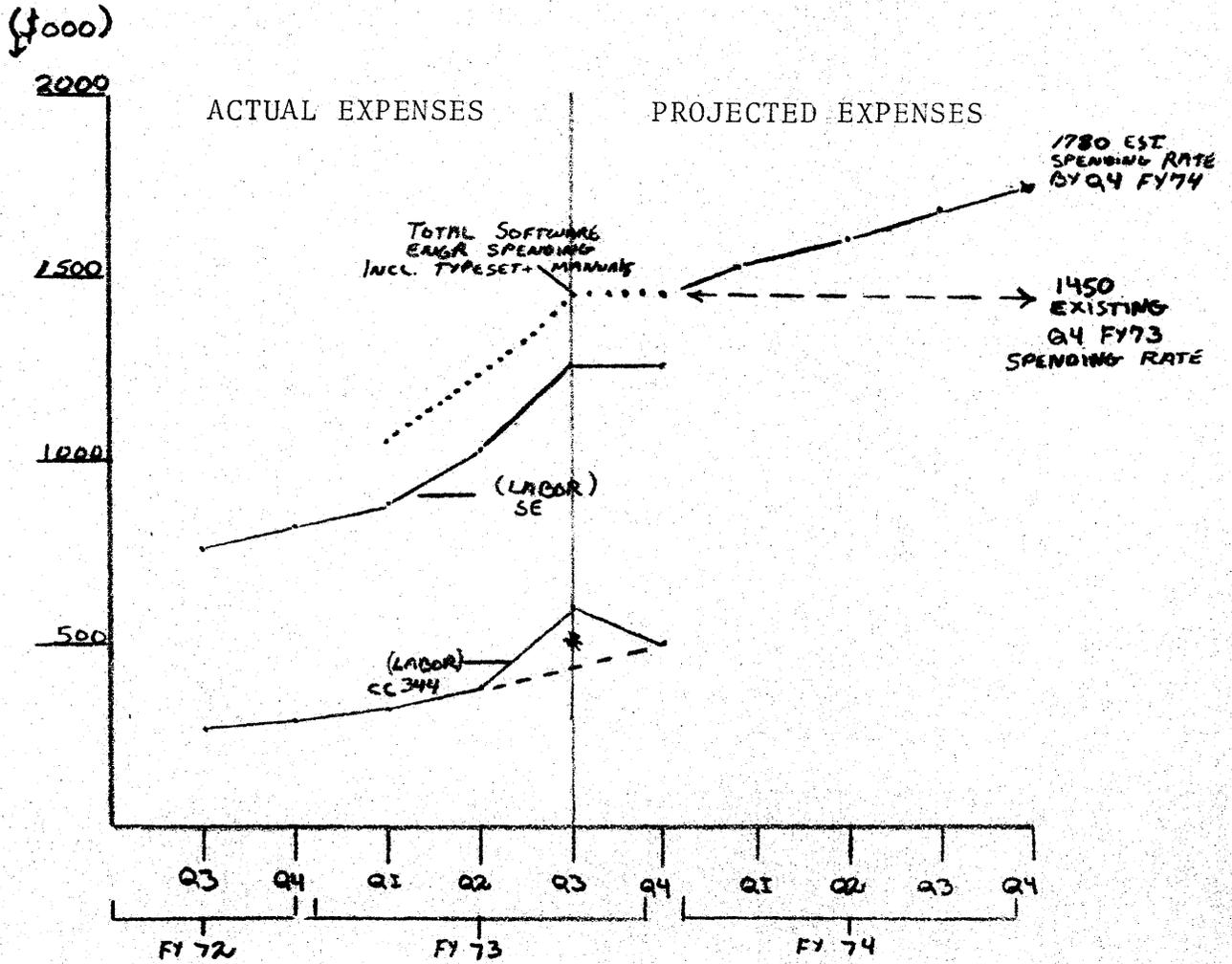
(\$000)

<u>See Page</u>		<u>FY73</u>	<u>FY74</u>	<u>FY75</u>
A2	PDP-11 Market Areas (Non Shared Project)	1,196	1,280	1,225
A3	DECsystem-10 Market Areas	1,210	1,490	1,480
A4	Other Market Areas	561	345	295
A5	Shared PDP-11 Software	2,374	3,660	3,480
	Contingency for Future Unknowns	-	-	<u>640</u>
	TOTAL SOFTWARE ENGINEERING	<u>5,341</u>	<u>6,775</u>	<u>7,120</u>

NOTES

These figures cover all Software Engineering expenses for Programming, Writing, and Software Manual Production (cost centers 241, 341, 342, 343, 344; "Y" Expense 550, 551, 552, 553, 554). Shared PDP-11 Software is the name applied to PDP-11 Operating Systems, Languages, and Support which are part of products sold by more than one Product Line. (It is not P.L. 96, which constitutes only a small part of such Shared Projects.) Substantial programming expenses not under Software Engineering control are not included.

