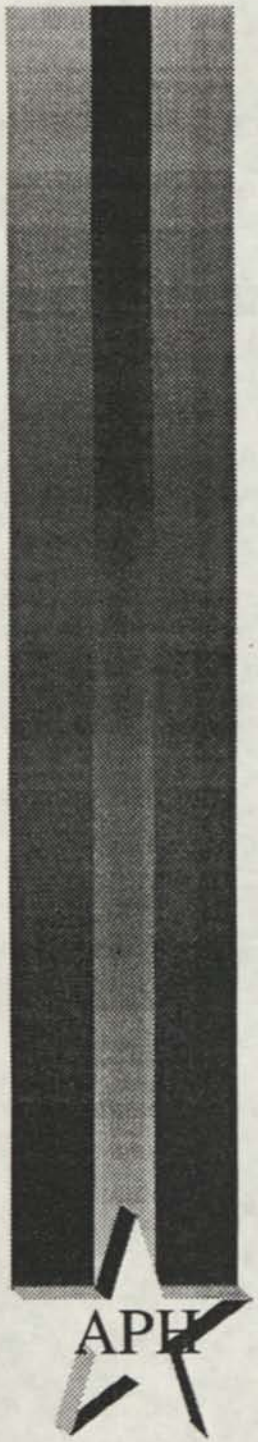
SAM - FYI ---

DAVE 10/6



TURNOVER

US ENGINEERING

7/3 - 9/23/94

Annualized

Turnover Data 9/30/94

Overall

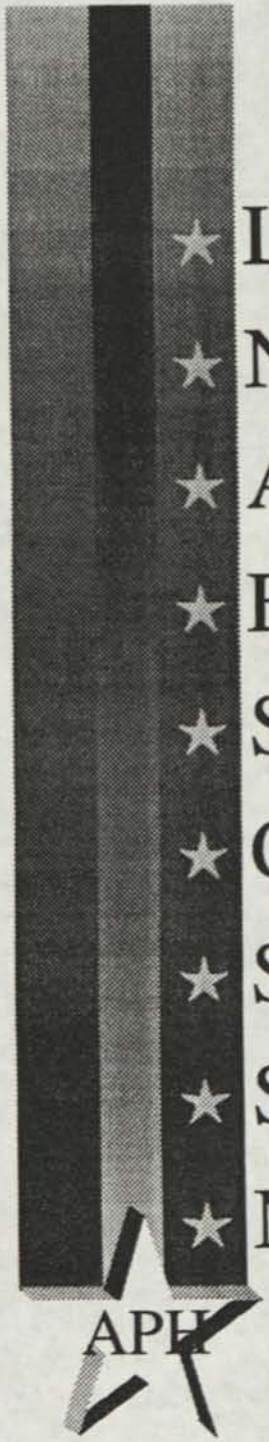
- All groups - All Functions 21%
- Engineering Job Codes 24%
- Non-Engineers 17%

APH

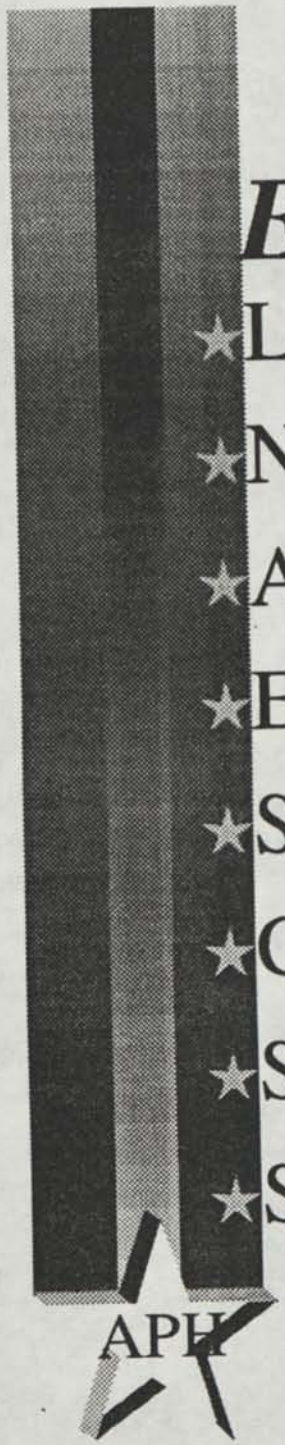
Turnover Data 9/30/94

Overall - By Group

★ Layered Software Group	33%
★ Networks Engineering	24
★ Advanced Technology	14
★ Enterprise Objects S/W	29
★ Systems Software	10
★ Central	42
★ Systems Hardware	10
★ Systems Engineering	18
★ Marketing (Industry & Corp.)	20



Turnover Data 9/30/94



ENGINEERING JOB CODES

★Layered Software Group	38%
★Networks Engineering	30
★Advanced Technology	17
★Enterprise Objects S/W	26
★Systems Software	11
★Central	135
★Systems Hardware	11
★Systems Engineering	22

Turnover Data 9/30/94

Issues

- EVERY category is up 2 points from the 8 week analysis
- Layered S/W Engineers are up 5 points
- FY'94 Overall Annual Rate 13 vs. 21%
- Quarterized Trend
  - Q3FY'94 = 9%
  - Q4FY'94 = 17%
  - Q1FY'95 = 21%

Turnover Data 9/30/94

Methodology

- Find Terms YTD (Excluding TFSO)
  - Divide terms by ytd weeks
  - Multiply by 52
- Find Current Active
  - Add ytd terms
- Divide Annualized terms by Adjusted Active Base

APH

Turnover Data 9/30/94

Benchmark Summary (Cont'd.): Digital Equipment Corporation

Company Name

Function	Assigned To (Name And Title)	Telephone	Is This A (1) Corporate Function? (Please Circle)	Where Do You View This Function Relative To The Best Practices Of Other Firms Of Similar Size And Complexity? (Please Circle)
			Yes No	Needs Improvement 1 2 3 4 5 Among The Best
2. Business Strategy			Yes No	1 2 3 4 5
3. Communications			Yes No	1 2 3 4 5
4. Public Affairs			Yes No	1 2 3 4 5
5. Human Resources			Yes No	1 2 3 4 5
6. Information Systems			Yes No	1 2 3 4 5
7. Legal			Yes No	1 2 3 4 5
8. Materials Management			Yes No	1 2 3 4 5
9. Mergers & Acquisitions			Yes No	1 2 3 4 5
10. Research ~~Development & Engineering Strategy~~ (DEC)	Sam Fuller V.P. Research	223-3710	Yes No	1 2 3 4 5

Note: (1) Employees managed and expenses budgeted by Corporate executives

ATK26/096/30a mko

Functional Organizational Profile: Research, Development & Engineering Strategy

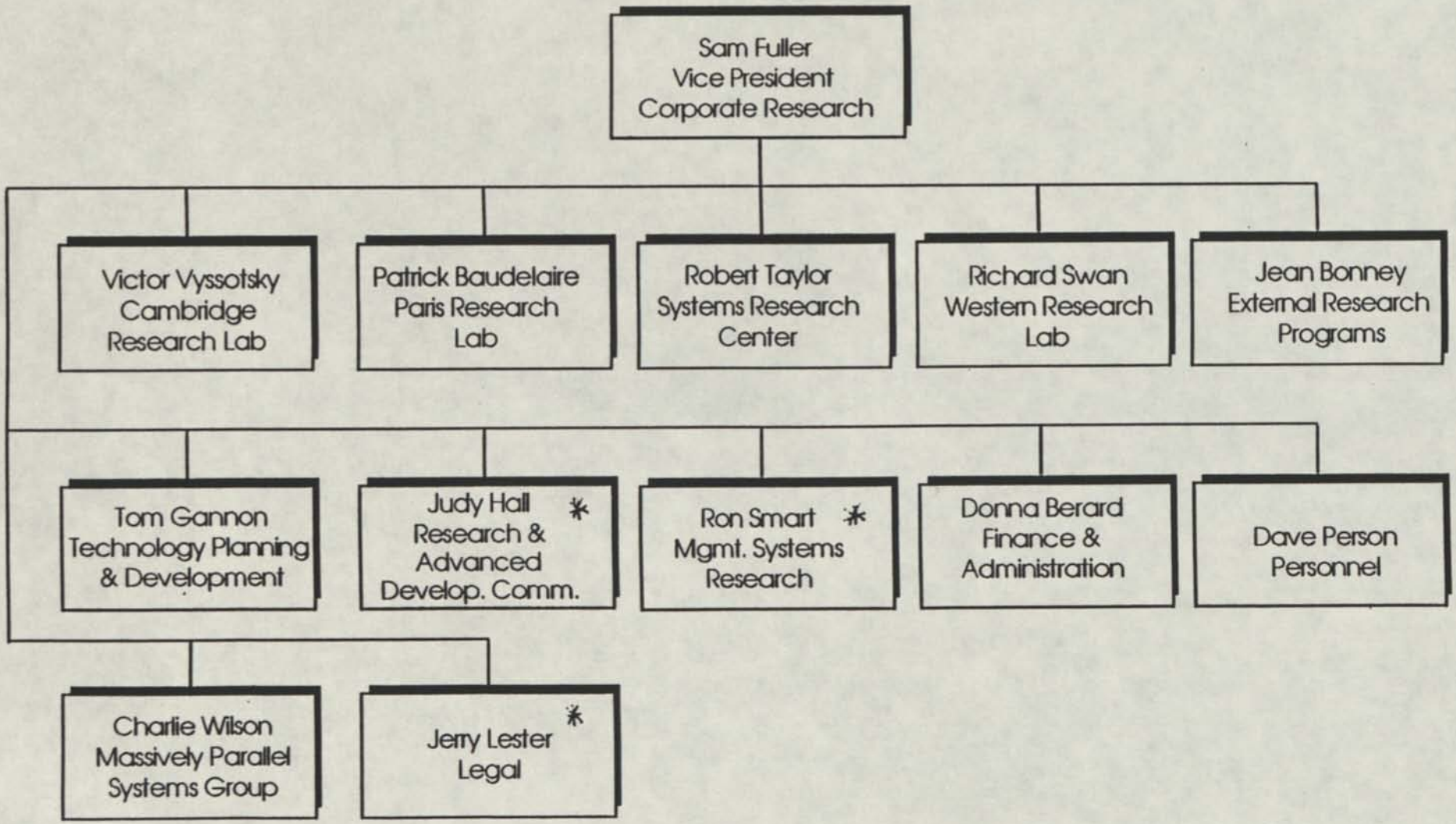
- Please attach an organizational chart for this function, showing titles and headcounts, from the functional head to first line supervisors.
- What is this function called at your firm? Corporate Research
- What is the title of the functional head? Vice President, Corporate Research
- How many people, excluding secretaries and assistants, report directly to the functional head? 9
- What is the number of management layers in this function at corporate? 4
- What is the number of management layers in this function including corporate and business units? N/A
- To whom does the head of this function report?
  Primarily to: (title only) Senior Vice President – Solid line
  Secondarily to: (title only) N/A – Dotted line
- What percent of this function's activity (based on total number of annual employee hours) is consumed by:
  - 65 % U.S. business units
  - 25 % Non-U.S. business units
  - 5 % Other corporate departments (please describe Legal, Strategic Relations)
  - 5 % External organizations (e.g., S.E.C., outside counsel, etc.) (please describe Nat'l Academy of Science, professional societies, public policy organizations, etc.)

  Total 100%
- What are the three most important performance measures used in managing this function?

  Is the head of this function's compensation tied to this performance measure?

  1. Creation of new ideas — X Yes ___ No
  2. Moving ideas to products & services — X Yes ___ No
  3. Scientific peer review — ___ Yes X No
- What percent of 1991 revenue is the result of new products introduced over the past two years? N/A %

Corporate Research (CRA)



* indirect

2/16/92

Functional Headcount And Expense Profile: Research, ~~Development & Engineering Strategy~~ (only)

- Is any portion of this function outsourced? ☒ Yes ☐ No If yes, what percent? 4.1 % (In Dollars)
  - If yes, what aspects are outsourced? applied research at consortia & universities
  - If no, what is the likelihood that a portion of this function will be outsourced within two years?

    ___ Highly Likely
    ___ Somewhat Likely
    ___ Not Likely

	1991 (Millions)
What is the company-wide (Corporate and business unit) expense for this function?	$ 46.5
What is the Corporate (1) expense (before chargeouts) for this function?	$ 48.7

- What is the Corporate expense (before chargeouts) by resource. Please allocate only the Corporate expense:

• Exempt employee expense	65.4 %
• Non-exempt employee expense	3.4 %
• Information systems expense	9.2 %
• Facilities expense	10.8 %
• Purchased services expense	2.2 % Please describe: technical consultants
• Other expense	9.0 % Please describe: lab capital equipment depreciation
	Total 100%

- How is Corporate's expense allocated to the business units? (Please check all that apply)
  - ☐ Allocated, based upon usage (e.g., training hours, vouchers processed, etc.)
  - ☒ Allocated, based upon formula (e.g., percent of sales, headcount, etc.)
  - ☐ The expense is not allocated to business units, or is partially allocated
    If partially allocated, please estimate the percent of this function's expense allocated to the business units ___ %
  - ☐ Other (please specify) ___

Note: (1) Total expenses incurred at the Corporate as opposed to the Business Unit level. Calculate prior to any allocations or chargebacks to the Business Units

ATK26/096/54a mko

Functional Headcount And Expense Profile: Research, ~~Development & Engineering Strategy~~ (only)

Please Provide The Actual Or Best Estimated Numbers Of:	1991 Employee (1) Headcount	1991 Contract/ (2) Temporary FTE's
■ Company-wide	295	23.34 ←
• U.S.	244	20.15 ←
• Non-U.S.	51	3.19
■ Corporate-wide (3)	295	23.34 ←
• Number of exempt (4) →	266	12.49 ←
• Number of non-exempt (5) →	29	10.85
■ Business unit (6)	36	2.0

(1) Full and part-time personnel on payroll
(2) Temporaries, contract employees and long-term (i.e., more than six months) consultants annualized based on 2,000 hours per year
(3) On the Corporate payroll or budget
(4) Exempt includes all salaried administrative, professional and executive employees (ineligible for overtime)
(5) Non-exempt includes all hourly employees (eligible for overtime)
(6) On the business units' payroll or budget

■ Within this function, how many people at the business units report to corporate headquarters? On a solid line? 38 On a dotted line? Ø

■ Is this function a Shared Service(7) today (Y/N)? N
• Was it a shared service two years ago (Y/N)? N
• Will it be a shared service in the next two years (Y/N)? N

■ Which services are currently shared? N/A

■ Has the reporting relationship between Corporate and the Business Units changed in the last 2 years?

☐ Was A Solid Line, Now Is Dotted ☐ Was A Dotted Line, Now Is Solid ☒ Has Not Changed

• If the relationship has changed, please describe how/why: N/A
• Do you expect the reporting relationship to change over the next 2 years? ☐ Yes ☒ No

(7) A Shared Service is a support function that consolidates a few closely related activities into one organizational unit in order to serve multiple business units; expenses are normally charged out based on direct usage

ATK26/096/54b mko

Functional Activity Profile: Research, ~~Development & Engineering Strategy~~ (only)

■ For each functional activity listed below, please estimate the number of exempt, non-exempt and contract/temporary positions; the proportion of total 1991 Corporate functional expense borne by this activity; and the percent of the Corporate activity outsourced

(Add or modify activities as necessary to properly describe this function's primary activities)

	1991 Corporate Employee Headcount (1)		1991 Corporate Non-employee Headcount	Percentage Of 1991 Actual Or Estimated Corporate Expenses Allocated To This Activity	Percentage Outsourced
	Exempt (2)	Non-exempt (3)	Contract/ Temporary (4)	(This Column Must Total 100%)	
1. Technology Planning & Development	29	5	1	5.2 %	10 %
2. External Research Programs	25	4	4	8.0 %	26 %
3. Applied Research (Internal labs inc CRL, PRL, SRC & WRL) & MCC	196	16	21	81.2 %	5.1 %
				%	%
4. General Management & Admin (inc. Finance, Personnel, IM&T) Hq staff, etc.)	16	4	0	5.6 %	0 %
				%	%
				Total 100%	

Note: (1) The number of full and part-time employees on the corporate, as opposed to a business unit's, payroll
(2) Exempt includes all salaried administrative, professional and executive employees (ineligible for overtime)
(3) Non-exempt includes all hourly employees (eligible for overtime)
(4) Temporary, leased or other contract personnel, and long-term (i.e., greater than six months) consultants. Calculated at 2,000 hours per year per contract position
(5) Includes functional head and all secretaries and assistants not dedicated to specific functional activities

Revised 2/10/92

ATK26/096/54c mko

Functional Transaction Volumes: Research, ~~Development & Engineering Strategy~~ (only)

■ Please estimate your **Corporate-level** transaction volumes for this function using the measures provided. If these measures are not appropriate, please provide your own:

Corporate Transaction Volume Measures	FY91 Actual Or Best Estimated ~~1991~~ Corporate Transaction Volume (Annual) (1)
• Number of ongoing ~~R&D~~ Research projects (applied) – Total	365
• Number of ongoing ~~R&D~~ projects (basic)	Ø
• Number of ongoing engineering projects	Ø
• Number of ~~R&D~~ scientists and technicians company-wide	188
• Number of engineering professionals company-wide	N/A
~~Instead, we use~~ other:	
# internal research projects	~65
# university research projects	~300
average duration (years)	2.2
# internal technical reports/yr.	55
average staff per project	3.3
# articles written per year	88

Note: (1) If an alternative measure is used, please specify volume and associated time period

01-JUN-1992 filename: popfcst.f93 PRINT FILE: [reports.fy92]POPFCST.F93

CRA FY93 NOTE: All Population actuals = equivalent

********** * POPULATION * ********** --RESEARCH--	FY92 Fcst EQUIV	Current Month Actual JULY Gross	Equiv	Q1 Act	Q1 Fcst	Q1 Bud	Q2 Act	Q2 Fcst	Q2 Bud	Q3 Act	Q3 Fcst	Q3 Bud	Q4 Act	Q4 Fcst	Q4 Bud
SRC - 36D															
Reg - U.S.	77.0	.0	.0	.0	.0	80	.0	.0	80	.0	.0	80	.0	.0	80
Non-Reg - U.S.	8.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
S-T SRC	85.0	.0	.0	.0	.0	80	.0	.0	80	.0	.0	80	.0	.0	80
WRL - 3C7															
Reg U.S.	30.0	.0	.0	.0	.0	34	.0	.0	34	.0	.0	34	.0	.0	34
Non-Reg - U.S.	7.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
NSL - 32Q															
Reg - U.S.	9.0	.0	.0	.0	.0	12	.0	.0	12	.0	.0	12	.0	.0	12
Non-Reg - U.S.	.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
S-T WRL	46.0	.0	.0	.0	.0	46	.0	.0	46	.0	.0	46	.0	.0	46
CRL - YAQ															
Reg - U.S.	44.0	.0	.0	.0	.0	45	.0	.0	45	.0	.0	45	.0	.0	45
Non-Reg - U.S.	6.0	.0	.0	.0	.0	2	.0	.0	2	.0	.0	2	.0	.0	2
AI - 3UW															
Reg - U.S.	11.0	.0	.0	.0	.0	11	.0	.0	11	.0	.0	11	.0	.0	11
Non-Reg - U.S.	.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
S-T CRL	61.0	.0	.0	.0	.0	58	.0	.0	58	.0	.0	58	.0	.0	58
PRL - GGV															
Reg - Europe	34.0	.0	.0	.0	.0	37	.0	.0	37	.0	.0	37	.0	.0	37
Non-Reg - Europe	6.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
Non-Reg - U.S.	.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
S-T PRL	40.0	.0	.0	.0	.0	37	.0	.0	37	.0	.0	37	.0	.0	37
TOTAL RESEARCH	232.0	.0	.0	.0	.0	221	.0	.0	221	.0	.0	221	.0	.0	221
EXTERNAL RESEARCH															
Reg - U.S.	23.0	.0	.0	.0	.0	24	.0	.0	24	.0	.0	24	.0	.0	24
Reg - Europe	17.0	.0	.0	.0	.0	18	.0	.0	18	.0	.0	18	.0	.0	18
Non-Reg U.S.	2.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
Non-Reg Europe	.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
TOTAL ERP	42.0	.0	.0	.0	.0	42	.0	.0	42	.0	.0	42	.0	.0	42
BUSINESS OPS															
REGULAR - U.S.															
F & A - 3C6	8.8	.0	.0	.0	.0	10	.0	.0	10	.0	.0	10	.0	.0	10
MSR - 3C6	3.0	.0	.0	.0	.0	4	.0	.0	4	.0	.0	4	.0	.0	4
IMT - 39G	4.0	.0	.0	.0	.0	5	.0	.0	5	.0	.0	5	.0	.0	5
PERS- YBK	4.0	.0	.0	.0	.0	4	.0	.0	4	.0	.0	4	.0	.0	4
EEP - YN7	2.0	.0	.0	.0	.0	3	.0	.0	3	.0	.0	3	.0	.0	3
SUB-TOTAL REG	21.8	.0	.0	.0	.0	26	.0	.0	26	.0	.0	26	.0	.0	26
NON-REGULAR - U.S															
MSR - 3C6	1.0	.0	.0	.0	.0	1	.0	.0	1	.0	.0	1	.0	.0	1
TOTAL BUS OPS	22.8	.0	.0	.0	.0	27	.0	.0	27	.0	.0	27	.0	.0	27