Page references are to the Appendix.



1) QUARTERLY SPENDING RATE ANALYSIS

LEGEND

* Q3 INCLUDES 100K COBOL CONTRACT

1) NOTE

Q4 FY73 SPENDING RATE FOR FY74 WOULD BE \$6 MILLION. PROPOSED INCREASE TO \$6.8 MILLION IS 13% OVER CURRENT RATE

A Summary of Shared PDP-11 Software Development for Fiscal Year 1974

(A detailed cost breakdown is presented as an appendix.)

I. Small Systems (In Progress) (see page A6 for cost details)

1. Finish and support CAPS-11 as our low-end cassette-based system (\$30K).
2. Support RSX-11A as our low-end real-time multi-tasking system (\$30K).
3. Finish and support RT-11 as our combined real-time and program development system. Basic is the primary development language (\$90K).
4. Create a small, fast Fortran to run under RT-11 and RSTS or RSX. This product would be of the WATFOR flavor (\$80K).

II. Medium Systems (In Progress) (see page A7)

1. Stop DOS/BATCH development in Q1 with release nine. Do maintenance only (\$120K).
2. For the RSTS family, support the existing 11/20 RSTS and extend RSTS-E as a first class Basic time-sharing system. Add RJE capability and compatible file system with RSX-11D, new peripherals, etc. (\$180K).
3. Continue substantial development on RSX-11D to create already committed Batch support for release two. Push RSX-11D as the world's best process control real-time system for larger applications (\$450K).
4. Continue to support the current RSX-11D Fortran (medium-sized) under both RSX-11D and DOS/BATCH. Implement 11/45 optimized Fortran (requiring FPP) to run under RSX-11D (June 1974) (\$270K).
5. Continue current COBOL-11 effort to provide January 1974 release with RSX-11D release II (as ANS-73 level 1). Extend COBOL beyond that to level 2 (\$180K).

III. New Products (see page A9)

1. Cover the system gap left by RSX-11A, RT-11, and RSX-11D by investigating an OEM flavor operating system aimed at DG's RDOS (small, multi-tasking, supports development). This system could be based on RSX-11A, RT-11 or a subset of RSX-11D but will in any case be the basis for an RSX-11D network of small systems (\$150K).

2. Extend our grip on the top end of the program development and applications system area by investigating a general purpose time-sharing system (probably not allowing assembly language). Candidates for this system's base are RSTS-multi-language and RSX-11D with a Time Sharing Option (\$180K).
3. Extend RSTS-E (independent of RSTS-ML) to keep RSTS as the top-performing high-end PDP-11 time-sharing system (\$120K).
4. Investigate new language support (PL1?) (\$30K).
5. Provide two people to work with shared engineering on new memory hierarchies and new system architecture (\$60K).

IV. General Support Projects (see page A10 for costs)

General Support projects are summarized in two ways. First, a brief statement about each project is listed; and second a table showing which projects impinge on the goals and problems is given.

1. BLISS-10/BLISS-11 - Support FORTRAN-10 (written in BLISS-10) as well as FORTRAN-11 (to be written in BLISS-11). Products developed by Carnegie-Mellon; we just modify slightly and maintain.
2. Hardware Pool - In July 1973 we will have about 1 million dollars retail worth of PDP-11 hardware. Current expectations are that by July 1974 we will need 2.5 million dollars worth. Specific needs are:
 - a. A competent engineer/manager to run, plan, and configure these systems.
 - b. A set of cross-bar switches to enable fast, fault-free reconfiguration for testing software on all legal systems (two four-CPU complexes are planned; each can operate stand-alone with one or more of four different peripheral mixes.) This project should be in Bruce Delagi's budget.
 - c. A DECsystem-10/PDP-11 data link to allow easy transmission of data from the 10-based software tools (see 3. below) to the 11 testing systems and vice versa.
3. 10-11 Software Tools - Unify and maintain all DECsystem-10-based software tools for PDP-11 development. Included are MACX11, MACY11, LINKX11, LINKY11, a librarian, and sysgen capability.
4. MIMIC - Continue current support for this DECsystem-10-based simulator by adding new peripherals as they are developed and maintaining old ones.

5. Shared Engineering Support - Provide a man to Grant Saviers to create device handler strategies in conjunction with design of the device and the controller.
6. Network Coordination - Define, implement, and enforce corporate software policies regarding network interconnection of our systems. Includes communications protocols, data semantics, command languages, etc.
7. Field Test Administration - Define and implement procedures ensuring that maximal benefit is gained from the field test of all major products. Provide good communication to and from customer sites, software services, and Software Engineering. Keep records on effectiveness of various sites.
8. Acceptance Tests - As part of product release procedure, ensure that an adequate acceptance test is created to support:
 - a. the manufacturing floor,
 - b. field service on-site,
 - c. software services personnel,
 - d. our contract to be paid for the accepted software.

Create tests for those products already developed which are to be sold.
9. Product Planning - Create a two-man staff of highly competent software product planners within Software Engineering to propose an overall software product strategy for the corporation in conjunction with the product lines. This group will disseminate accurate and timely planning and competitive analysis information to the people who need it (e.g., the PDP-11 Operating Systems Characteristics memo dated March 2, 1973). They will also generate new product proposals for review by the PDP-11 Shared Software Development Committee.
10. Entry Level Training - This function will be responsible for the hiring, training, and integration of entry-level (college-graduate mainly) personnel into Software Engineering. It is an essential part of stabilizing the programmer salary structure and gives us an ideal mechanism to implement the corporation's Equal Employment Opportunity action program. This money will be used to pay for the first six months work/training of approximately twenty people over the year.
11. Evaluation of Purchased Software - As we start to sell software products, it becomes more profitable to encourage our customers to create application packages for our machines. When we buy them, however, we must subject them to an adequate evaluation process to ensure that they meet the quality standards for our products. This shared part of those

evaluations will ensure that uniform procedures are developed and followed.

	BLISS-10/ BLISS-11	HARDWARE POOL	SWITCHES	10-11 DATA LINK	10-11 SOFTWARE TOOLS	MIMIC	SHARED ENGINEERING SUPPORT	NETWORK COORDINATION	FIELD TEST ADMINISTRATION	ACCEPTANCE TEST	PRODUCT PLANNING	ENTRY LEVEL TRAINING	EVALUATION OF PURCHASED SOFTWARE
SUPPORT PROJECTS													
<u>CORPORATE DIRECTIONS</u>													
software as product									X	X	X		X
sharing products								X			X		
centralized engineering							X				X		
<u>GOALS</u>													
less products/components	X							X			X		X
higher quality products	X						X		X	X	X	X	X
unified product plan								X			X		
inter-system communications			X	X				X			X		
customer upgrades								X			X		
hardware/software coordination							X				X		
new, proven technology	X		X	X	X	X							
save money		X	X	X	X	X			X	X		X	
<u>PROBLEMS</u>													
poor profit											X		
support costs	X								X	X	X		X
lack of policies									X		X		X
inter-connection & upgrade			X	X				X			X		
too many products								X			X		X

APPENDIX

TABLE OF CONTENTS

	PAGE
PDP-11 MARKET AREAS SUMMARY	A2
DECSYSTEM-10 MARKET AREAS SUMMARY	A3
OTHER MARKET AREAS SUMMARY	A4
SHARED PDP-11 SUMMARY	A5
SHARED SMALL PDP-11 PROJECT DETAIL	A6
SHARED MEDIUM PDP-11 PROJECT DETAIL	A7
SHARED PDP-11 MANUAL PRODUCTION	A8
SHARED PDP-11 NEW PROJECT DETAIL	A9
SHARED PDP-11 SUPPORT AND OTHER PROJECT DETAIL	A10

PDP-11 MARKET AREAS

	FY73		FY74		FY75	
	<u>Maint</u>	<u>Dev</u>	<u>Maint</u>	<u>Dev</u>	<u>Maint</u>	<u>Dev</u>
Business		246*	30	30	60	60
Communications		171*	60	210	90	240
DECNET		55	10	50	20	40
LDP		183*	30	190	30	220
MUMPS-11		161	30	30	30	60
TYPESET-11 (Gross Estimate)		330	50	460	75	200
11 Area's Manual Production		<u>50</u>		<u>100</u>		<u>100</u>
Subtotal 11 Market Areas		<u>1,196</u>	<u>210</u>	<u>1,070</u>	<u>305</u>	<u>920</u>
TOTAL 11 MARKET AREAS MAINTENANCE & DEVELOPMENT		<u>1,196</u>	<u>1,280</u>		<u>1,225</u>	