********** * POPULATION * **********	FY92 Fcst EQUIV	Current Month Actual July Gross	Equiv	Q1 Act	Q1 Fcst	Q1 Bud	Q2 Act	Q2 Fcst	Q2 Bud	Q3 Act	Q3 Fcst	Q3 Bud	Q4 Act	Q4 Fcst	Q4 Bud
TECHNOLOGY PLANNING & DEVELOPMENT															
TPD - 3B7															
Reg - U.S.	7.2	.0	.0	.0	.0	6	.0	.0	6	.0	.0	6	.0	.0	6
Non-Reg - U.S.	.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
TDP - 3YZ															
Reg - U.S.	6.0	.0	.0	.0	.0	7	.0	.0	7	.0	.0	7	.0	.0	7
Non-Reg - U.S.	.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
MCC - Y19															
Reg - U.S.	1.0	.0	.0	.0	.0	2	.0	.0	3	.0	.0	3	.0	.0	3
Non-Reg U.S.	1.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
TAP - 384															
Reg - U.S.	4.0	.0	.0	.0	.0	4	.0	.0	4	.0	.0	4	.0	.0	4
Non-Reg - U.S.	.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
EIP - 3B2															
Reg - U.S.	8.0	.0	.0	.0	.0	8	.0	.0	8	.0	.0	8	.0	.0	8
Reg - Europe	2.0	.0	.0	.0	.0	2	.0	.0	2	.0	.0	2	.0	.0	2
Non-Reg - U.S.	.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
DTJ - YH9															
Reg - U.S.	5.0	.0	.0	.0	.0	5	.0	.0	5	.0	.0	5	.0	.0	5
Non-Reg - U.S.	.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
Total TP&D	34.2	.0	.0	.0	.0	34	.0	.0	35	.0	.0	35	.0	.0	35
MGMT ADJUSTMENTS															
Regular - U.S.	.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
Regular - Europe	.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
Non-Reg - U.S.	.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
Non-Reg - Europe	.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
TOTALS															
REGULAR - U.S.	248.0	.0	.0	.0	.0	265	.0	.0	266	.0	.0	266	.0	.0	266
REGULAR - EUROPE	53.0	.0	.0	.0	.0	57	.0	.0	57	.0	.0	57	.0	.0	57
NON-REG - U.S.	25.0	.0	.0	.0	.0	3	.0	.0	3	.0	.0	3	.0	.0	3
NON-REG - EUROPE	6.0	.0	.0	.0	.0	0	.0	.0	0	.0	.0	0	.0	.0	0
TOTAL CRA	332.0	.0	.0	.0	.0	325	.0	.0	326	.0	.0	326	.0	.0	326
MPSG - CCY25/YY8/YY9															
--REGULAR - U.S.	40.0	.0	.0	.0	.0	46	.0	.0	52	.0	.0	52	.0	.0	52
--REGULAR - EUROPE	1.0	.0	.0	.0	.0	1	.0	.0	1	.0	.0	1	.0	.0	1
--NON-REG - U.S.	7.0	.0	.0	.0	.0	2	.0	.0	2	.0	.0	2	.0	.0	2
TOTAL MPSG	48.0	.0	.0	.0	.0	49	.0	.0	55	.0	.0	55	.0	.0	55

Need this in Population/Admin

will probably need again.

note: Cross Filed/Budget 1992

TRANSITION - PHASE III

METHODOLOGY FOR CORPORATE RESEARCH GROUP

A) WORKFORCE PLAN BASED ON CRA'S OPRERATING & LONG RANGE PLAN

1) "EXCLUSIONS" BASED ON:

- o WORK CONTINUING/EXPANDING
- o CRITICAL SKILLS FOR FUTURE

2) WORK GOING AWAY:

- o RESTRUCTURING & REORGANIZATION
- o CONSOLIDATION/REDESIGN OF WORK
- o ELIMINATION OF PROJECTS

B) SELECTION CRITERIA

1) WORK GOING AWAY (AFTER EXCLUSIONS)

2) PERFORMANCE RATING

C) A.A. AND ADVERSE IMPACT ANALYSIS

D) CROSS ORGANIZATION TRANSITION COMMITTEE APPROVAL

E) TRAINING FOR MANAGERS

F) COMMUNICATION

G) IMPLEMENTATION

CORPORATE RESEARCH

WORKFORCE PLANS - FY91

FY91	Beginning Population	- 329	
Ending Q2	Population	- 302	(Adjusted from original 289)
Ending Q3	Population	- 296	(Based on assumptions concerning separations, attrition, and hiring)
Ending Q4	Population	- 312	(Based on assumptions concerning summer interns and hiring)

Net reduction for full year - 17 (+ 2 from NCA = 19 total)

Net reduction beginning FY91 to FY92 - 5.2%

S.H. FULLER
24 JAN 91

CORPORATE RESEARCH

RESEARCH IS:

- FOCUSSED ON STRATEGIC AREAS:
  1. DISTRIBUTED COMPUTING
  2. APPLICATION TECHNOLOGIES
  3. INTERACTIVE, MULTIMEDIA HUMAN INTERFACES
  4. OPEN SYSTEMS

- MORE AGRESSIVELY MOVING TO EUROPE WHEN COMPARED WITH REST OF ENGINEERING (20% verses 9%)

- MORE AGRESSIVELY MOVING TO SOFTWARE WHEN COMPARED WITH REST OF ENGINEERING (5:1 ratio of SW to HW Engineers within CRA)

YET

- IS A SLOWLY DECLINING FACTION OF ENGINEERING

- ABOUT ONE HALF PROPORTION OF ENGINEERING WHEN COMPARED WITH PRINCIPAL COMPETITORS
  (IBM, HITACHI, NEC, AT&T)

WORKSHEET FOR FY91 WORKFORCE PLAN--JANUARY 28 OPERATIONS COMMITTEE

****

PLEASE SUBMIT THE REQUESTED INFORMATION TO MAURICE VANDERPOT BY JANUARY 24.

****

The information should be coordinated with Finance and the Group Vice Presider before submission.

ORGANIZATION CRA

1. FY91 BEGINNING POPULATION (RESTATED-OCTOBER,1990)	329 *
2. ENDING Q2FY91 POPULATION	302 **
3. ENDING Q3 PROJECTION	296
4. ENDING Q4 PROJECTION	312
5. +/- FOR FULL YEAR	-17

6. NUMBER OF SEPARATIONS WITH PACKAGE

A. Q3 6 (plus 2-NCA)

B. Q4 0

C. TOTAL 6 (plus 2-NCA)

* BEGINNING FY91 RESTATEMENTS WERE LAST DONE IN OCTOBER, 1990. THIS NUMBER IS AGREED TO BY CORPORATE FINANCE AND PERSONNEL. IT IS MY UNDERSTANDING THAT YOUR FINANCE MANAGER ALSO HAS THIS NUMBER.

** THIS NUMBER COMES FROM THE POPULATION REPORTS GENERATED BY PERSONNEL AS OF DECEMBER 28 AND SUBMITTED TO FINANCE ON JANUARY 10.

CORPORATE RESEARCH

FY91 WORKFORCE PLAN

Beginning Q1, FY91 - 329

Ending Q2 - 302

289	reported on workforce plan
-6	PRL double counting and consultant counting
283	
+17	EERP
+ 2	EIP
302	- Adjusted Q2 ending

Ending Q3 - 296

302	- start
-6	- separations
296	
-3	- early Q3 attrition -1 SRC; -1 NSL; -1 TP+D
293	
-2	- attrition to end of Q3
291	
+3	- replacement hiring - 3 of 11 seperations and attrition
294	
2	- new hires - researchers
296	- end Q3

Ending Q4 - 312

296	- start
+4	- new hires - researchers
300	
+2	- replacements
+10	- summer interns
312	- end Q4

CORPORATE RESEARCH

RESEARCH IS:

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CORPORATE RESEARCH

RESEARCH IS:

- FOCUSSED ON STRATEGIC AREAS:
  1. DISTRIBUTED COMPUTING
  2. APPLICATION TECHNOLOGIES
  3. INTERACTIVE, MULTIMEDIA HUMAN INTERFACES
  4. OPEN SYSTEMS

- MORE AGRESSIVELY MOVING TO EUROPE WHEN COMPARED WITH REST OF ENGINEERING (20% verses 9%)

- MORE AGRESSIVELY MOVING TO SOFTWARE WHEN COMPARED WITH REST OF ENGINEERING

YET

- IS A SLOWLY DECLINING FACTION OF ENGINEERING

- ABOUT ONE HALF PROPORTION OF ENGINEERING WHEN COMPARED WITH PRINCIPAL COMPETITORS
  (IBM, HITACHI, NEC, AT&T)

TRANSITION - PHASE III

METHODOLOGY FOR CORPORATE RESEARCH GROUP

A) WORKFORCE PLAN BASED ON CRA'S OPRERATING & LONG RANGE PLAN

1) "EXCLUSIONS" BASED ON:

- o WORK CONTINUING/EXPANDING
- o CRITICAL SKILLS FOR FUTURE

2) WORK GOING AWAY:

- o RESTRUCTURING & REORGANIZATION
- o CONSOLIDATION/REDESIGN OF WORK
- o ELIMINATION OF PROJECTS

B) SELECTION CRITERIA

1) WORK GOING AWAY (AFTER EXCLUSIONS)

2) PERFORMANCE RATING

C) A.A. AND ADVERSE IMPACT ANALYSIS

D) CROSS ORGANIZATION TRANSITION COMMITTEE APPROVAL

E) TRAINING FOR MANAGERS

F) COMMUNICATION

G) IMPLEMENTATION

CORPORATE RESEARCH

WORKFORCE PLANS - FY91

FY91	Beginning Population	- 329	
Ending Q2	Population	- 302	(Adjusted from original 289)
Ending Q3	Population	- 296	(Based on assumptions concerning separations, attrition, and hiring)
Ending Q4	Population	- 312	(Based on assumptions concerning summer interns and hiring)

Net reduction for full year - 17

Net reduction beginning FY91 to FY92 - 5.2%

WORKSHEET FOR FY91 WORKFORCE PLAN--JANUARY 28 OPERATIONS COMMITTEE

****

PLEASE SUBMIT THE REQUESTED INFORMATION TO MAURICE VANDERPOT BY JANUARY 24.

****

The information should be coordinated with Finance and the Group Vice President before submission.

ORGANIZATION CRA

1. FY91 BEGINNING POPULATION (RESTATED-OCTOBER,1990)	329 *
2. ENDING Q2FY91 POPULATION	302 **
3. ENDING Q3 PROJECTION	296
4. ENDING Q4 PROJECTION	312
5. +/- FOR FULL YEAR	-17

6. NUMBER OF SEPARATIONS WITH PACKAGE

A. Q3 6 (plus 2-NCA

B. Q4 0

C. TOTAL 6 (plus 2-NCA)

* BEGINNING FY91 RESTATEMENTS WERE LAST DONE IN OCTOBER, 1990. THIS NUMBER IS AGREED TO BY CORPORATE FINANCE AND PERSONNEL. IT IS MY UNDERSTANDING THAT YOUR FINANCE MANAGER ALSO HAS THIS NUMBER.

** THIS NUMBER COMES FROM THE POPULATION REPORTS GENERATED BY PERSONNEL AS OF DECEMBER 28 AND SUBMITTED TO FINANCE ON JANUARY 10.

CORPORATE RESEARCH

FY91 WORKFORCE PLAN

Beginning Q1, FY91 - 329

Ending Q2 - 302

289	reported on workforce plan
-6	PRL double counting and consultant counting
283	
+17	EERP
+ 2	EIP
302	- Adjusted Q2 ending

Ending Q3 - 296

302	- start
-6	- separations
296	
-3	- early Q3 attrition -1 SRC; -1 NSL; -1 TP+D
293	
-2	- attrition to end of Q3
291	
+3	- replacement hiring - 3 of 11 seperations and attrition
294	
2	- new hires - researchers
296	- end Q3

Ending Q4 - 312

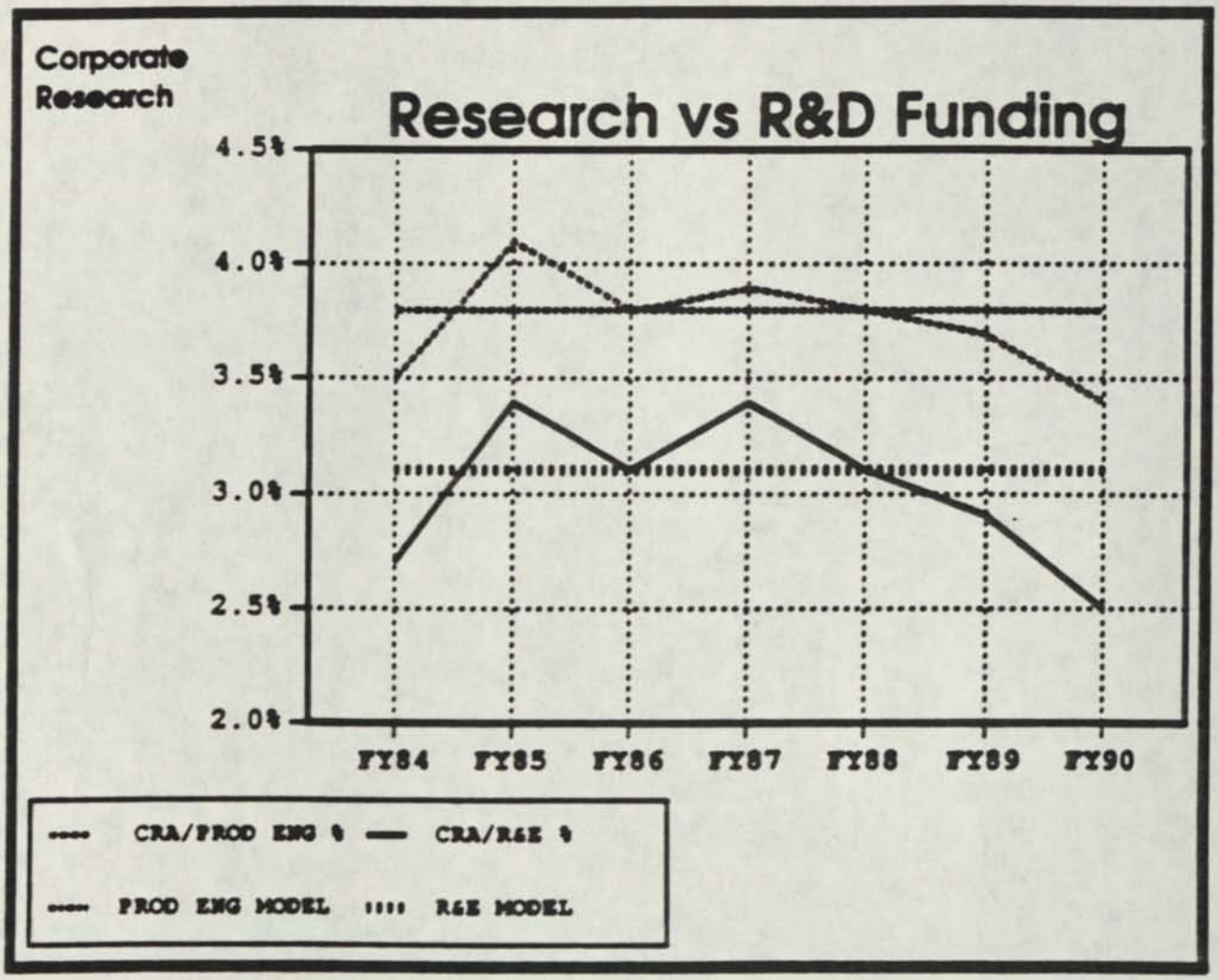
296	- start
+4	- new hires - researchers
300	
+2	- replacements
+10	- summer interns
312	- end Q4

```
PUBLICATIONS MANAGER
TECHNICAL EDITOR 2
NEW HIRE CONS CANDIDATE
1032> F ALL
238 EMP records found
1032> F JC 28AC 28AD 28AE 28AF
18 EMP records found
1032> CONSIDER ON
1032> VAL JC
28AC     (2)
28AD     (13)
28AE     (2)
28AF     (1)
1032> CONSIDER OFF
1032> F JC 50AB 50AC 50AD 50AE 50AF
100 EMP records found
1032> CONSIDER ON
1032> VAL JC
50AB     (7)
50AC     (12)
50AD     (55)
50AE     (16)
50AF     (10)
1032>
```

85%

HW SR ENG
HW PRIN ENG
HW CONSULTANT ENG
HW SR CONSULTANT ENG

SW ENG 2
SW SR ENG
SW PRIN ENG
SW CONSULTANT ENG
SW SR CONSULTANT ENG



- Since FY87, Research has been a shrinking fraction of R&E
- Both previous and current STF recommend that Research be stable % of R&E

S. Fuller

filename: funding.trend prepared by: Donna Berard

24-JAN-1991

	FY83 Actual	FY84 Actual	FY85 Actual	FY86 Actual	FY87 Actual	FY88 Actual	FY89 Actual	FY90 Actual	FY91 Budget
Spending ($M)									
CRA	10.7	16.9	24.5	25.5	34.1	40.9	44.0	43.7	43.0
R&AD					109	127	149	151	N/A
Prod Eng (gross)	356	486	594	676	857	1058	1183	1349	1324
Digital R&E = MEM	472	630	717	814	1010	1307	1525	1686	1669
Digital NOR	4272	5584	6686	7590	9389	11475	12742	12943	13000
% GROWTH									
CRA		57.9%	45.0%	4.1%	33.7%	19.9%	7.6%	- .7%	- 1.6%
Prod Eng (gross)		36.5%	22.2%	13.8%	26.8%	23.5%	11.8%	14.0%	- 1.9%
Digital R&E		33.0%	13.8%	13.5%	24.1%	29.4%	16.7%	10.6%	- 1.0%
Digital NOR		31.0%	19.7%	13.5%	23.7%	22.2%	11.0%	1.6%	.4%
CRA as a % of:									
Prod Eng (gross)	3.0%	3.5%	4.1%	3.8%	4.0%	3.9%	3.7%	3.2%	3.2%
Digital R&E	2.3%	2.7%	3.4%	3.1%	3.4%	3.1%	2.9%	2.6%	2.6%
Digital NOR	.25%	.30%	.37%	.34%	.36%	.36%	.35%	.34%	.33%
R&AD as a % of:									
Digital NOR	ERR	ERR	ERR	ERR	1.16%	1.11%	1.17%	1.17%	ERR

Average Growth	FY 84-86	FY 87-89	FY 83-90
CRA	35.7%	20.4%	23.9%
Prod Eng (gross)	24.2%	20.7%	21.2%
R&E	20.1%	23.4%	20.2%
NOR	21.4%	19.0%	17.5%

#'s provided by Dave James X6690

estimate based on 6 months actuals

assuming H1 = H2 NOR.