*Maintenance not separated from Development

DECSYSTEM-10 MARKET AREAS

	FY73		FY74		FY75	
	<u>Maint</u>	<u>Dev</u>	<u>Maint</u>	<u>Dev</u>	<u>Maint</u>	<u>Dev</u>
DECsystem-10 Software	300	760	330	985	360	920
Manual Production		150		175		200
Subtotal 10 Market Areas	<u>300</u>	<u>910</u>	<u>330</u>	<u>1,160</u>	<u>360</u>	<u>1,120</u>
TOTAL 10 MARKET AREAS MAINTENANCE & DEVELOPMENT	<u>1,210</u>		<u>1,490</u>		<u>1,480</u>	

OTHER MARKET AREAS

	FY73		FY74		FY75	
	<u>Maint</u>	<u>Dev</u>	<u>Maint</u>	<u>Dev</u>	<u>Maint</u>	<u>Dev</u>
MUMPS-15	53	-	-	-	-	-
PDP-8	39	177	60	60	60	60
PDP-15	159	-	60	90	100	-
TPL	33	-	25	-	25	-
Other Manual Production	-	<u>100</u>	<u>50</u>	-	<u>50</u>	-
Subtotal Other Market Areas	<u>284</u>	<u>277</u>	<u>195</u>	<u>150</u>	<u>235</u>	<u>60</u>
TOTAL OTHER MARKET AREAS MAINTENANCE & DEVELOPMENT	<u>561</u>		<u>345</u>		<u>295</u>	

Excluded Areas:

TYPESET-8
 TYPESET-10
 Medical Systems
 CSS
 Advanced Systems (10)
 Lorrin Gale
 Programming done by product lines

(NO Diagnostics
 SDC
 or Software Support
 is included.)

SHARED PDP-11 SOFTWARE

<u>See Page</u>		<u>FY73</u>	<u>FY74</u>	<u>FY75</u>
A6	<u>Small PDP-11 Existing Systems and Extensions</u>			
	Operating Systems	191	120	60
	Languages	16	140	90
	Support & Other	<u>98</u>	<u>100</u>	<u>60</u>
	Subtotal Small PDP-11 Existing Systems	<u>305</u>	<u>360</u>	<u>210</u>
A7	<u>Medium PDP-11 Existing Systems and Extensions</u>			
	Operating Systems	1,124	750	270
	Languages	404	600	450
	Support & Other	<u>196</u>	<u>300</u>	<u>300</u>
	Subtotal Medium PDP-11 Existing Systems	<u>1,724</u>	<u>1,650</u>	<u>1,020</u>
A8	<u>Shared Manual Production</u>	<u>345</u>	<u>515</u>	<u>690</u>
A9	<u>New Shared PDP-11 Systems</u>			
	Operating Systems	-	510	720
	Languages	-	30	180
	Support & Other	<u>-</u>	<u>595</u>	<u>660</u>
	Subtotal New PDP-11 Systems	<u>-</u>	<u>1,135</u>	<u>1,560</u>
	GRAND TOTAL SHARED PDP-11 SOFTWARE	<u>2,374</u>	<u>3,660</u>	<u>3,480</u>

SHARED SMALL PDP-11 EXISTING SYSTEMS AND EXTENSIONS

See
Page

	FY73		FY74		FY75	
	<u>Maint</u>	<u>Dev</u>	<u>Maint</u>	<u>Dev</u>	<u>Maint</u>	<u>Dev</u>
CAPS-11		34	30	-	30	-
RT-11		118	30	30	30	-
RSX-11A, B, C	<u>39</u>	<u>-</u>	<u>30</u>	<u>-</u>	<u>-</u>	<u>-</u>
Subtotal Small Operating Systems	<u>39</u>	<u>152</u>	<u>90</u>	<u>30</u>	<u>60</u>	<u>-</u>
Subtotal Maintenance & Development	<u>191</u>		<u>120</u>		<u>60</u>	
Basic	-	16	30	30	30	-
Fortran	<u>-</u>	<u>-</u>	<u>-</u>	<u>80</u>	<u>30</u>	<u>30</u>
Subtotal Small Languages	<u>-</u>	<u>16</u>	<u>30</u>	<u>110</u>	<u>60</u>	<u>30</u>
Subtotal Maintenance & Development	<u>16</u>		<u>140</u>		<u>90</u>	
A10 Support & Other	<u>59</u>	<u>39</u>	<u>-</u>	<u>100</u>	<u>-</u>	<u>60</u>
Subtotal Maintenance & Development	<u>98</u>		<u>100</u>		<u>60</u>	
Subtotal Small PDP-11	<u>98</u>	<u>207</u>	<u>120</u>	<u>240</u>	<u>120</u>	<u>90</u>
TOTAL SMALL PDP-11 MAINTENANCE & DEVELOPMENT	<u>305</u>		<u>360</u>		<u>210</u>	