8/15/91

SAM - This sheet was submitted today, Aug. 15th. I discussed the numbers with DONNA B. and Charlie W. and we are all in agreement. The only change from last month is a higher ramp up in hiring for MTSG in Q1+Q2. GOOD LUCK! DAVE

15 August 1991
V.P. Sam Fuller

CRA, MPSG AND NCA

1. Ending FY91 headcount actuals (gross, and also shown as equivalent).

	CRA	MPSG	NCA
gross:	302	6	38
equivalent:	298	6	38

2. Beginning FY92 actuals (gross, and also shown as equivalent).

	CRA	MPSG	NCA
gross:	302	6	38
equivalent:	298	6	38

	CRA	MPSG	NCA
3. End of Q1 projected (EQUIVALENT ONLY)	310	18	40
4. End of Q2 projected (EQUIVALENT ONLY)	313	21	40
5. End of Q3 projected (EQUIVALENT ONLY)	317	21	40
6. End of Q4 projected (EQUIVALENT ONLY)	320	21	40
7. +/- for the year (item 6 minus item 2)	+20	+15	+2

****

Also show under the heading SEPARATE WITH PACKAGE

8. in Q1/Q2 (EQUIVALENT ONLY)	0	0	0
9. in Q3/Q4 (EQUIVALENT ONLY)	0	0	0
10. Total (EQUIVALENT ONLY)	0	0	0

From: RDVAX::BARRY "MARY T. BARRY DTN: 223-1128" 12-JUL-1991 12:09:50.3
4
To: NM%HAVOC::VANDERPOT
CC: FULLER,PERSON,BERARD,BARRY
Subj: CORPORATE RESEARCH POP. PROJECTIONS

Date: 12-JUL-91
V.P.: Sam Fuller

CRA, MPSG AND NCA

1. Ending FY91 headcount actuals (gross, and also shown as equivalent).

	CRA	MPSG	NCA
gross:	302	6	38
equivalent:	298	6	38

2. Beginning FY 92 actuals (gross, and also shown as equivalent).

	CRA	MPSG	NCA
gross:	302	6	38
equivalent:	298	6	38

	CRA	MPSG	NCA
3. End of Q1 projected (EQUIVALENT ONLY)	310	6	40
4. End of Q2 projected (EQUIVALENT ONLY)	313	12	40
5. End of Q3 projected (EQUIVALENT ONLY)	317	21	40
6. End of Q4 projected (EQUIVALENT ONLY)	320	21	40
7. +/- for the year (item 6 minus item 2)	+20	+15	+2

****

Also show under the heading SEPARATE WITH PACKAGE

	CRA	MPSG	NCA
8. in Q1/Q2 (EQUIVALENT ONLY)	0	0	0
9. in Q3/Q4 (EQUIVALENT ONLY)	0	0	0
10.Total (EQUIVALENT ONLY)	0	0	0

From: Person 7/15

for JBS tea party Wed AM.
Vander Pol presenting
numbers. His form
incorporates numbers
from CRA and
MPSG.

Subj: LANDSCAPE - PLEASE PRINT

From: RDVAX::PERSON "15-Mar-1991 1035" 15-MAR-1991 10:37:56.50
To: @CRASTAFF.DIS,@OPSMGRS.DIS
CC: BENDER,BAYDEC::SUTTER,BAYDEC::BOOTH,PERSON
Subj: cra workforce plans

CRA WORKFORCE PLAN

- THROUGH Q4, FY91 -

GROUP	END OF JANUARY ACTUAL	ESTIMATED ATTRITION	COMMITTED	TBD	INTERN	ALLOCATED INTERN SLOTS	TOTAL
WRL	30	0	2	1	1	2	36
IM&T	2	0	1	1	0	0	4
ERP	43	(1)	0	1	0	0	43
NSL	8	(1)	0	2	0	0	9
SRC	76	(3)	1	3	2	4	83
CRL	36	(1)	3	2	2	2	44
AIRG	13	(4)	1	0	1	0	11
FINANCE	5	0	1	0	0	0	6
PRL	32	0	2	1	3	2	40
VP OFFICE	6	(2)	0	0	0	0	4
PERS/EEP	7	0	0	0	0	0	7
DTJ	5	0	0	0	0	0	5
TP&D	32	(1)	1	0	0	0	32
TOTAL	295	(13)	12	11	9	10	324

Doug Clark
Grondalski

As of 2/26/91

Personnel fo hiring/admin
FYI

Printed by Sam Fuller

DIGITAL INTERNAL USE ONLY Document

I N T E R O F F I C E M E M O R A N D U M

(1) Kates
(2) Roberts

Doc. No: 006929
Date: 18-Dec-1990 02:41pm EST
From: Sam Fuller
FULLER.SAM
Dept: Corp. Research & Arch.
Tel No: 223-3710

TO: See Below

Subject: CRA FY91 HIRING

This memo is to secure your support for extending external offers as necessary for the balance of the fiscal year, all other internal avenues having been explored.

Corporate Research is committed to maintaining its headcount at its FY90 ending number of 329. Since that time, however, we have had significant turnover (25-30%) in our lab support and technical support staffs and several researcher resignations. As we have experienced the attrition, we have reviewed the work either not replaced or, in some cases, will do without a certain level of support staff; choosing instead to hire researchers to bring the two newer labs to critical mass.

CRA's charter is to stay on the leading edge of technology, to provide the innovation for the future. Within the headcount constraints, the Lab Directors need the freedom to bring the best minds available to bear on problems having significance and pay-back for the future of Digital Equipment Corporation. While we will make every effort to find those individuals within the Corporation, it is most likely that we will continue to draw candidates mainly from universities and other competitor labs.

Your agreement will make it possible for us to make prudent, but timely offers.

/id

Distribution:

TO:	Jack Smith	(SMITH.JACK)
TO:	Dick Farrahar	(FARRAHAR.DICK)
CC:	Remote Addressee	(BAUDELAIRE @DECPRL@VMSMAIL)
CC:	Remote Addressee	(BERARD @RDVAX@VMSMAIL)
CC:	Remote Addressee	(IRIS DELUCA @MLO)
CC:	Remote Addressee	(GANNON @RDVAX@VMSMAIL)

SAM - For our discussion...

DAVE 2/8

RECEIVED
FEB 4 1991
SAM FULLER

P.S. - This is only a starting point - not a firm commitment. Everyone realizes that the #'s will change.

DIGITAL ENGINEERING COLLEGE PROGRAM

* HISTORY

* CURRENT PERSPECTIVES ON:

    * COMPETITION

    * COLLEGE VIEW

    * STUDENT VIEW

* CONCLUSIONS

* RECOMMENDATIONS AND ACTIONS

kh:fy91cr:187:01-Feb-1991

DIGITAL EQUIPMENT CORPORATION

FY85 - FY90

COLLEGE HIRES

	FY85	FY86	FY87	FY88	FY89	FY90
U.S.	515	580	771	765	264	100
(ENG.)	260	322	382	281	97	41

ENGINEERING ORGANIZATION WORKFORCE FY86 - FY90

JOB CODE TITLE	FY86	FY87	FY88	FY89	FY90
Hardware Principal Engineer and Hardware Senior Engineer	771	1,022	1,139	1,185	1,143/30
Hardware Engineer (College Hire Entry Level)	400	497	542	435	297/25
Software Principal Engineer and Software Senior Engineer	1,199	1,390	1,428	1,683	1,936/107
Software Engineer One and Software Engineer Two (College Hire Entry Level)	732	808	707	701	552/27
TOTAL ENTRY LEVEL:	1,132	1,305	1,249	1,136	849/52
ENGINEERING COLLEGE HIRES FY85: 260	322	382	281	97/41	

Note: Number under slash mark denotes total number of employees hired externally during FY90 into each classification

CONCLUSIONS ON ENGINEERING WORKFORCE

* ENTRY LEVEL POOL WAS FLAT GROWTH FOR FY86 THROUGH FY89, THEN DROPPED SIGNIFICANTLY IN FY90

* DIRECT CORRELATION BETWEEN COLLEGE HIRES AND ENTRY LEVEL POOL

* POOL WILL CONTINUE TO DRY UP IN FY91 DUE TO ONLY 41 COLLEGE HIRES IN FY90

* SENIOR/PRINCIPAL ENGINEERS INCREASED 50%+ OVER FIVE YEARS

* RATIO OF SENIOR/PRINCIPAL TO ENTRY LEVEL POOL INCREASED FROM 2:1 TO 4:1 OVER FIVE YEARS

* <u>CONCLUSION</u>: WE'RE IN BIG TROUBLE!!!!

COLLEGE HIRE COMPETITIVE DATA
(Company View)

FULLTIME UNITED STATES HIRES

	FY87 ACTUAL	FY88 ACTUAL	FY89 ACTUAL	FY90 ACTUAL	FY91 ESTIMATE
IBM	2,600	2,295	1,289	830	1,400
AT&T	1,560	1,453	1,681	1,600	1,000**
GE	1,791	1,642	1,980	1,832	1,422
DIGITAL	771	765	264	100	---

**(AT&T also had 800 coops/summer for FY91)

COLLEGE RECRUITING TRENDS 1991
(College View)

UNIVERSITIES POLLED:

Cornell
Georgia Tech
MIT
Northeastern
Rensselaer Poly Tech
Stanford
U of Illinois
U of Massachusetts @ Amherst
U of Wisconsin @ Madison
Worcester Poly Tech

TRENDS:

- Overall number of companies recruiting on-campus was down in the Fall.
- The number of schedules requested by companies was down.
- The larger companies were cancelling schedules. Smaller companies were filling the gap.
- Students with technical backgrounds were being recruited for non-traditional openings; i.e., consulting firms.
- MIT is seeing a demand for software specialization in hardware companies. Cornell stated there were more software opportunities than students to fill those positions.

COMMENTS:

To drive a College Program of excellence for Digital, we need to target the brightest and best candidates in the graduating class. The students are there and we need to aim for the best.

STUDENT RANKING OF DIGITAL EQUIPMENT CORPORATION
(Student View)

March 1990 "Graduating Engineer" Magazine Survey: Top 25 Employer Choices:	1985	1987	1989
Overall:	26	6	16
Electrical:	17	4	12
Computer Science/Engineering	4	3	4

(Source on how one forms an Employer Choice)

1. News reports or articles about the company
2. Contacts with company people
3. Experience with company products/services

NATIONAL SOCIETY OF BLACK ENGINEERS MAGAZINE:

	DECEMBER 1989 SURVEY	NOVEMBER 1990 SURVEY
Overall Rating	5	15
Fulltime Careers	13	15
Summer Employment	1	14
Scholarships	1	13
Cooperative Education	4	13

CONCLUSIONS ON COLLEGE PROGRAM

1. It takes four years to build a competitive program. It takes one year to lose it. This includes competition for best engineers, best women and minority candidates, faculty mindshare, etc.

2. While traditionally larger companies have cut back on recruiting (20% plus or minus) and smaller companies have moved in to pick up some of the slack, the available pool of graduate students is shrinking. Therefore, our strategy this year should be to have a college hire program calculated to capture the best technologists to meet our needs, so that we regain our competitive position of three years ago.

3. Students are not looking at Digital's total college hire number, but rather who from their class has been hired by Digital, which in turn filters down to the incoming senior class.

CONCLUSION: We're in big trouble if we don't crank up the program this year!

WORLDWIDE ENGINEER COLLEGE HIRE
WORKFORCE PLAN

ORGANIZATION:

FY91/FY92 HIRING PLAN:

ASSUMPTIONS: These commits are inclusive of the FY91 workforce plans that were prepared by your organization for the 1/28/91 Operations Committee

The college hires will impact headcount in FY91 or FY92 depending upon when they start. We realize there is no FY92 headcount plan yet so we'll need to sort all this out.

Software Engineers

HIRES:

From College:

	Permanent	Coop/Summer
BS	_____	_____
MS/PhD	_____	_____

From Other Sources:

IM&T _____

STEP _____

EXPERIENCED/EXTERNAL _____

Total Software Engineer Hires _____ (All Sources Incl. college)

Other Engineers (Specific Majors/Technologies)

From College:

		Permanent	Coop/Summer
1)	BS	_____	_____
	MS/PhD	_____	_____
2)	BS	_____	_____
	MS/PhD	_____	_____
3)	BS	_____	_____
	MS/PhD	_____	_____

VL - SAFE SOURING
LISA RUDIN

FROM: DAVE PERSON
2/8/91

WORLDWIDE ENGINEER COLLEGE HIRE
WORKFORCE PLAN

ORGANIZATION: CORPORATE RESEARCH

FY91/FY92 HIRING PLAN:

ASSUMPTIONS: These commits are inclusive of the FY91 workforce plans that were prepared by your organization for the 1/28/91 Operations Committee

The college hires will impact headcount in FY91 or FY92 depending upon when they start. We realize there is no FY92 headcount plan yet so we'll need to sort all this out.

Software Engineers

From College:

HIRES:	FY91 Permanent	FY92	FY91 (Q4) Coop/Summer	FY92
BS				
MS/PhD	5 (Q3+4)	10	8	24

From Other Sources:

IM&T	
STEP	
EXPERIENCED/EXTERNAL	

Total Software Engineer Hires ______ (All Sources Incl. college)

Other Engineers (Specific Majors/Technologies)

From College:

		FY91 Permanent	FY92	FY91 (Q4) Coop/Summer	FY92
1)	BS				
	MS/PhD	2 (Q3+4)	3	2	6
2)	BS				
	MS/PhD				
3)	BS				
	MS/PhD				

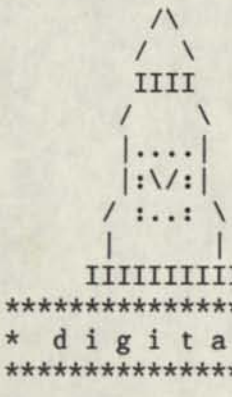
College Recruiting

RECEIVED
AUG 30 1988

INTEROFFICE * MEMORANDUM

SAM FULLER 9/23

copy of 1st page to Jane GORING & cc: McCredie Watkins



TO: Sam Fuller

DATE: 30 August 1988
FROM: Jane Goring
DEPT: MEM College Program
EXT: 223-9681
MAIL: ML03-4/T69
NODE: HAVOC::GORING

Jane Goring

f: Employment

SUBJECT: FY88 YEAR END COLLEGE RECRUITING WRAP-UP REPORT

Sam, by now you should have received the Manufacturing, Engineering, Product Marketing FY88 College, Year End, Wrap-Up Report. From the FY87 College Wrap-Up Report, you had made a suggestion that we try to get a better understanding of how our new hires' grade point averages compare to those graduating in the top 5%, top 10% of their classes.

I wanted to let you know that your suggestion was not overlooked. The U.S. Corporate Office was able to supply the data at twenty universities. When we used their information with our known GPA's, we found that our data was not complete enough to draw solid conclusions. Enclosed is what we were able to capture for FY88.

The U.S. Corporate Office for FY89 will build in my data request so that we will have a complete GPA profile for each university we recruit from. I am also communicating to my employment managers the need for each hire's GPA, whether sourced through campus recruiting or a direct mail-in. With that, for FY89, we should be able to provide a more comprehensive picture of our new college hires.

I hope all is well, and that you and your family have had a great summer.

Jane, thanks for tracking this data.
I think the key is to look for good predictors of future success at Digital. How about looking at your 1983 hires? How many still here? % of 1, 2, P3 performers. What helps some succeed more than others?

Sam Fuller

SAMPLE GPA'S OF STUDENTS HIRED INTO ~~ME&PM~~ MEM

	Known GPA's	Average Of Known GPA's	Top 5%	Top 10%	Top 15%	Top 25%	Top 50%
RPI	26	3.4	31%	31%			
WPI	3	3.7	N/A	N/A			
CORNELL	12	3.3	58%	67%			
CARNEGIE MELLON	9	3.2	0	0			
MIT	10	4.0	N/A	N/A			
U MASS	25	3.3	20%	40%			
NORTHEASTERN	26	3.3	31%	39%			
U ILLINOIS	4	4.0	N/A	25%			
GEORGIA TECH	1	3.4	0	0			
TENNESSEE STATE	3	3.0	0	N/A	33%		
U WISCONSIN	7	3.7	43%	86%			
CCNY	1	2.8	0	0			
U OF LOWELL	14	3.3	36%	36%			
BOSTON UNIVERSITY	11	3.4	27%	64%			
U NEW HAMPSHIRE	6	3.4	N/A	N/A		67%	100%
NCA&T	2	3.3	50%	50%			

MANUFACTURING, ENGINEERING, PRODUCT MARKETING

COLLEGE PROGRAM OFFICE

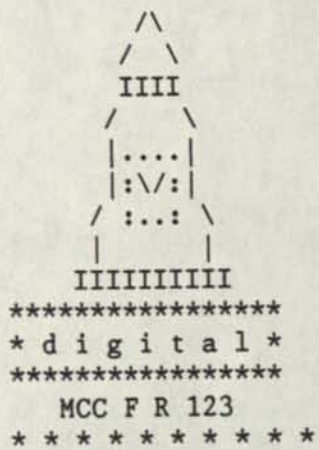
EXECUTIVE SUMMARY REPORT

FY88

TABLE OF CONTENTS

INTEROFFICE * MEMORANDUM

* *



TO: Distribution

DATE: 26 August 1988
FROM: Jane Goring
DEPT: ME&PM College Program
EXT: 223-9681
MAIL: ML03-4/T69
NODE: HAVOC::GORING

* *

SUBJECT: FY88 EXECUTIVE SUMMARY REPORT

The following information and data analyses will provide you with the summary highlights of the FY88 Manufacturing, Engineering, and Product Marketing College Program results, which represented 88% of the Corporation's total (765) College Hire Program. Given the tremendous external and internal economic pressures this past fiscal year, the college hiring results within Manufacturing, Engineering, and Product Marketing continued to demonstrate a strong commitment on the part of each organization to hire the vital technical talent needed to create, design, and manufacture the future products which will enable us to be successful in world wide markets.

* We hired 671 college graduates within ME&PM for FY88:

Manufacturing	309
Engineering	281
Product Marketing	81

(see pages 5 through 7)

College hires with technical degrees represented 82% of total hires (M=80%, E=89%, PM=61%); graduates with advanced degrees represented 36%.

* We achieved an acceptance ratio of 78% in FY88; (M=83%, E=74%, PM=77%). Given the timing of making offers, the overall and individual organizational accept percentages are excellent. The overall accept percentage was the same in the FY87 program.

* Hiring results at selected key schools are down by 1% from last year's program. The trend over the last three years shows a downward movement from the list of key schools. In FY88, 26% (N=175) of ME&PM hires were from these selected schools, versus 27% (N=190) in FY87, and 34% (N=185) in FY86 (refer to page 8). One possible explanation for this may have been due to the stall in the program, and consequently, the lateness of offers may have cost us by not having better higher results from these key campuses.

* Colleges from whom we hired most heavily (refer to page 9), are colleges with which we have a strong co-op or works-project program affiliation. Hiring results from the FY87 program showed an identical hiring pattern. With the exception of CMU, these schools are located in the New York/New England region where we have our greatest presence. Previous college hiring trends have indicated that approximately 81% of our hires are from those two geographical regions.

* The overall grade point average of the hires this year was 3.37, versus 3.32 in 1987 and 3.30 in FY86. Refer to page 10 for further analysis. I feel when presenting this data that we need to keep in mind that Grade Point Average is only one indicator we should consider in the overall evaluation of each candidate.

* Our continued efforts to strengthen our EEO/AA hiring of minorities and women resulted in an increase; 31.3% of our hires were minorities, and 26.8% were white females. Thus, 58.1% of our hires in FY88 represented minorities and women. Overall, and by individual organizations, significant strides have been made in FY88 to hire more minorities and women. Pages 11 through 15 provide historical and current information regarding minority and women college hiring results in ME&PM.

* Six major sources account for 93% of our FY88 results:

On-campus recruiting	48% (N=321)
Resumes Sent Directly To Our Office	19% (N=127)
Employee Referrals	10% (N=64)
Previous Co-op and Summer	10% (N=64)
Career Fairs	4% (N=29)
Minority and Womens Scholarship Programs	2% (N=16)

These were the same top six sources in the FY87 College Hire Program.

* Summer and Co-op programs continue to be major efforts within ME&PM, and major hiring resources for us, as noted in two previous sections of this summary. Of all available co-ops, 38% (N=75) were made offers, with 85% (N=64) accepting. Presently, within ME&PM, there are four hundred forty-one students on a rotational basis co-oping with us from over twenty-five universities. Of the students we have had with us this summer, 65% (N=194) were representative of the highly specialized minority and women's programs that we have continuously funded and sponsored since 1980. In our opinion, it is these feeder programs, the centerpiece to our long range strategic hiring goals, which will enable us to identify and attract minority and women technologists in an early identification process.

As we move into the FY89 program for ME&PM, there are some major projects we will be supporting that will ensure an even larger pool of talented technologists.

* We will continue to promote a high degree of visibility across ME&PM to the existing and new EEO/AA college programs, and we will continue to strengthen the Minority and Women's Tuition Scholarship Program. We helped in the design of the new scholarship procedures, which have become effective this quarter. The procedures clearly involve line management input, and the line will have earlier visibility with our scholars in Q2, versus end of Q3 and into Q4.

* For the first time in the history of the Scholarship Program, we are funding this fall, at 50% tuition, four entering freshmen students. These four had been identified as Gold Medal winners from the ACT-SO Program/NAACP Convention. Three of these students have been accepted at MIT. It is this early identification process that will help us to attract and retain these fine talented students. We see this process increasing and playing a major role for us in helping minority students come to Digital.

* We are in the process of gathering the FY89 College Hire Projections. We have asked each organization for projections broken down by EEO/AA goals. This will enable us to identify projected minority and women's populations earlier in the recruiting year and allow more flexibility of our sourcing capabilities.

* We are continuing to drive a very solid and comprehensive advertising campaign across the United States, aimed at every top Engineering and Computer Engineering/Science College. ME&PM will have presence in Graduating Engineer, Engineering Horizons, and Computerworld. In addition to the above-mentioned magazines, we will also be advertising in the Graduating Engineer minority publication, and Graduating Engineer women's publication. Additionally, ads will be appearing in publications of the National Society of Black Engineers Journal, National Society of Black Engineers Special Edition, American Indian Science and Engineering Society, Society of Hispanic Professional Engineers, and the National Society of Women Engineers.

* With our on-line summer and co-op tracking and administrative systems in place, we now have the capability of securing resumes of those students coming up for graduation, as they work for us. This is a more timely and cost-effective process to provide visibility to the line early in the recruiting season, thus avoiding a hit-or-miss on seeing these candidates' resumes, and increasing our yield rate on the investments we have already made.

* Additional programs that we will continue to work on during FY89 include an orientation program for new college hires that groups/sites can adapt to their own business needs, a more comprehensive summer program, and stronger/faster systems for our offices.

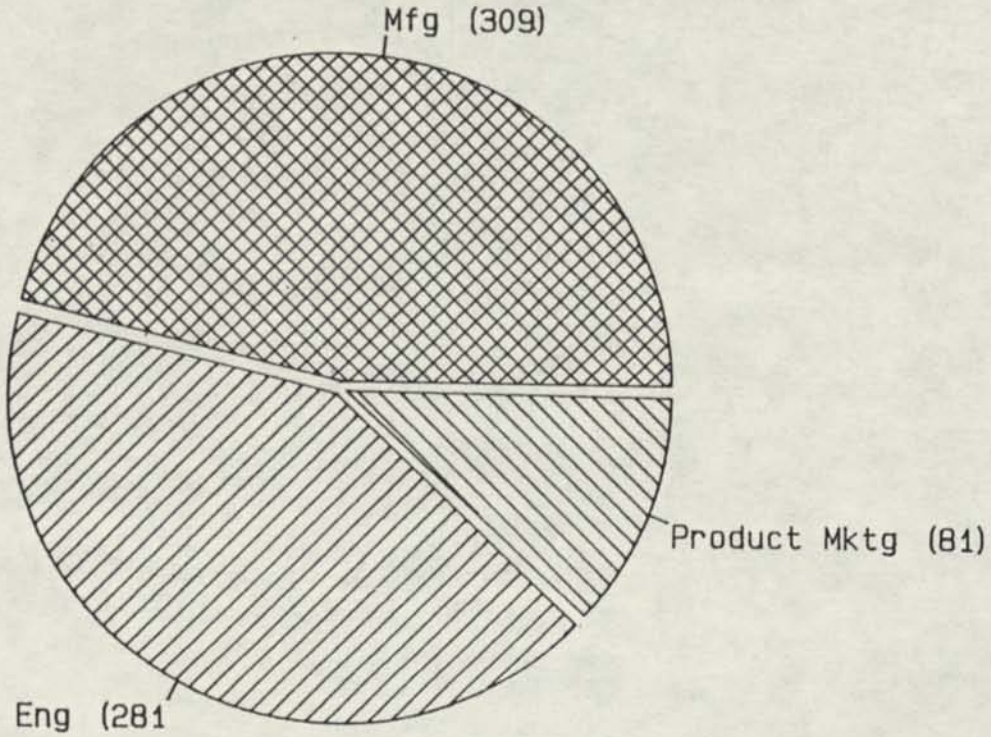
With the FY88 College Hire Program completed, we can look back at our results with pride. With so many pressures and influences affecting the program, we sincerely appreciated your commitment to drive and support an overall program of excellence. We doubly appreciated the line managers holding strong to their projected college hiring numbers, and senior managers supporting these numbers during a dynamic business cycle.

* Even with the reductions of the original projections, the total hiring numbers overall were well planned, and the organization's commitment to fill those final hiring numbers was met.

* The goal to increase our hiring efforts of minorities and women was met. That is a fine accomplishment, which was not a small effort, and showed the line's responsiveness to a hiring concern that needed to clearly change.

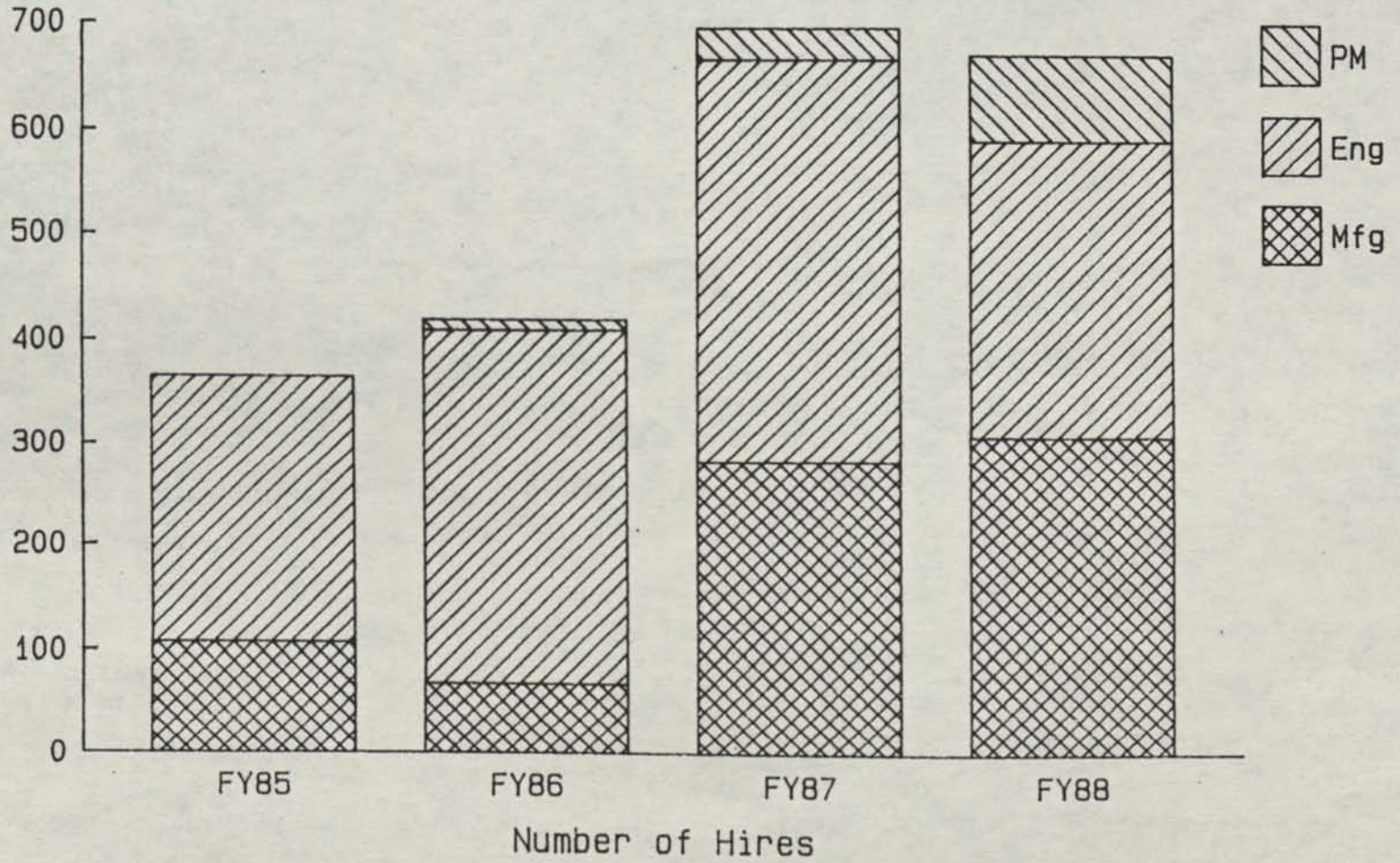
We know that in FY89, we will face a number of challenges. We are confident that we will continue to improve upon the goals and the programs, in partnership with the line's need to identify critical college hiring talent. We thank you for your valued commitment and support of the ME&PM College Program Office, and we look forward to working with all of you in FY89.

Manufacturing/Engineering/Product Marketing
FY88 Hiring Results

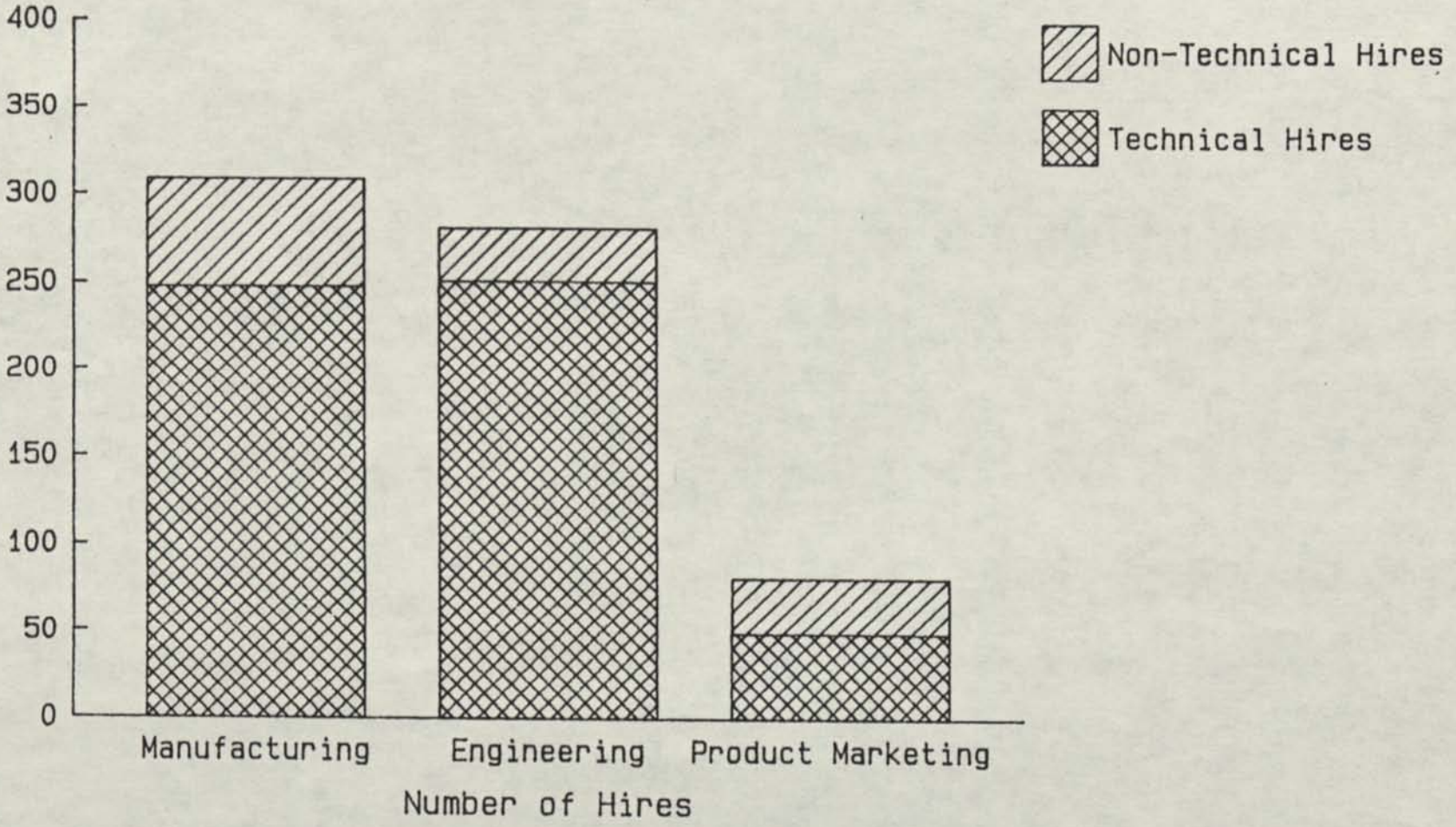


Fiscal Year 1988
Total Hires 671

Manufacturing/Engineering/Product Marketing
Hiring Results FY85 - FY88



Manufacturing/Engineering/Product Marketing
Technical College Hires

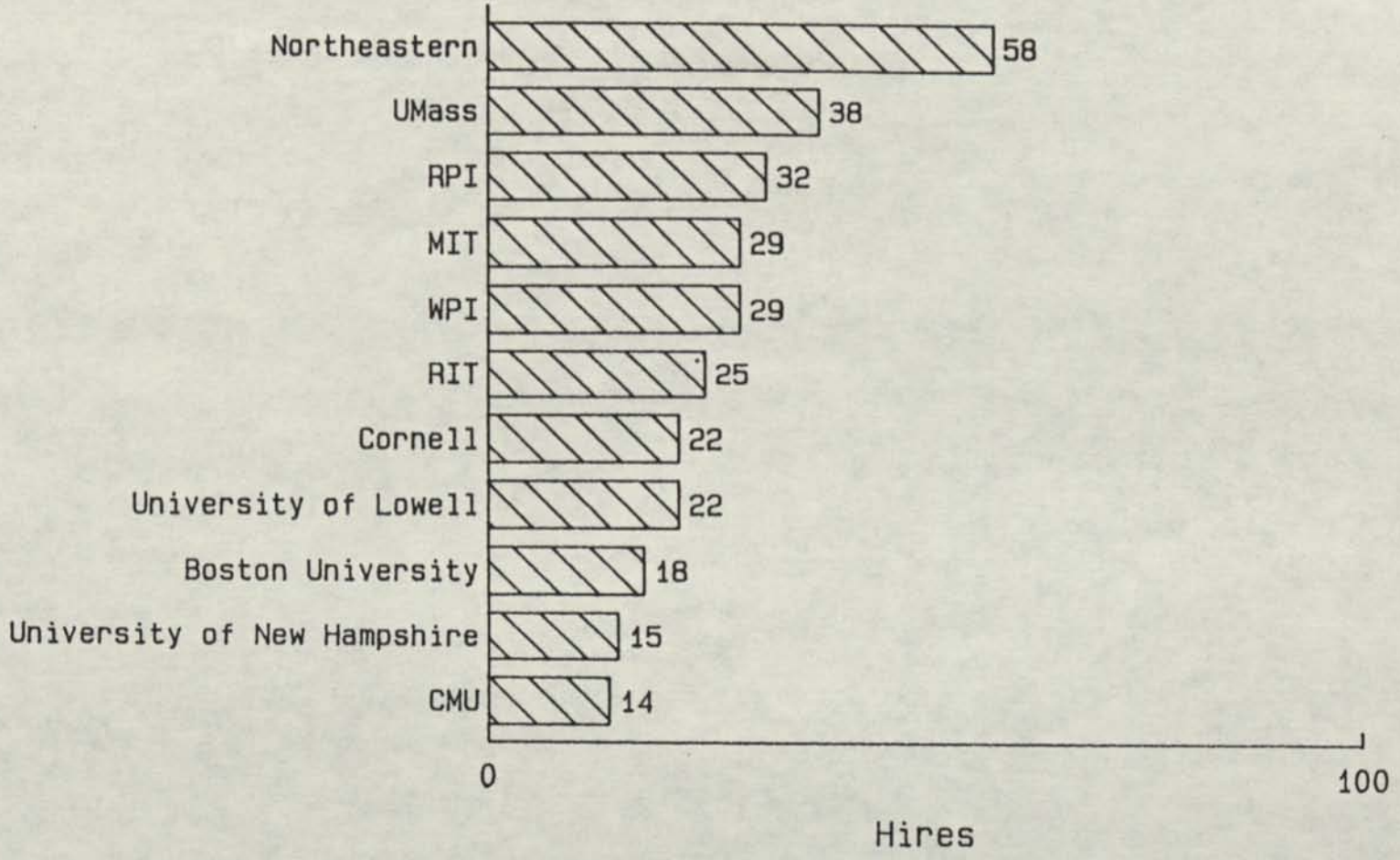


Fiscal Year 1988

HIRING RESULTS AT SELECTED SCHOOLS

	FY86	FY87	FY88
U of California at Berkeley	6	4	4
Brown University	7	7	3
Carnegie Mellon University	25	9	14
Columbia University	2	2	5
Cornell University	27	20	22
Georgia Institute of Technology	4	6	1
University of Illinois	13	15	9
Mass Institute of Technology	30	24	29
University of Michigan	7	5	9
Rochester Institute of Technology	19	29	25
Rensselaer Polytechnic Institute	34	44	32
Stanford	4	12	6
University of Washington	1	4	7
University of Wisconsin	6	9	9
TOTALS	185	190	175

Colleges With Highest Hiring Activity
FY88



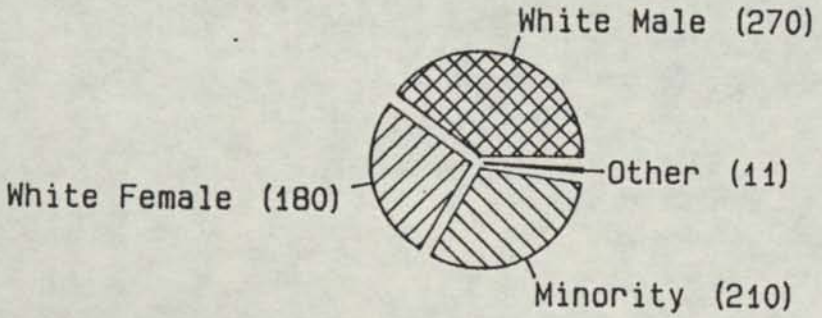
MANUFACTURING, ENGINEERING, PRODUCT MARKETING
Grade Point Averages - FY 86-FY 88