SHARED MEDIUM PDP-11

See
Page

	FY73		FY74		FY75	
	Maint	Dev	Maint	Dev	Maint	Dev
DOS/BATCH	82	169	120	-	60	-
RSTS	44	104	30	30	-	-
RSTS-E	-	99	30	90	60	-
RSX-11D	-	626	150	300	150	-
Subtotal Medium Operating Systems	126	998	330	420	270	-
Subtotal Maintenance & Development	1,124		750		270	
COBOL-11	-	251	-	330	60	120
FORTRAN	23	130	30	240	30	240
Subtotal Medium Languages	23	381	30	570	90	360
Subtotal Maintenance & Development	404		600		450	
A10 Support & Other	16	180	-	300	-	300
Subtotal Maintenance & Development	196		300		300	
Subtotal Medium PDP-11	165	1,559	360	1,140	360	660
TOTAL MEDIUM PDP-11 MAINTENANCE & DEVELOPMENT	1,724		1,650		1,020	

SHARED PDP-11 MANUAL PRODUCTION

	<u>FY73</u>	<u>FY74</u>	<u>FY75</u>
Software Manual Production (Originals)	120	180	240
Software Manual Reprints & Diagnostics (Including SDC Printing)	<u>225</u>	<u>335</u>	<u>450</u>
GRAND TOTAL SHARED PDP-11 MANUAL PRODUCTION	<u><u>345</u></u>	<u><u>515</u></u>	<u><u>690</u></u>

SHARED PDP-11 PROJECTS
NEW OPERATING SYSTEMS & LANGUAGE

See Page	FY73		FY74		FY75	
	<u>Maint</u>	<u>Dev</u>	<u>Maint</u>	<u>Dev</u>	<u>Maint</u>	<u>Dev</u>
	OEM Operating System					
	RSX Network Node		-	150	60	90
	RSX ABC					
	RSTS Multi-Language					
	RSX-T/S		-	180	60	180
	New System Architecture		-	60	60	150
	RSTS-E Extensions		-	120	-	120
	Subtotal New Operating Systems		-	510	180	540
	Subtotal Maintenance & Development		510		720	
	New Language			30		180
A10	Support & Other			595		660
	TOTAL SHARED PDP-11 (NEW OPERATING SYSTEMS & LANGUAGE) MAINTENANCE & DEVELOPMENT		1,135		1,560	

SHARED PDP-11 PROJECTS
SUPPORT AND OTHER

	FY73		FY74		FY75	
	Maint	Dev	Maint	Dev	Maint	Dev
BLISS-10/BLISS-11	30*	-	45	45	45	45
Hardware Pool Management	30	-	30	-	60	-
Engineering 10-11 Data Link	-	-	-	45	15	-
10-11 Software Tools (MACRO,Linker)	15	15	30	30	30	30
MIMIC	-	88	30	40	30	40
Shared Engineering Support (RP04, etc.)	-	8	-	30	-	60
Network Coordination & Policies	-	15	-	60	-	60
Field Test & Administration	-	30	-	60	-	60
Product Planning	-	-	-	60	-	60
Acceptance Test Generation (Includes Mfg Support)	-	30	15	75	30	90
Entry Level Training	-	10	-	150	-	200
General Maintenance	53	-	-	-	-	-
Evaluation of Purchased Software	-	-	-	60	-	90
Subtotal Support & Others	<u>98</u>	<u>196</u>	<u>150</u>	<u>655</u>	<u>210</u>	<u>735</u>
TOTAL SUPPORT & OTHERS MAINTENANCE & DEVELOPMENT	<u>294</u>		<u>805</u>		<u>1,005</u>	
Shared By:						
Small PDP-11	<u>98</u>		<u>100</u>		<u>60</u>	
Medium PDP-11	<u>196</u>		<u>300</u>		<u>300</u>	
New PDP-11	<u>-</u>		<u>595</u>		<u>660</u>	

*Funded by DECsystem-10; not included in totals