	FY86	FY87	FY88
Manufacturing	3.22	3.30	3.30
Engineering	3.36	3.38	3.50
Product Marketing	3.32	3.27	3.30

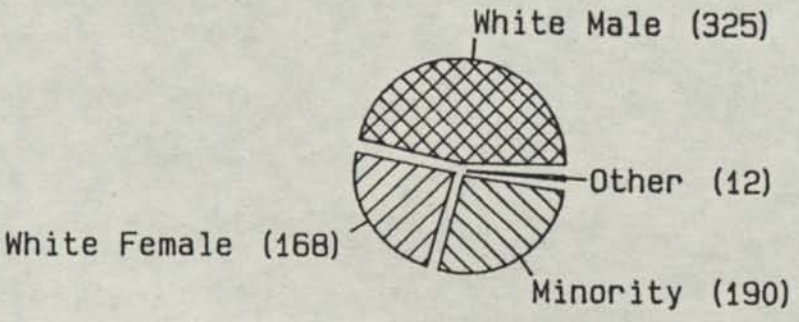
ME&PM HIRING EEO/AA HIRING RESULTS BY PERCENTAGES AND NUMBERS FY88

	MANUFACTURING	ENGINEERING	PRODUCT MKT.
M/F01, M/F03, M/F04 (Blacks, Hispanics, American Indians)	18.1% (N= 56)	8.5% (N= 24)	5.0% (N= 4)
M/F02 (Asians)	14.2% (N= 44)	24.9% (N= 70)	14.8% (N=12)
F05 (White Women)	28.8% (N= 89)	21.7% (N= 61)	37.0% (N=30)
M05 (White Men)	35.6% (N=110)	44.5% (N=125)	43.2% (N=35)
M/F06	3.2% (N= 10)	1.0% (N- 1)	-- --

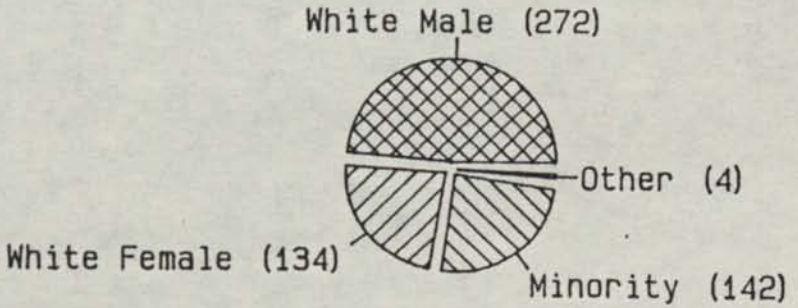
Manufacturing/Engineering/Product Marketing
College Hires by EEO/AA Groupings



FY88

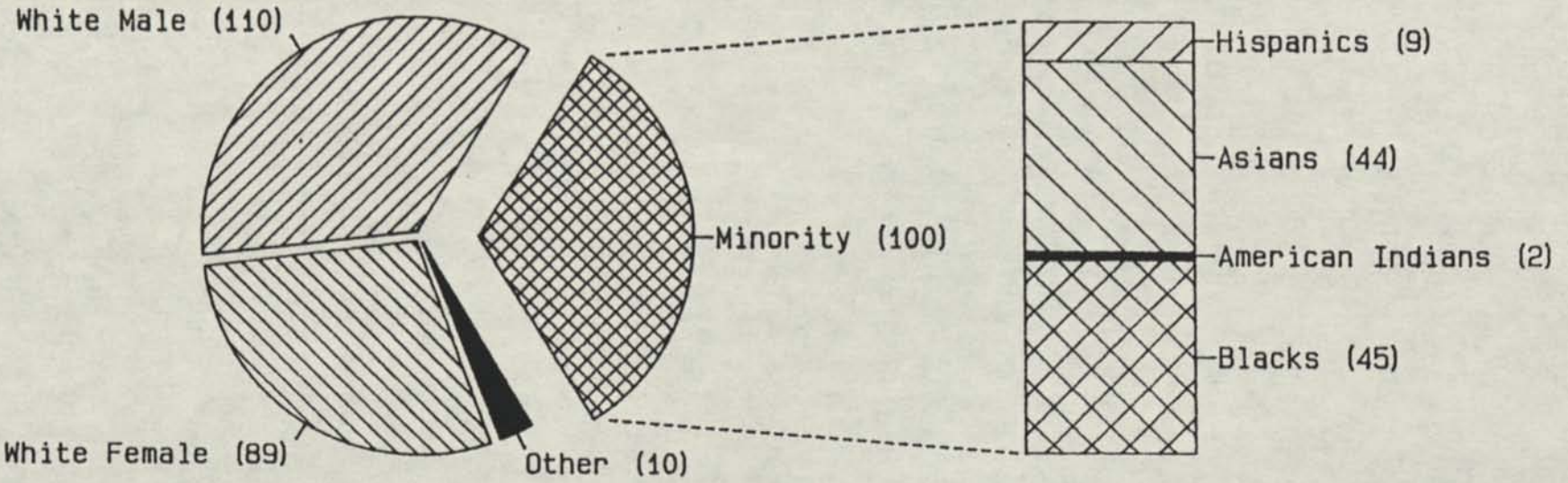


FY87



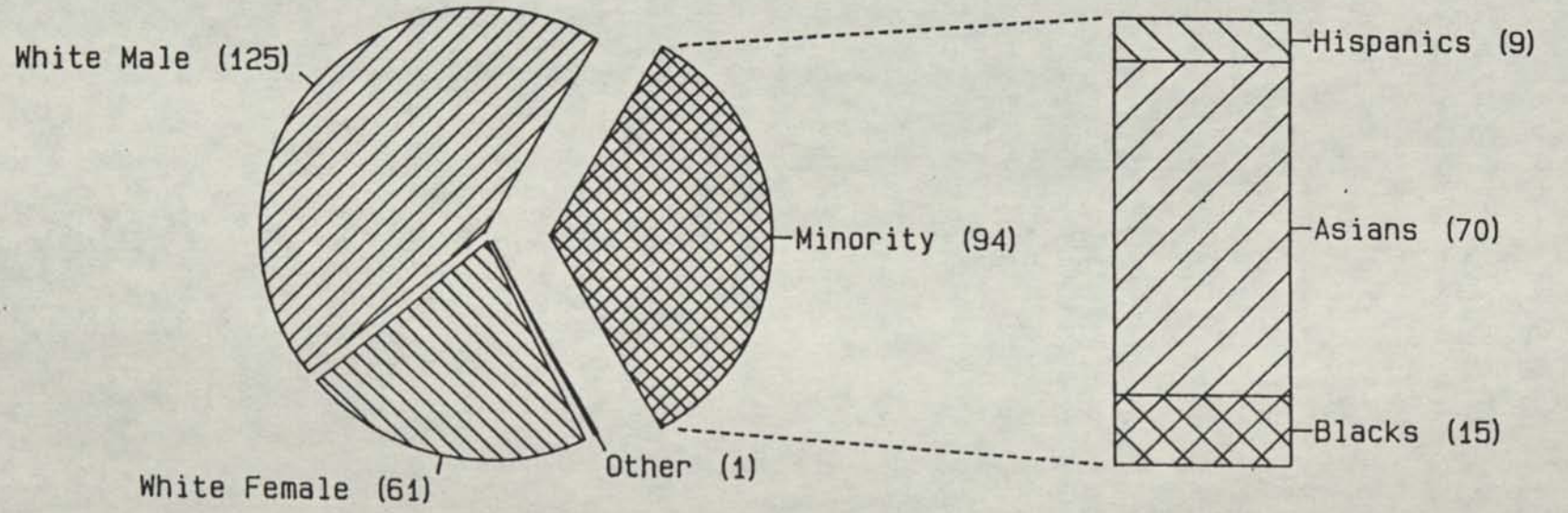
FY86

Manufacturing
College Hires by EEO/AA Groupings



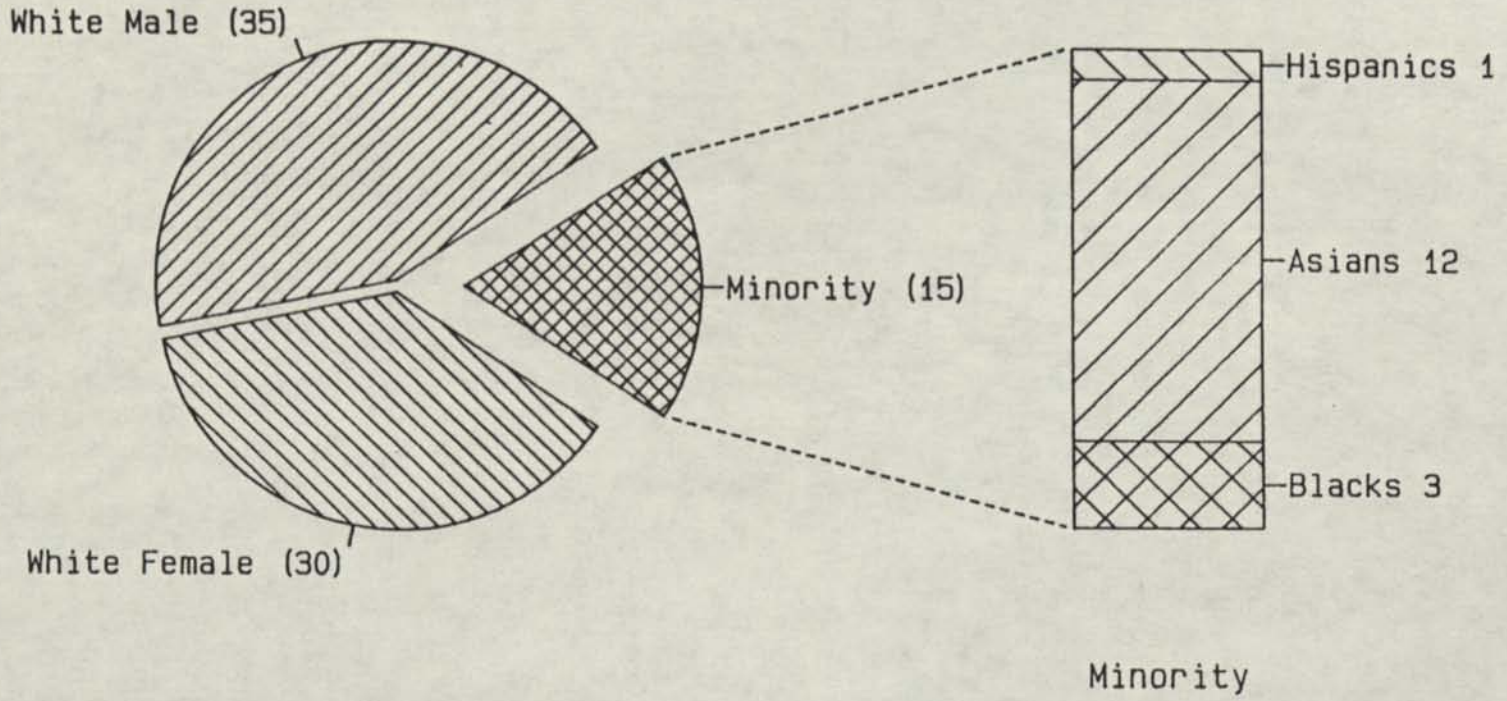
FY88

Engineering
College Hires by EEO/AA Groupings



FY88

Product Marketing
College Hires by EEO/AA Groupings



FY88

From: RDVAX::FULLER 14-MAR-1990 14:02:44.23
To: WATSON
CC: DELUCA,@SWAN
Subj: Turino return from leave of Absence

Jenny, this memo is to confirm the fact that I believe we need to process Silvo T's return to Digital as a return from a leave of absence.

Open ended questions f: interviewing / admin

Possible Interview Questions

WORK EXPERIENCE

Attitudes and Feelings About the Job/Co-workers -

Have you had to change your approach to others in order to become better accepted in your work setting?

What kind of people do you like to work with?

Do you prefer working alone or as part of a group? Why? (team player)

What kind of people do you find it most difficult to work with? Why? - people may not have the clout.

In your last job, what would you say were the main drawbacks to pursuing that kind of a job as a career?

Starting with your last job, would you tell me about your achievements that were recognized by your superiors?

What are some of the things on your job you feel you have done particularly well or in which you have achieved the greatest success? Why do you feel this way?

Can you give me an example or two of your ability to manage or supervise others?

What are some things you would like to avoid in a job? Why?

What kind of pressures do you encounter in your job?

What would you say is the most important thing you are looking for in an employer?

What were some of the things about your last job that you found difficult to do?

What are some of the problems you encounter in doing your job? How do you deal with these?

What would you say was the most, or least promising job you ever had? Why do you feel this way?

What are some of the reasons that are prompting you to consider leaving your present job?

What are some things you particularly like about your previous/current job?

Do you consider your progress on the job representative of your ability? Why?

How do you feel about the way you or others in the department were managed by your supervisor?

In what ways has your supervisor helped you to further develop your capabilities?

How do you feel your supervisor rated your work performance? What were some of the things indicated you could improve upon?

GOALS, AMBITIONS/JOB OBJECTIVES

What are your expectations around this particular position?

What is your long-term objective?

What do you feel you need to develop yourself in to be ready for such a position?

What is it you have going for you that might make you successful in such a job?

What are some things you would want to avoid in future jobs? Why?

Who or what in your life would you say influenced you most with regard to your career objectives?

Can you pinpoint any specific things in your past experiences that affected your present career objectives?

SELF-ASSESSMENT

What would you say there is about you that has accounted for your progress to date?

How about the other side of the coin? Apart from knowledge or experience, what traits or qualities do you feel could be strengthened or improved upon?

What would you say are some of the basic factors that motivate you?

What kinds of things do you feel most confident in doing?

What are some of the things you are either doing now or have thought about doing that are self-development activities?

Can you describe for me a difficult obstacle you have had to overcome? How did you handle it? How do you feel this experience affected your personality or ability?

How would you describe yourself as a person?

What do you think are the most important characteristics and abilities a person must possess to become a success? How do you rate yourself in these areas?

Do you consider yourself a self-starter? If so, explain, why.

What things in life that you have been asked to do have you found to be the hardest?

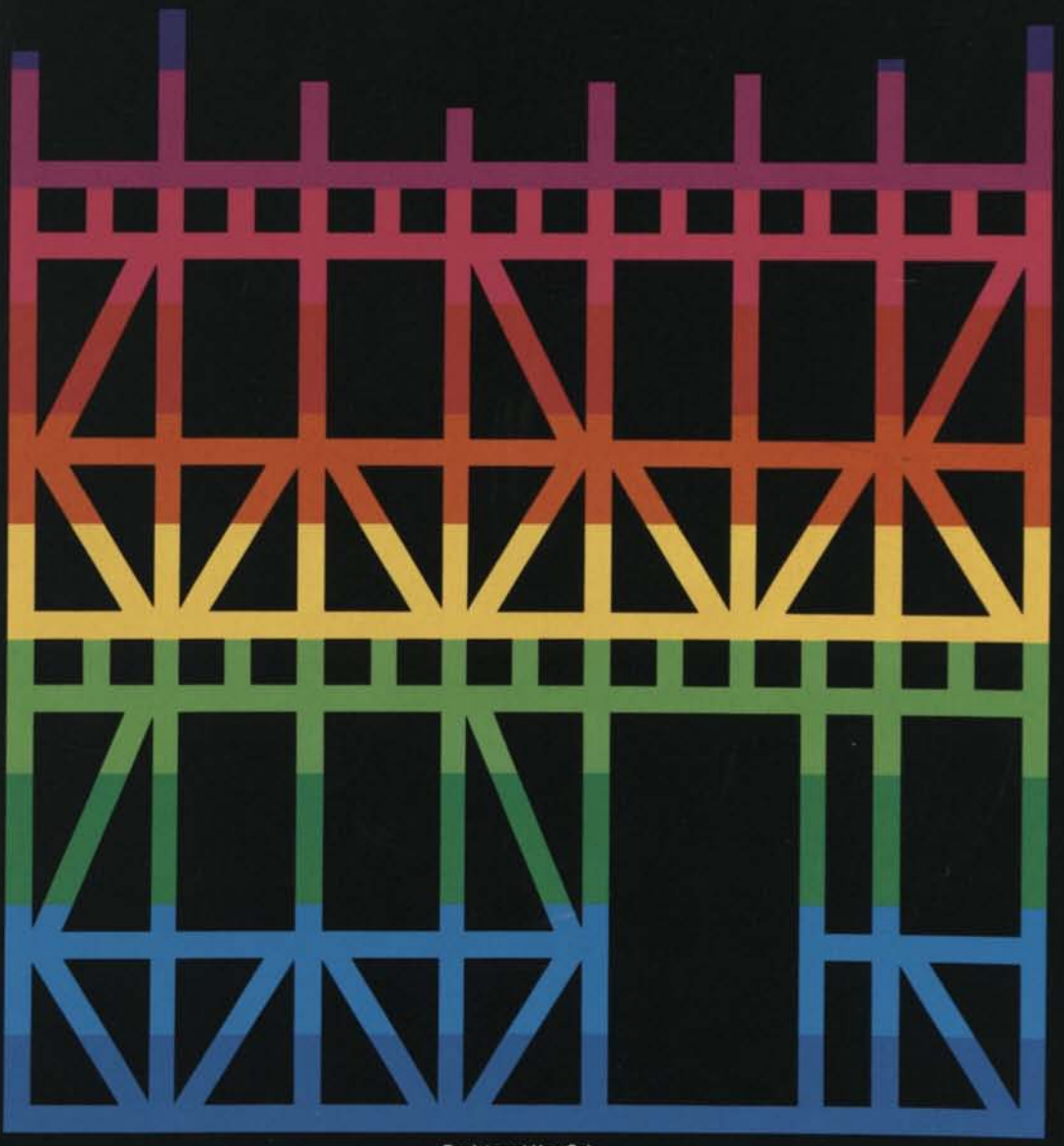
What would you consider to be your greatest achievement to date? Why?

What things give you the greatest satisfaction?

What things frustrate you the most? How do you usually cope with them?

digital

Job Evaluation and Classification — in Perspective



For Internal Use Only

Why Did Digital Initiate the JEC Project?

For the past 30 years, as jobs have been created, each has been evaluated and given a job title, job code and salary range that positions it in an overall hierarchy called the job structure.

Over time, various organizations within Digital may have used different methods to evaluate work. In some cases, this meant that similar jobs were being described differently from one organization to another. This has made it more difficult to compare jobs across functions. As Digital has grown and diversified in people and products, the need to have a consistent method for evaluating work and classifying employees across functions has become clear.

As a result of JEC, Digital has taken a serious look at the job structure created over three decades to assure that there is consistency in the way jobs are identified, described and positioned across the company. The new structure is credible, consistent across organizations and responsive to management and employee needs.

What Has Happened So Far?

Much time and effort has been spent on the JEC project during the past year.

First, senior managers from across the company identified a set of criteria or "factors" to help define and differentiate jobs. These factors enable managers to look at the same criteria when evaluating the content of one job versus the content of another job. In this way, jobs can be compared consistently to each other within and across functions. The degree to which these factors are key to the job determines the position of the work in the job structure.

The factors are:

- participation in decision-making
- effect on financial results
- management or influence of people
- problem-solving complexity
- qualifications required

These five factors were customized to suit Digital's unique culture and values.

Second, information was collected on about 300 jobs, called "benchmarks." Benchmarks are jobs that can be compared, through marketplace surveys, to similar jobs in other companies. Such surveys enable Digital to determine competitive salaries.

Third, benchmark jobs were evaluated and then placed into a hierarchy. This hierarchy is the foundation of the new job structure for all exempt jobs.

Who Is Involved in JEC?

Since JEC will ultimately have an impact on every exempt employee in the U.S., the process has been designed to encourage the participation and involvement of every employee who will be affected.

To date, a cross-section of managers and employees has been involved at every stage, from project design and development to implementation strategies and project schedules.

Over 200 senior line mangers, for example, participated in 19 cross-functional committees to evaluate benchmark jobs. In addition, several task forces and committees were established to help direct and manage the project.

All exempt employees are participating in the process by filling out a questionnaire to provide job content information.

Broad participation has helped to steer and validate the project at each step along the way, assuring that all interests are represented and that channels for sharing information are in place.

What Comes Next?

One of the most important events in the JEC process — classification — occurs next. During this phase, the work of every exempt employee will be matched to a job description and assigned a job code, job title, and job level.

Managers who supervise exempt employees and are knowledgeable about the work content of their jobs are responsible for employee classification. They will receive comprehensive training prior to classification to assist them in this role.

All exempt employees will participate in the classification process by completing the Job Overview Questionnaire (JOQ) to provide information about their job's tasks and responsibilities. This information will help managers to assess the work that employees are currently performing and match it to appropriate job descriptions.

When classification begins, job descriptions will exist only for benchmark jobs. To create descriptions for all jobs, several hundred employees will be asked to complete a full Job Profile Questionnaire (JPQ) to describe the work they perform in more detail. By the end of classification, appropriate job descriptions will exist for all exempt work.

What Changes Can Employees Expect?

Since one outcome of JEC is the creation of a new job structure, exempt employees can expect changes in their classification. Job descriptions, job titles, job codes, and job levels will reflect the work currently being done. Managers will meet with all exempt employees to discuss their new classification prior to the effective date of the changes.

No employee's current pay will be reduced as a result of JEC; reporting relationships will not change; work will not be eliminated; and the work performed will not be affected. Work may, however, be better defined through the use of the new job descriptions.

Future salary increases will continue to be based on an employee's performance and position in the appropriate salary range. The JEC project focuses entirely on job content, not on an individual's performance in the job.

If an employee disagrees with the appropriateness of his/her classification, the employee may request a review following procedures outlined in the JEC Classification Review Policy (available from managers or Personnel).

What Is the End Result of JEC?

The JEC project has taken enormous time, resources, and commitment and it represents a major investment by Digital. At the completion of the project:

- over 40,000 exempt employees in the U.S. will be classified using the new process;
- job descriptions that accurately describe the work being done will exist for all exempt jobs;
- managers and employees will have access to an on-line, automated data base of job descriptions to assist in career pathing and classification; and
- a new methodology will exist for evaluating jobs and classifying employees that can be used for many years to come.

Who Can Answer Questions About JEC?

Managers are the prime resource for further information about JEC. They will be trained and kept informed about the project to help them communicate to their employees. They will meet with employees in staff and one-on-one meetings to discuss the JEC project and to answer any questions.

Employees are encouraged to ask questions, participate, and seek out more information.

Personnel is a resource to consult with managers and employees through all phases of the JEC project.

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call Job Evaluation
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empt employees in the future.
that all employees understand
ose and scope. The information
rovides an overview so that
icipate their role in the project
or future impact on their job.

egan a major U.S.-wide project
and Classification, or JEC. The
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project will affect the job classi-
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exempt employees because
s increased rapidly in recent
roject is completed, the com-
hether a similar process should
valuate non-exempt jobs.

JEC
JOB EVALUATION
& CLASSIFICATION

PROBLEM STATEMENT

INDIVIDUAL CONTRIBUTORS DOING APPLIED RESEARCH ARE NOT CURRENTLY COVERED BY A DIGITAL JOB DESCRIPTION.

- CURRENT PRACTICE HAS BEEN TO IGNORE EXISTING RANGES/TITLES (123% COMPA RATIO)

- CONSULTANT REVIEW PROCESS DOES NOT FULLY CONSIDER RESEARCH FUNCTION IN CRITERIA EFFECTIVELY ELIMINATING LEVEL 12/14 FOR RESEARCH.

OBJECTIVE

EVALUATE WORK IN RESEARCH ENVIRONMENT AND CLASSIFY EMPLOYEES INTO RESULTING JOBS.

ENSURE PROCESS IS CONSISTANT WITH OTHER NON-RESEARCH JOBS.

PROCESS FOR EVALUATION OF WORK

- CREATE JOB DESCRIPTIONS FOR EXISTING WORK

- JPQ INCUMBENTS

- HAVE DESCRIPTIONS AND JPQ RESULTS EVALUATED BY JEC COMMITTEE(s) (E & J) AS WITH ANY OTHER ENGINEERING NON-BENCHMARK JOB.

- THREE POSITIONS TO BE EVALUATED

PROCESS FOR CLASSIFICATION

- ESTABLISH CRITERIA MATRIX FOR RESEARCH

- POSITIONS SIMILAR TO CONSULTANT REVIEW PROCESS

- PRESENT CRITERIA TO CONSULTANT REVIEW BOARD

    - IS THIS CRITERIA SIMILAR TO THE POINT THAT THE CRB CAN INCLUDE IT AS PART OF THIER PROCESS.

    - CAN THE CRB BE AMENDED THROUGH ADDITIONAL MEMBERS TO INCLUDE THIS WORK.

    - SHOULD WE CREATE A SEPARATE BOARD.

- CLASSIFY EXISTING EMPLOYEES WITH RESULTS OF DECISION.

ISSUES

- WILL NEW STRUCTURE FIT RESEARCH JOBS

  - CURRENT SALARIES NEED TO BE MODELED AGAINST NEW STRUCTURE.

- WILL/SHOULD THIS NEW JOB FAMILY BE FOR RESEARCH POSITIONS OUTSIDE OF CRA

- HOW MUCH AUTONOMY ARE RESEARCH MANAGERS LOSING WITH CONSULTANT REVIEW BOARD.

PROPOSED RESEARCH JOBS vs. CURRENT STRUCTURE

Engineering Titles	Research Titles	Current Structure			Current Research Salaries
		Min.	Mid.	Max.	High/Low
Principal Engineer	Principal Researcher	40,000	51,300	62,600	56K - 63K
Consultant Engineer	Research Staff Member	48,000	62,100	76,300	74K - 84K
Sr. Consultant Engineer	Sr. Research Staff Mem.	70,400	92,400	114,400	85K - 116K

PROMOTION CRITERIA FOR CONSULTING & SENIOR CONSULTANT ENGINEER:

POSITION	PRINCIPAL ENGINEER (REFERENCE)	CONSULTANT ENGINEER	SENIOR CONSULTANT ENGINEER	CORPORATE CONSULTANT (REFERENCE)
Number of major technical contribution(s)		1 or more	2 or more	3 or more
Relevant years of experience typical	8	10	14	17
Education Requirement	BS or equivalent experience	MS or equivalent experience	MS or equivalent experience	MS or equivalent experience
Continued education over the past 5 years - (courses, seminars papers)	← ON GOING TECHNICAL EDUCATION →			
Technical leadership (task force consulting to management)	Project	Group	PBU	Engineering
Breadth & visibility of contribution	Group	PBU	Engineering	Corporate
Skill/knowledge breadth & depth	Working knowledge of one or more areas	PBU leader in area of specialty	Engineering leader in area of specialty	Corp./Industry leader in area of specialty: broad working tech. knowledge.

PROMOTION CRITERIA FOR RESEARCH STAFF MEMBER & SENIOR RESEARCH STAFF MEMBER

Position	Principal Researcher	Research Staff Member	Senior Research Staff Member
Number of Major Research Contributions	1	2 or more	3 or more
Research Contributions • Major System Implementation or Prototype • Patents • Publishing	Few	Several	Many
Technology Transfer Activities Consulting, Task Force Participation, Seminar Leadership	Few	Several	Many
Visibility of Research Contribution	Within & Across Labs; Research Community	Within & Across Labs; Advanced Development/ Product Groups; Research Community	Within & Across Labs; Research Community, Advanced Development/ Product Groups; Technical & Product Strategy Development
Skill/Knowledge Breadth & Depth	Working Knowledge or 1 or more Research Areas	Technical Leader in Area of Speciality; Recognized Authority; Mature Technical Judgement	Sustained Excellence in Area of Speciality; High Level of Innovations, Vision
Years Since First Degree (Typical)	5 - 10	8 - 20	15 +
Education Requirement	PHD or Equivalent Attainment	PHD or Equivalent Attainment	PHD or Equivalent Attainment

DRAFT

POSITION TITLE: PRINCIPAL RESEARCHER

Position Function:

Within the broad mission of a group, the Research Staff Member I, is effective in generating new ideas and concepts while performing advanced scientific studies. These scientific activities may be theoretical or experimental (or both) in nature. They result in highly complex, original and creative scientific achievements requiring application of advanced computer science.

Nature and Scope:

1. Generates highly novel ideas (theoretical or experimental), evaluates them, plans, and is involved in, their execution and their implementation;

2. Invents and designs complex prototypes and/or processes and is often involved in engineering these to an advanced state of prototype feasibility; and,

3. Disseminates, internally and externally, the results of such activities through publications, patent disclosures, seminar participation, and internal documentation.

4. Represents the Company at professional meetings, professional societies and universities.

5. Keeps technically abreast of the literature and progress within his/her specific and related areas of expertise.

6. Functions as an internal consultant in his/her areas of professional expertise and provides technical guidance within the organization: this includes technology transfer within the Company's engineering and research communities.

7. Assists in the selection, recruiting, and later evaluation of other highly qualified professionals, especially in his/her areas of expertise.

Position Requirements:

Utilizes, in her/his work, advanced scientific and technical knowledge as would normally be obtained through graduate study, usually through the PhD level. Demonstrates originality and inventiveness in computer science and exhibits superior scientific proficiency and/or potential as an expert in the field as judged by his/her peers.

DRAFT

POSITION TITLE: RESEARCH STAFF MEMBER

Position Function:

Within the broad mission of a group, is effective in generating new ideas and concepts while performing advanced scientific studies resulting in highly complex, original and creative scientific achievements requiring application of advanced computer science and may technically direct other staff members and technical support personnel.

Nature and Scope:

1. Generates highly novel ideas (theoretical or experimental), evaluates them, plans, and is involved in, their execution and their implementation; is expected to exercise initiative and resourcefulness in contributing to problem selection and approach (their own and others).

2. Invents and designs complex prototypes and/or processes and is often involved in engineering these to an advanced state of prototype feasibility; and,

3. Disseminates, internally and externally, the results of such activities through publications, patent disclosures, seminar participation, and internal documentation.

4. Represents the Company at professional meetings, professional societies and universities.

5. Keeps technically abreast of the literature and progress within his/her specific and related areas of expertise.

6. Functions as an internal consultant in his/her areas of professional expertise and provides technical guidance within the organization: this includes technology transfer within the Company's engineering and research communities.

7. Assists in the selection, recruiting, and later evaluation of other highly qualified professionals, especially in his/her areas of expertise.

8. May direct technically, within the broad mission of the group, activities of other RSM's and technical support persons in the implementation of ideas.

Position Requirements:

Utilizes, in her/his work, advanced scientific and technical knowledge as would normally be obtained through graduate study, usually through the PhD level. Demonstrates originality and inventiveness in computer science and exhibits superior scientific proficiency and/or potential as an expert in the field as judged by his/her peers.

POSITION TITLE: SENIOR RESEARCH STAFF MEMBER

Position Function:

Within the broad mission of the group, is effective in generating new ideas and concepts while performing advanced scientific studies. These scientific activities may be theoretical, or experimental (or both) in nature. They result in highly complex, original and creative scientific achievements requiring application of advanced computer science. The Research Fellow technically directs other staff members and technical support personnel as the situation requires.

Nature and Scope:

1. Generates highly novel ideas (theoretical or experimental), evaluates them, plans, and is involved in, their execution and their implementation; is expected to exercise initiative and resourcefulness in contributing to problem selection and approach (their own and others).

2. Invents and designs complex prototypes and/or processes and is often involved in engineering these to an advanced state of prototype feasibility; and,

3. Disseminates, internally and externally, the results of such activities through publications, patent disclosures, seminar participation, and internal documentation.

4. Represents the Company at professional meetings, professional societies and universities.

5. Keeps technically abreast of the literature and progress within his/her specific and related areas of expertise.

6. Functions as an internal consultant in his/her areas of professional expertise and provides technical guidance within the organization: this includes technology transfer within the Company's engineering and research communities. May sit on established committees.

7. Assists in the selection, recruiting, and later evaluation of other highly qualified professionals, especially in his/her areas of expertise.

8. Directs, technically, within the broad mission of the group, activities of other RSM's and technical support persons in the implementation of ideas.

Position Requirements:

Utilizes, in her/his work, advanced scientific and technical knowledge as would normally be obtained through graduate study, usually through the PhD level. Demonstrates originality and inventiveness in computer science and exhibits superior scientific proficiency and/or potential as an expert in the field as judged by his/her peers.

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JOB TITLE: HARDWARE PRIN ENGINEER JOB CODE: 28AD
JOB FUNCTION: HARDWARE ENGINEERING

FLSA STATUS: Exempt Last Update: 30-NOV-1987
GOVERNMENT CODE: 02
JOB TYPE: Exempt

SUMMARY:

Performs highly complex engineering duties in the design, development, and analysis of computer products or systems. Functions as a project engineer. Conceives, proposes, and sells new ideas and products in the engineering organization, and guides their implementation to a final product or system. Is expected to supply technical direction on major engineering projects. Responsibilities are those of an emerging authority in the area of specialty.

TASKS:

1. Usually functions as project engineer. Initiates, guides and coordinates the overall design and development effort for computer products or systems. Investigates the use of new technology to meet current and future needs. Works fairly independently, starting with product definition and continuing through product release. Establishes the overall scheme of design and method of approach to be used to meet project requirements and stay consistent with product or customer needs.

   Writes and presents project proposals. Is expected to generate and meet goals and schedules for the project. Develops time and cost estimates covering all phases of project work. Designs and writes project specifications for the product. Assigns areas of work to other project team members and guides and directs them in development of the detail design. May specialize in one area of development or design, or may be involved in total systems engineering or product support.

3. Represents the work unit as the prime contact on the project. Interacts with a variety of groups and managers on significant technical matters that often require coordination across organizational lines.

4. Plans and coordinates technical tasks in the project such as technical documentation, test procedures, and design configurations. Keeps up-to-date with new techniques and advances in own and related technical fields in case new techniques can be applied to product design and development.

   Performs other related duties as required.

JOB TITLE: HARDWARE PRIN ENGINEER JOB CODE: 28AD

BREADTH Decisions are usually limited to immediate assigned function.

PROBLEM SOLVING COMPLEXITY:

SCOPE Solves problems involving very complex technical issues across multiple disciplines. Problems, while unique, are more tactical in nature, having short-term implications of less than one year. May work with technical people outside of Digital in order to solve problems.

GUIDANCE Limited guidance is available.

QUALIFICATIONS:

BREADTH Needs some in-depth knowledge of Digital organization and policies.

DEPTH Typically requires business, technical or functional knowledge at the mastery level. Needs administrative or operations knowledge.

SKILLS Must have good project management skills. Should also be skilled in analysis, scheduling, controlling, and presentation.

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JOB TITLE: HARDWARE ENGINEERING CONS JOB CODE: 28AE
JOB FUNCTION: HARDWARE ENGINEERING

FLSA STATUS: Exempt Last Update: 30-NOV-1987
GOVERNMENT CODE: 02
JOB TYPE: Exempt

SUMMARY:

Provides technical direction and advice to management in long-range planning for new or projected technologies. Researches new and emerging technologies, new project directions, and new applications. Provides expert guidance to engineers and support staff.

TASKS:

1. Provides a strong technical focus for design and development from the initial proposal of need for a product or system through the final detail design and successful manufacture of the product. Takes into account both business and technical viewpoints in product planning.

2. Provides technical direction to all levels of engineers. May direct the technical work of others on major products.

3. Maintains regular contact with engineering personnel throughout the company.

. Adheres to and contributes to corporate or industry level standards.

5. Keeps up-to-date in area of expertise, and demonstrates technical leadership by taking part in standards committees.

6. May participate in symposia or conferences, and contributes to technical publications.

Performs other related duties as required.

This description is not intended to be a complete statement of the position, but rather to act as a guide to the general work to be performed.

Use of this job code requires approval by the Consultant Engineering Promotion Board.

EFFECT ON FINANCIAL RESULTS:

JOB TITLE: HARDWARE ENGINEERING CONS JOB CODE: 28AE

SCOPE	Is typically confronted with multidisciplinary issues, often strategic in nature, which may have impact over a relatively long time span (several years). Must frequently be resourceful and original in formulating solutions. Problems are occasionally technical and may affect more than one organization.
GUIDANCE	Adheres to corporate goals.

QUALIFICATIONS:

BREADTH	Needs to know Digital policies, markets, and processes. May require specialized functional knowledge.
DEPTH	Typically requires mastery to state-of-the-art technical, functional, or business knowledge. Emphasis of the position is on depth of knowledge in a specialized area.
SKILLS	Needs some managerial and planning skills, as well as skills in analysis, innovation, communication, and negotiation.

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JOB TITLE: HAREWARE ENG SENIOR CONS
JOB FUNCTION: HARDWARE ENGINEERING

JOB CODE: 28AF

FLSA STATUS: Exempt
GOVERNMENT CODE: 02
JOB TYPE: Exempt

Last Update: 30-NOV-1987

SUMMARY:

Serves as a corporate resource, providing technical direction and advice to management in long-range planning. Considers new or projected areas of technological research, new technologies, and new applications. Recommends and provides technical direction and strategy, and develops information that extends the field of knowledge in area of expertise.

TASKS:

1. Works independently within general guidelines. Develops proposals leading to the exploration of new technologies, products, and ideas.

2. Provides technical focus for design and development from the intial proposal of need for a product or system through the final detail design and successful manufacture of the product. Takes into account both business and technical viewpoints in product planning, specification, and design.

3. Provides technical advice and assistance, usually definitive, to all levels of engineers and managers. May provide technical direction on a critical development project. May act as a project leader or direct the others who work on major products or engage in advanced research.

4. Provides effective technical force in making sure that management, product line supervisors and customers are aware of strategic and technical issues before making decisions.

5. Maintains regular contact with engineering personnel throughout the company.

6. Adheres to and contributes to corporate or industry standards.

7. Keeps up-to-date in area of specialization. Stays professionally active outside the company. Publishes in technical journals, writes comprehensive design documents, and participates in design groups and standards committees.

8. Meets with customers and representatives of other corporations in order to represent Digital views.

JOB TITLE: HAREWARE ENG SENIOR CONS JOB CODE: 28AF

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such as methods and standards, investments, technology definition.

REVIEW Few guidelines available.

TIMEFRAME Impact of decisions may extend up to five years.

BREADTH May play a role in some corporate or cross-functional decisions.

PROBLEM SOLVING COMPLEXITY:

SCOPE Encounters problems that are very broad in scope and diverse in nature, with long-range organizational implications (several years). Is often required to deal with strategic business issues that affect more than one organization. Usually has no define or redefine problems.

GUIDANCE Adheres to corporate goals.

QUALIFICATIONS:

BREADTH Needs broad knowledge of Digital policies, products, markets, and processes, as well as an understanding of business management principles and practices.

DEPTH Typically requires state-of-the-art technical, functional, or business knowledge.

SKILLS Needs skills in management, planning, problem solving, innovation, analysis, communication, and negotiation.

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JOB TITLE: SOFTWARE PRIN ENGINEER JOB CODE: 50AD
JOB FUNCTION: SOFTWARE ENGINEERING

FLSA STATUS: Exempt Last Update: 30-NOV-1987
GOVERNMENT CODE: 02
JOB TYPE: Exempt

SUMMARY:

Performs highly complex engineering duties in design, development, and analysis. Functions as a project engineer. Conceives, proposes, and sells new ideas and products in the engineering organization, and guides their implementation to a final product or system. Provides technical direction on major engineering projects. Responsibilities are those of an emerging authority in the area of specialty.

TASKS:

1. Initiates or reviews proposed hardware architecture for software impact. Provides system level and demonstration software for delivered hardware.

2. Works on designs that span several groups or affect hardware decisions.

3. Collects, reviews, and evaluates hardware design documents. Evaluates and reviews software requirements. Develops preliminary software plan. Recommends hardware changes.

4. Determines software goals and objectives. Analyzes stated goals of project. Collects data on projected use of hardware. Evaluates availability of personnel and computing resources. Reviews existing similar systems. Reviews any available marketing information.

5. Typically leads a complex project or works on a significant piece of new design and directs its implementation.

6. Can translate market and product requirements into technical solutions and deliver those solutions.

7. Provides comments and suggestions for changes in proposed standards. Reviews compatibility with other applicable standards. Reviews applicability of proposal and evaluates proposal against requirements. Develops, documents, and drafts a response.

8. Gives technical advice and supervision to members of a project team. Reviews and approves software designs. Ensures that parts developed by different team members are compatible. Drafts or

J TITLE: SOFTWARE PRIN ENGINEER JOB CODE: 50AD

ROLE — Gives heavy technical input into decisions. May make or participate in decisions on work assignments, schedule revisions, design features, resource allocations.

REVIEW — Limited guidelines available. Receives limited review of decisions.

TIMEFRAME — Impact of decisions typically extends from six months to one year.

BREADTH — Decisions are usually limited to immediate assigned function.

PROBLEM SOLVING COMPLEXITY:

SCOPE — Solves problems involving very complex technical issues across multiple disciplines. Problems, while unique, are more tactical in nature, having short-term implications of less than one year. May work with technical people outside of Digital in order to solve problems.

GUIDANCE — Limited guidance is available.

QUALIFICATIONS:

BREADTH — Needs some in-depth knowledge of Digital organization and policies.

DEPTH — Typically requires business, technical or functional knowledge at the mastery level. Needs administrative or operations knowledge.

SKILLS — Must have good project management skills. Should also be skilled in analysis, scheduling, controlling, and presentation.

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JOB TITLE: SOFTWARE ENGINEERING CONS JOB CODE: 50AE
FUNCTION: SOFTWARE ENGINEERING

FLSA STATUS: Exempt Last Update: 30-NOV-1987
GOVERNMENT CODE: 02
JOB TYPE: Exempt

SUMMARY:

Serves as a corporate resource, providing technical direction and advice to management in long-range planning for new or projected areas of technological research. Designs, researches, and develops new systems at the product level. Provides expert guidance to engineers and support staff.

TASKS:

1. Provides a strong technical focus in product planning for a complete software system. Coordinates the involvement of management, product line, and customers in developing new applications and technologies. Takes into account both business and technical viewpoints in product planning.

2. Provides technical direction to all levels of engineers. Typically leads a highly strategic product or a software architecture effort.

3. Maintains regular contact with engineering personnel throughout the company.

4. Works with technical writers to provide accurate and timely documentation.

5. Adheres to and contributes to corporate or industry level standards.

6. Keeps up-to-date in area of expertise, and demonstrates technical leadership by taking part in standards committees.

7. May participate in symposia or conferences, and contributes to technical publications.

Performs other related duties as required.

This description is not intended to be a complete statement of the position, but rather to act as a guide to the general work to be performed.

Use of this job code requires approval of the Consultant Engineering

JOB TITLE: SOFTWARE ENGINEERING CONS JOB CODE: 50AE

PROBLEM SOLVING COMPLEXITY:

SCOPE	Is typically confronted with multidisciplinary issues, often strategic in nature, which may have impact over a relatively long time span (several years). Must frequently be resourceful and original in formulating solutions. Problems are occasionally technical and may affect more than one organization.
GUIDANCE	Adheres to corporate goals.

QUALIFICATIONS:

BREADTH	Needs to know Digital policies, markets, and processes. May require specialized functional knowledge.
DEPTH	Typically requires mastery to state-of-the-art technical, functional, or business knowledge. Emphasis of the position is on depth of knowledge in a specialized area.
SKILLS	Needs some managerial and planning skills, as well as skills in analysis, innovation, communication, and negotiation.

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JOB TITLE: SOFTWARE ENG SENIOR CONS JOB CODE: 50AF
JOB FUNCTION: SOFTWARE ENGINEERING

FLSA STATUS: Exempt Last Update: 30-NOV-1987
GOVERNMENT CODE: 02
JOB TYPE: Exempt

SUMMARY:

Serves as a corporate resource, providing technical direction and advice to management in long-range planning. Considers new or projected areas of technological research, new technologies, and new applications. Recommends strategy, provides technical direction, and develops information that extends the field of knowledge in area of expertise.

TASKS:

1. Develops proposals leading to the exploration of new technologies, products, and ideas.

2. Coordinates management, product line, and customers in developing and implementing new applications and operations programs. Considers both business and technical viewpoints in product planning, specification, and design.

3. Provides technical advice and assistance, usually definitive, to all levels of engineers and managers. May provide technical direction on a critical development project. May act as project leader or direct the work of others engaged in major product development or advanced research.

4. Provides technical influence to ensure that management, product line, and customers are aware of strategic and technical issues before reaching decisions.

5. Maintains regular contact with engineering personnel throughout the company.

6. Adheres to and contributes to corporate or industry standards.

7. Keeps up-to-date in area of specialization. Stays professionally active outside the company; publishes in technical journals; writes comprehensive design documents; and participates in design groups and standards committees.

8. Represents Digital views to customers and representatives of other corporations.

Performs other related duties as required.

JOB TITLE: SOFTWARE ENG SENIOR CONS JOB CODE: 50AF

REVIEW	Few guidelines available.
TIMEFRAME	Impact of decisions may extend up to five years.
BREADTH	May play a role in some corporate or cross-functional decisions.

PROBLEM SOLVING COMPLEXITY:

SCOPE	Encounters problems that are very broad in scope and diverse in nature, with long-range organizational implications (several years). Is often required to deal with strategic business issues that affect more than one organization. Usually has no define or redefine problems.
GUIDANCE	Adheres to corporate goals.

QUALIFICATIONS:

BREADTH	Needs broad knowledge of Digital policies, products, markets, and processes, as well as an understanding of business management principles and practices.
DEPTH	Typically requires state-of-the-art technical, functional, or business knowledge.
SKILLS	Needs skills in management, planning, problem solving, innovation, analysis, communication, and negotiation.

RESEARCH

CLASSIFICATION

PROPOSAL

MEMPMC 9/87

PROPOSED RESEARCH STRUCTURE

Corporate Research Staff Member
(Very Selective)

Research Staff Member
(Most of the Researchers)

Principal Engineer
(Primarily, New PhD Hires)

ISSUES

- MARKET PLACE IS DIFFERENT
- NATURE OF THE WORK IS DIFFERENT
- MEASURED DIFFERENTLY
- PAID DIFFERENTLY

SELECTED RESEARCH ORGANIZATIONS

COMPANY	PRACTICE
IBM	One Title-Research Staff Member
ATT-Bell Labs	One Title-Member Tech Staff
H-P	One Title-Engineer
Bellcore	One Title-Member Tech Staff
Sandia Labs	One Title-Member Tech Staff
Xerox	3 Levels-Principal Scientist Member Res. Staff II Member Res. Staff I
Lawrence Livermore	One Title -Physicist, Chemist, Computer Scientist, etc.
Kodak	One Title-Scientist

TPF&C RESEARCH SURVEY

Background

- **14 Major Corporations Participated:**

  Bell Communications Research
  Digital
  Eastman Kodak
  Exxon
  Ford
  General Motors
  Hewlett-Packard
  IBM
  Northern Telecom
  RCA
  3M
  Wang
  Westinghouse
  Xerox

- **Bell Communications Research sponsored this study**

- **Data collected through intensive on-site interviews**

TPF&C RESEARCH SURVEY

Findings

- Significant departures from Corporate salary policies for research professionals
- Specialized policies apply primarily to a centralized research lab, division, or staff
- Use a formal designation to identify individuals in research:

  RSM ***Research Staff Member***
  MTS ***Member Technical Staff***
  MRS ***Member Research Staff***
  RP ***Research Professional***
  RS ***Research Scientist***

- Do not have supervisory jobs within their research organizations
- Use maturity curve market data. Reflects viewpoint that "there is only one job"
- Pay differences are based on individual performance and technical capability

USE OF ENGINEERING CLASSIFICATIONS IN RESEARCH

- **Engineering Job Descriptions Do Not Fit a Research Organization**
- **Competitive Research Organizations Do Not Use Engineering Levels**
- **Defined and Leveled Positions Do Not Reflect the Research Environment and Approach to Work**

PROPOSED RESEARCH STRUCTURE

Corporate Research Staff Member
(Very Selective)

Research Staff Member
(Most of the Researchers)

Principal Engineer
(Primarily, New PhD Hires)

CORPORATE RESEARCH STAFF MEMBER

- IN THE CORPORATE RESOURCE GROUP
- APPROVED BY JACK SMITH'S STAFF
- EQUIVALENT TO CORPORATE/SENIOR CORPORATE CONSULTING ENGINEER

RESEARCH STAFF MEMBER

- A Single-Leveled Position
- Applies to Individual Contributors
- Increases are Based on Performance Assessment, Peer Ranking and Maturity Curve Data
- Majority of Encumbents are PhD's
- Reflects Viewpoint that "There is only one job"
- Approved by a Research Review Committee (Managers and Sr Individual Contributors)

PRINCIPAL ENGINEER

- Entry level position for new Researchers
- Primarily new hire PhD's
- Applies to individual contributors
- Adapt to a research environment

IMPLICATIONS

- PROMOTIONS
- STOCK PLANNING
- SURVEY DATA
- SPEND NUMBERS

RESEARCH

CLASSIFICATION

PROPOSAL

HP8/C
① Hirtist
②

MEMPMC

9/87

PROPOSED
RESEARCH STRUCTURE

Corporate Research Staff Member
(Very Selective)

Research Staff Member
(Most of the Researchers)

Principal Engineer
(Primarily, New PhD Hires)

ISSUES

- MARKET PLACE IS DIFFERENT
- NATURE OF THE WORK IS DIFFERENT
- MEASURED DIFFERENTLY
- PAID DIFFERENTLY

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COMPANY	PRACTICE
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H-P	One Title-Engineer
Bellcore	One Title-Member Tech Staff
Sandia Labs	One Title-Member Tech Staff
Xerox	3 Levels-Principal Scientist Member Res. Staff II Member Res. Staff I
Lawrence Livermore	One Title -Physicist, Chemist, Computer Scientist, etc.
Kodak	One Title-Scientist

TPF&C RESEARCH SURVEY

Background

- 14 Major Corporations Participated:

  Bell Communications Research
  Digital
  Eastman Kodak
  Exxon
  Ford
  General Motors
  Hewlett-Packard
  IBM
  Northern Telecom
  RCA
  3M
  Wang
  Westinghouse
  Xerox

- Bell Communications Research sponsored this study

- Data collected through intensive on-site interviews

TPF&C RESEARCH SURVEY

Findings

- Significant departures from Corporate salary policies for research professionals
- Specialized policies apply primarily to a centralized research lab, division, or staff
- Use a formal designation to identify individuals in research:

  RSM Research Staff Member

  MTS Member Technical Staff

  MRS Member Research Staff

  RP Research Professional

  RS Research Scientist

- Do not have supervisory jobs within their research organizations
- Use maturity curve market data. Reflects viewpoint that "there is only one job"
- Pay differences are based on individual performance and technical capability

USE OF ENGINEERING CLASSIFICATIONS IN RESEARCH

- **Engineering Job Descriptions Do Not Fit a Research Organization**
- **Competitive Research Organizations Do Not Use Engineering Levels**
- **Defined and Leveled Positions Do Not Reflect the Research Environment and Approach to Work**

PROPOSED
RESEARCH STRUCTURE

Corporate Research Staff Member
(Very Selective)

Research Staff Member
(Most of the Researchers)

Principal Engineer
(Primarily, New PhD Hires)

CORPORATE RESEARCH STAFF MEMBER

- IN THE CORPORATE RESOURCE GROUP
- APPROVED BY JACK SMITH'S STAFF
- EQUIVALENT TO CORPORATE/SENIOR CORPORATE CONSULTING ENGINEER

RESEARCH STAFF MEMBER

- A Single-Leveled Position
- Applies to Individual Contributors
- Increases are Based on Performance Assessment, Peer Ranking and Maturity Curve Data
- Majority of Encumbents are PhD's
- Reflects Viewpoint that "There is only one job"
- Approved by a Research Review Committee (Managers and Sr Individual Contributors)

PRINCIPAL ENGINEER

- **Entry level position for new Researchers**
- **Primarily new hire PhD's**
- **Applies to individual contributors**
- **Adapt to a research environment**

IMPLICATIONS

- PROMOTIONS
- STOCK PLANNING
- SURVEY DATA
- SPEND NUMBERS

RESEARCH STAFF MEMBER

Criteria

- **Technical Impact**
  - Creativity, Novelty of Ideas, and New Directions
  - Problem Selection and Approach
  - Initiative and Resourcefulness
  - Technical Breadth, Depth and Currency
- **Internal Impact**
  - Technology Transfer
  - Strategic Significance of Work
  - Organizational Interactions
  - Consulting
  - Task Force Participation
  - Recruiting
- **External Impact**
  - Publications
  - Speaking Engagements
  - Honors or Awards
  - University Relations
  - Professional Society Activities

From: CRAVAX::WATSON "17-Nov-1987 1555" 17-NOV-1987 16:17
To: @RSCHJOB.DIS;
Subj: DESCRIPTIONS

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INTEROFFICE MEMO

TO: Patrick Baudelaire
Bob Taylor
Victor Vyssotsky
Richard Swan
Sam Fuller

DATE: 17 November 87
FROM: Jenny Watson
DEPT: Corp Research & Arch.
EXT.: 223-9173
LOC.: MLO12-3/U35

CC: Andy Ambrose
Andrea Booth
Sandra Farnsworth

SUBJECT: DESCRIPTIONS

I am forwarding a memo containing revised job descriptions from Nancy Donchin, the technical writer assigned to us for this process.

Please comment on the descriptions, specifically addressing:

job titles
scope of description

The descriptions have been abbreviated for VTX single-screen parameters.

Please get your comments back to me by the end of the week so that the descriptions can be part of a proposal package going to LaCava and Heffner the week after Thanksgiving.

As always, your flexibility is appreciated.

Jenny

JW:mtb

From: MRED::DONCHIN 11-NOV-1987 14:29
To: CRAVAX::WATSON
Subj: Drafts of 3 Research Job Descriptions

<<JOB CODE>>Research Staff Member I

<<
Generates complex computer science ideas and concepts through advanced theoretical and/or experimental scientific studies.
>>

<<
1. Generates, evaluates, plans, implements, and executes theoretical and/or experimental advanced computer science ideas in areas of expertise (or within name of organization.)

2. Invents and designs prototypes and/or processes. May participate in the development of these prototypes and/or processes.

3. Disseminates project information both internally and externally through publications, patent disclosures, internal documentation, and participation in technical seminars.

4. Represents the Corporation at professional meetings and universities. Participates in professional societies and related activities.

5. Maintains awareness of technological changes in areas of expertise.

6. Acts as a consultant to Digital's engineering and research organizations. Provides technical guidance to less experienced researchers in (name of organization).

7. Assists (name of organization) management in selecting, recruiting, and evaluating job candidates for positions in areas of expertise.
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<<JOB CODE>>Research Staff Member

<<
Generates highly complex computer science ideas and concepts through advanced theoretical and/or experimental scientific studies. May direct the technical activities of Research Staff Member I and technical support personnel.
>>

<<
1. Generates, evaluates, plans, implements, and executes theoretical and/or experimental advanced computer science ideas in areas of expertise (or within name of organization.) Assists other Research Staff Members in problem selection and approach.

2. Invents and designs prototypes and/or processes. Participates in the development of these prototypes and/or processes.

3. Disseminates project information both internally and externally through publications, patent disclosures, internal documentation, and participation in technical seminars.

4. Represents the Corporation at professional meetings and universities. Participates in professional societies and related activities.

5. Maintains awareness of technological changes in areas of expertise.

6. Acts as a consultant to Digital's engineering and research organizations. Provides technical guidance to less experienced researchers in (name of organization).

7. Assists (name of organization) management in selecting, recruiting, and evaluating job candidates for positions in areas of expertise.
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<<JOB CODE>>Research Fellow

<<
Generates technologically advanced computer science ideas and concepts through advanced theoretical and/or experimental scientific studies. Directs the technical activities of Research Staff Members and technical support personnel.
>>

<<
1. Generates, evaluates, plans, implements, and executes theoretical and/or experimental advanced computer science ideas in areas of expertise (or within name of organization.) Guides the problem selection and approach process for (name of organization).

2. Invents and designs prototypes and/or processes. Oversees the development of these prototypes and/or processes.

3. Disseminates project information both internally and externally through publications, patent disclosures, internal documentation, and participation in technical seminars.

4. Represents the Corporation at professional meetings and universities. Participates in professional societies and related activities.

5. Maintains awareness of technological changes in areas of expertise.

6. Acts as a consultant to Digital's engineering and research organizations. Provides technical guidance to less experienced researchers in (name of organization). May participate on Corporate technical committees.

7. Assists (name of organization) management in selecting, recruiting, and evaluating job candidates for positions in areas of expertise.
>>
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From: CRAVAX::WATSON 6-NOV-1987 15:56
To: DECPRL::BAUDELAIRE,DECSRC::TAYLOR,SONORA::SWAN,RDVAX::HOWE,HAVOC::MULKEY
,ABLE::AMBROSE,RDVAX::FULLER,WATSON
Subj: JOB DESCRIPTION

Your comments on the attached job descriptions would be appreciated. They will have to be finalized by November 25, 1987 to keep in step with the Job Evaluation process.

Thank you for your efforts.

Jenny

POSITION TITLE: RESEARCH STAFF MEMBER I

Position Function:

Within the broad mission of a group, the Research Staff Member I, is effective in generating new ideas and concepts while performing advanced scientific studies. These scientific activities may be theoretical or experimental (or both) in nature. They result in highly complex, original and creative scientific achievements requiring application of advanced computer science.

Nature and Scope:

1. Generates highly novel ideas (theoretical or experimental), evaluates them, plans, and is involved in, their execution and their implementation;

2. Invents and designs complex prototypes and/or processes and is often involved in engineering these to an advanced state of prototype feasibility; and,

3. Disseminates, internally and externally, the results of such activities through publications, patent disclosures, seminar participation, and internal documentation.

4. Represents the Company at professional meetings, professional societies and universities.

5. Keeps technically abreast of the literature and progress within his/her specific and related areas of expertise.

6. Functions as an internal consultant in his/her areas of professional expertise and provides technical guidance within the organization: this includes technology transfer within the Company's engineering and research communities.

7. Assists in the selection, recruiting, and later evaluation of other highly qualified professionals, especially in his/her areas of expertise.

Position Requirements:

Utilizes, in her/his work, advanced scientific and technical knowledge as would normally be obtained through graduate study, usually through the PhD level. Demonstrates originality and inventiveness in computer

science and exhibits superior scientific proficiency and/or potential as an expert in the field as judged by his/her peers.

POSITION TITLE: RESEARCH STAFF MEMBER

Position Function:

Within the broad mission of a group, is effective in generating new ideas and concepts while performing advanced scientific studies resulting in highly complex, original and creative scientific achievements requiring application of advanced computer science and may technically direct other staff members and technical support personnel.

Nature and Scope:

1. Generates highly novel ideas (theoretical or experimental), evaluates them, plans, and is involved in, their execution and their implementation; is expected to exercise initiative and resourcefulness in contributing to problem selection and approach (their own and others).

2. Invents and designs complex prototypes and/or processes and is often involved in engineering these to an advanced state of prototype feasibility; and,

3. Disseminates, internally and externally, the results of such activities through publications, patent disclosures, seminar participation, and internal documentation.

4. Represents the Company at professional meetings, professional societies and universities.

5. Keeps technically abreast of the literature and progress within his/her specific and related areas of expertise.

6. Functions as an internal consultant in his/her areas of professional expertise and provides technical guidance within the organization: this includes technology transfer within the Company's engineering and research communities.

7. Assists in the selection, recruiting, and later evaluation of other highly qualified professionals, especially in his/her areas of expertise.

8. May direct technically, within the broad mission of the group, activities of other RSM's and technical support persons in the implementation of ideas.

Position Requirements:

Utilizes, in her/his work, advanced scientific and technical knowledge as would normally be obtained through graduate study, usually through the PhD level. Demonstrates originality and inventiveness in computer science and exhibits superior scientific proficiency and/or potential as an expert in the field as judged by his/her peers.

POSITION TITLE: RESEARCH FELLOW

Position Function:

Within the broad mission of the group, is effective in generating new ideas and concepts while performing advanced scientific studies. These scientific activities may be theoretical, or experimental (or both) in nature. They result in highly complex, original and creative scientific achievements requiring application of advanced computer science. The Research Fellow technically directs other staff members and technical support personnel as the situation requires.

Nature and Scope:

1. Generates highly novel ideas (theoretical or experimental), evaluates them, plans, and is involved in, their execution and their implementation; is expected to exercise initiative and resourcefulness in contributing to problem selection and approach (their own and others).

2. Invents and designs complex prototypes and/or processes and is often involved in engineering these to an advanced state of prototype feasibility; and,

3. Disseminates, internally and externally, the results of such activities through publications, patent disclosures, seminar participation, and internal documentation.

4. Represents the Company at professional meetings, professional societies and universities.

5. Keeps technically abreast of the literature and progress within his/her specific and related areas of expertise.

6. Functions as an internal consultant in his/her areas of professional expertise and provides technical guidance within the organization: this includes technology transfer within the Company's engineering and research communities. May sit on established committees.

7. Assists in the selection, recruiting, and later evaluation of other highly qualified professionals, especially in his/her areas of expertise.

8. Directs, technically, within the broad mission of the group, activities of other RSM's and technical support persons in the implementation of ideas.

Position Requirements:

Utilizes, in her/his work, advanced scientific and technical knowledge as would normally be obtained through graduate study, usually through the PhD level. Demonstrates originality and inventiveness in computer science and exhibits superior scientific proficiency and/or potential as an expert in the field as judged by his/her peers.

RECEIVED

DEC 30 1986

SAM FULLER

digital

INTEROFFICE MEMORANDUM

DATE: 12/29/86
FROM: Andy Ambrose Andy
DEPT: WESTERN MEM PERSONNEL
EXT: 2229
LOC/MAIL STOP: ABO/F4
E-MAIL: ABLE::AMBROSE

TO: Sam Fuller

SUBJECT: PROPOSED RESEARCH STAFF MEMBER CLASSIFICATION

Attached is the outline for a briefing on the proposed Research Staff Member Classification.

I have forwarded a copy of this presentation to Rob and Hank. I am waiting to find out about the required approval steps from Rob. I will keep you posted on what is to be our next step.

Thanks for all your support and assistance on this proposal.

ATTACHMENT

RESEARCH

CLASSIFICATION

PROPOSAL

Use of Engineering Classifications In Research

- **Current Engineering Job Descriptions Do Not Fit a Research Organization**
- **Competitive Research Organizations Do Not Use Engineering Levels**
- **Defined and Leveled Positions Do Not Reflect the Research Environment and Approach to Work**

Selected Research Organizations

Company	Practice
IBM	One Title-Research Staff Member
ATT-Bell Labs	One Title-Member Tech Staff
H-P	One Title-Engineer
Bellcore	One Title-Member Tech Staff
Sandia Labs	One Title-Member Tech Staff
Xerox	3 Levels-Principal Scientist Member Research Staff II Member Research Staff I
Lawrence Livermore	One Title-Physicist, Chemist Computer Scientist, etc.
Kodak	One Title-Scientist

ISSUES

- **MARKET PLACE IS DIFFERENT**
- **NATURE OF THE WORK IS DIFFERENT**
- **MEASURED DIFFERENTLY**
- **PAID DIFFERENTLY**

IMPLICATIONS

- **PROMOTIONS**
- **STOCK PLANNING**
- **SURVEY DATA**
- **SPEND NUMBERS**

Proposed
Research Structure

Principal Engineer
(Primarily, New PhD Hires)

Research Staff Member
(Majority of Researchers)

Corporate Research Staff Member
(Very Selective)

Research Classification

(Research Staff Member)

- **A Single-Leveled Position**
- **Applies to Individual Contributors**
- **Increases are Based on Performance Assessment, Peer Ranking and Maturity Curve Data**
- **Majority of Encumbents are PhD's**
- **Reflects Viewpoint that "There is only one job"**
- **Approved by a Research Review Committee (Managers and Sr Individual Contributors)**

RESEARCH CLASSIFICATION

(Corporate Research Staff Member)

- **In the Corporate Resource Group**
- **Approved by Jack Smith's Staff**
- **Equivalent to Corporate/Sr Corporate Consulting Engineer**

Research Staff Member

Criteria

- **Technical Impact**

  - **Creativity, Novelty of Ideas, and New Directions**
  - **Problem Selection and Approach**
  - **Initiative and Resourcefulness**
  - **Technical Breadth, Depth and Currency**

- **Internal Impact**

  - **Technology Transfer**
  - **Strategic Significance of Work**
  - **Organizational Interactions**
  - **Consulting**
  - **Task Force Particpation**
  - **Recruiting**

- **External Impact**

  - **Publications**
  - **Speaking Engagements**
  - **Honors or Awards**
  - **University Relations**
  - **Professional Society Activities**

(D-R-A-F-T)

RESEARCH STAFF MEMBER

DESCRIPTION

Research Staff Member

Concept:

Within broad mission of a group or area, is effective in generating new ideas and concepts while performing advanced scientific and/or engineering studies resulting in highly complex, original and creative scientific and/or engineering achievements requiring application of advanced science and/or engineering in a specific discipline (chemistry, mathematics, physics, an engineering science, computer science, etc.) and may manage or technically direct other staff membrs and technical support personnel.

Responsibilities:

1. Generates highly novel ideas (theoretical or experimental), evaluates them, plans, and is involved in their execution and their implementation

   and/or

   invents and designs complex products and/or processes and may be involved in engineering these to an advanced state of feasibility.

   Disseminates, internally and externally, the results of such activities through publications, patent disclosures, seminar participation, internal documentation , etc.

2. Represents DEC at professional meetings, in professional societies and universities. Keeps technically abreast of the literature and progress within his/her specific and related areas of expertise. Functions as an internal consultant in his/her areas of professional expertise and provides technical guidance within the organization.

3. May direct technically, and/or manage, within the broad mission of the group, activities of other RSM's and technical support persons in the implementation of ideas for which he/she is primarily responsible.

Position Requirements:

Utilizes, in his/her work, advanced scientific and technical knowledge as would normally be obtained through graduate sutdy, as well as originality and inventiveness in a professional discipline, such as chemistry, mathematics, physics, an engineering science, computer science, etc. Exhibits superior scientific proficiency and/or potential as an expert in his/her field.

The 1987–1988 Taulbee Survey

The Computing Research Board's 1987–1988 Taulbee Survey includes the latest statistics on production and employment of Ph.D.'s and faculty in computer science and engineering. Included also are departments offering Ph.D.'s in computer engineering.

David Gries and Dorothy Marsh

This report describes the results of a survey completed in December, 1988, on the production and employment of Ph.D.'s and faculty of Ph.D.-granting Computer Science/Engineering Departments during the academic year 1987–88.[1] All 127 Computer Science (CS) departments (115 U.S. and 12 Canadian) participated. In addition, 34 departments offering the Ph.D. in Computer Engineering (CE) were included.[2] Throughout this report, CE statistics are reported separately so that comparisons with previous years can be made for CS, but the intention is to merge all statistics for CS and CE after several years. Some highlights from the survey are:

- The 127 CS departments produced 577 Ph.D.'s, an increase of 24 percent over the previous year; 309 were Americans, 30 Canadians, and 238 foreign. Of the 577, 295 (51 percent) went to academia, 167 (29 percent) to industry, 20 (3 percent) to government, and 55 (10 percent) overseas; 1 was self-employed; and 11 were unemployed (28 were unknown).
- The 127 CS departments expect to produce 769 Ph.D.'s next year. This 33 percent expected increase is probably too optimistic, and we expect, instead, an increase of 21 percent to 700.
- 1,113 students passed their Ph.D. qualifying exam in CS departments, an increase of 10 percent over 1986–87.
- The 127 CS departments have 2,427 faculty members, an increase of almost 7 percent: 939 assistant, 659 associate, and 929 full professors.
- The 127 CS departments reported hiring 239 faculty and losing 177 (to retirement, death, other universities, graduate school, and non-academic positions).
- The 127 CS departments want to grow from 2,477 faculty members to 3,255 by academic year 1992–93, an increase of 31 percent at an average rate of 1.5 per department per year. (Last year, they wanted a growth of 1.7 per department but grew 1.2 per department.)

The growth of 24 percent in CS Ph.D. production is almost twice what we expected. The growth in qualifying-exam passage in previous years and this year point to even more growth in Ph.D. production, and we look forward to 650–700 Ph.D.'s in 1988–89. This is indeed satisfying, but, at the same time, a cause for concern. Continued steady growth for three to four more years could lead to overproduction. The field still expects to grow, and there will not be steady retirements to offset new Ph.D. production for some ten years.

The field continues to be far too young and inexperienced, a problem that only time is slowly solving. CS continues to have more assistant professors than full professors, which puts an added burden on the older people. In fact, the ratios of assistant and associate professors to full professors has not changed appreciably in four years. As we have mentioned in previous Taulbee Reports, no other field, as far as we know, has this problem—in fact, most scientific fields are 80 to 90 percent tenured in many universities. The CE departments have more full professors than assistant professors, mainly because many are older EE departments offering CE degrees. Table III (shown later) shows that this problem is more severe at the newer and lower-ranked departments; the top 25 departments have, for the second straight year, slightly more full professors than assistant professors.

The percentage of CS Ph.D.'s given to foreign students rose slightly from 40 percent to 41 percent. In CE, the percentage was much higher: 65 percent.

SOME METHODOLOGICAL COMMENTS

Questionnaires were sent to 127 CS Ph.D.-granting departments and 34 CE Ph.D.-granting departments in late October, 1988. (The titles of the departments appear in Table I.)

The title of the survey honors Orrin E. Taulbee of the University of Pittsburgh, who conducted these surveys for the Computer Science Board annually from 1970 to 1984.

[1] 148 departments reported on an academic-year basis and 9 on a 1988 calendar-year basis.

[2] The Forsythe list—the list of all departments in the U.S. and Canada that grant a Ph.D. in CS or CE—is maintained by Terry Walker, a member of the Computing Research Board and its new executive director. This is the second year that the CE departments have been included.

TABLE I. Titles of Departments

Number of departments	Title
89	Computer Science(s)
22	Electrical and Computer Engineering
10	Computer and Information Science(s)
7	Electrical Engineering and Computer Science
11	Computer Science and Engineering
3	Computer Engineering
2	Computing Science
2	Electrical Engineering
2	Information and Computer Science
1	Advanced Computer Studies
1	Applied Sciences
1	Computational Science
1	Computer Engineering and Science
1	Computer Science and Electrical Engineering
1	Computer Science and Operations Research
1	Electrical, Computer, and Biomedical Engineering
1	Mathematical and Computer Sciences
1	Mathematical Sciences

(Instead of department, the terms center, division, program, and school were each used at least once.)

All 127 CS departments and 30 of the 34 CE departments completed the questionnaire. Thus, the figures in this report are complete for CS. There was a marked improvement in the number of CE departments responding; we hope to have responses from all the CE departments in next year's survey. The accuracy of this report depends, of course, on the accuracy with which the questionnaires were filled out by the individual departments. The new electrical engineering departments giving a Ph.D. in CE had a more difficult time completing the questionnaire for they were asked to give information only on the CE part of their departments, and the required information was difficult to extract.

As with most surveys, a small part of the data in the survey was not filled in or, obviously, was incorrectly entered. We took the liberty to adjust some figures and estimate a few others—for example, in a few cases, with 155 or 156 out of 157 departments reporting a figure in a field, we estimated that field for the others. Our goal was to make this report consistent, clear, and simple without modifying the overall results in any way.

In some places, we analyze the data for the higher-ranked departments as compared to the lower-ranked and unranked ones, using for ranking the 1980 survey done under the auspices of the National Research Council [4]. (We also included the two largest Canadian universities within the top 20.) Survey [4] is now nine years old, and many changes have occurred in CS since then (e.g., the emergence of over 60 Ph.D.-granting CS departments); nevertheless, this breakdown still provides some useful comparisons.

From time to time within this report, in order to draw meaningful conclusions regarding growth of the field (using older surveys), we compare figures for the CS departments only, keeping figures for CE separate; we will combine CS with CE in several years. Throughout this report, figures for 1970–84 are taken from [5], for 1984–85 from [2], for 1985–86 from [1], and for 1986–87 from [3]. The figures for 1970–84 may not be accurate because not all departments completed questionnaires in those days.

DATA ON STUDENTS

Ph.D. Production and Its Growth

The field of CS produced 577 Ph.D.'s in 1987–88, an increase of 111 (24 percent) over 1986–87 and an increase of 347 (150 percent) over 1980. The figures on Ph.D. production for CS and CE, as well as for qualifying-exam passage and sizes of incoming classes, are given in Table II. In the column headed "No. of depts," the first number is the number of departments reporting, and the second is the total number of known Ph.D.-granting departments.

As mentioned earlier, CS Ph.D. production increased 24 percent this year and 13 percent last year. Future growth is expected. Indeed, the 127 departments project 769 Ph.D.'s in 1988–89—a 33 percent increase. A more realistic estimate is 21 percent, to 700. Future increases in Ph.D. production are a matter of concern to the field. Estimates of the annual need for new Ph.D.'s range from 600 to over 1,000, and the field is growing steadily to meet the need. However, growth in Ph.D. production requires a commensurate growth in funding for research. Because of this interest in Ph.D. production, we go into more detail.

In 1987–88, an average of 4.7 CS-CE Ph.D.'s were produced per department (see Table II) with 21 departments producing 0, 24 producing 1, 18 producing 2, 20 producing 3, and 14 producing 4. Thus, 97 departments produced less and 60 departments more than the average. The 60 that produced more than the average—roughly 38 percent of the departments—produced 77 percent of the Ph.D.'s.

The over-average group of 60 expects to increase its Ph.D. production in one year far less (by 86 or 15 percent) than the under-average group (by 145 or 82 percent). For both 1985–86 and 1984–85, the expected growth was about the same for the over-average group (24 percent), but it is less for next year: 15 percent. Growth in the larger departments is slowing down. The predicted one-year growth by the under-average group was 167 percent in 1984–85, 164 percent in 1985–86, 116 percent in 1986–87, and 82 percent in 1987–88.

In an effort to find different expected-growth patterns, the data for the groups of departments in various rankings (according to [4]) is presented in Table III.

In 27 CS-CE departments, 15 or more students passed the qualifying examination; they accounted for 62 percent of the students passing the exam.

Sex and Minority Status of the Ph.D.'s.

Table IV gives the figures on Ph.D.'s awarded to minor-

TABLE II. Ph.D. Production and Its Growth

	Year	No. of depts.	Ph.D.'s produced	Average per dept.	Qualifying exam passage	Average per dept.	New Ph.D. students	Average per dept.
CS	1980–81		230					
CS	1984–85	103 (109)	326	3.2	755	8.2	1177	12
CS	1985–86	117 (118)	412	3.5	858	7.3	1170	10
CS	1986–87	123 (123)	466	3.8	1008	8.2	1430	12
CS	1987–88	127 (127)	577	4.5	1113	8.8	1497	12
CS-CE	1986–87	145 (156)	559	3.9	1168	8.1	1621	11
CS-CE	1987–88	157 (161)	744	4.7	1399	8.9	1801	11

TABLE III. Ph.D. Production in 1987–88 by Ranking

Rank	Ph.D.'s produced	Average per dept.	Ph.D.'s next yr.	Average per dept.	Qualifying exam passage	Average per dept.	New Ph.D. students	Average per dept.
CS (all)	577	4.5	769	6.1	1113	8.9	1497	11.8
CS 1–12	162	13.5	200	16.7	248	20.7	360	30.0
CS 13–24	87	7.3	118	9.8	175	14.6	238	19.8
CS 25–36	69	5.8	114	9.5	166	13.8	165	13.8
Other CS	259	2.8	337	3.7	524	5.9	734	8.0
CE	167	5.6	206	6.9	286	9.5	304	10.1

TABLE IV. Sex and Minority Status of the Ph.D.'s

	CS			CE			CS-CE		
Ph.D. minority status	Male	Female	Total	Male	Female	Total	Male	Female	Total
White, not of Hispanic origin	340	49	389	56	4	60	396	53	449
Black, not of Hispanic origin	4	0	4	1	1	2	5	1	6
Hispanic	5	0	5	2	1	3	7	1	8
Other	168	11	179	101	1	102	269	12	281
Total	517	60	577	160	7	167	677	67	744

ity students and females. The figures are rather depressing from the standpoint of minority and female representation in the field. Table V shows the statistics since 1970, with the data before 1984–85 being taken from [5]. Throughout the 1980's, the percentage of Ph.D.'s who are women has stayed relatively constant at about 10 percent, blacks at 1 percent, and Hispanics at 2 percent.

Citizenship of the Ph.D.'s

The number of Ph.D.'s given to foreigners increased from 181 to 238 although the percentage remained essentially the same as last year. Figures for citizenship of the Ph.D.'s are given in Table VI. Table V contains the figures for foreigners from 1970 to 1988.

Employment of the Ph.D.'s

As shown in Table VII, in CS, 33 percent of the Ph.D.'s produced took positions in the U.S. or Canada outside academia, and 51 percent took faculty positions in the U.S. or Canada. There is little change from last year when the figures were 35 percent and 54 percent.

Undergraduate and Master's Degrees

Many universities and colleges have undergraduate and/or master's programs but do not award the Ph.D., so the data given below says little about the field of computer science as a whole. Table VIII gives statistics on undergraduate and Master's degrees in Ph.D. departments, with columns labeled "88–89" representing expectations. The number of CS undergraduate degrees increased by 219, partly because of the four new departments, although the average per department stayed about the same. The departments expect a 1 percent decrease next year.

New Graduate Students in Fall 1988

Table IX gives enrollment figures for new students in Fall, 1988. In the table, "Ph.D. program" stands for the number of new graduate students in Ph.D. programs, regardless of whether they intend to earn a Master's degree first. The number of new graduate students in CS rose 12 percent from last year (from 3,644 to 4,067), and the number of new graduate students in CS Ph.D. programs rose from 1,430 to 1,497.

The data for part-time Master's students needs some explanation. Forty-five (5 percent) departments had no part-timers, and 30 departments had 5 or fewer. For these departments, the part-time master's program may be inconsequential—perhaps just a small employee de-

TABLE V. Sex, Minority Status, and Citizenship of the CS Ph.D's since 1970

Year	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	84–85	85–86	86–87	87–88
Total	112	124	206	208	203	256	246	208	223	248	230	235	244	256	274	326	412	466	577
Female	1	4	12	7	6	21	14	14	19	24	28	26	27	31	29	32	50	51	60
Percent	1	3	6	3	3	8	6	7	9	10	12	11	11	12	10	10	12	11	10
Black	1	1	2	2	2	1	0	0	2	1	0	0	1	2	3	3	6	1	4
Percent	1	1	1	1	1	0	0	0	1	0	0	0	0	1	1	1	1	0	1
Hispanic	No information					No information					No information					7	6	8	5
Percent																2	1	2	1
Foreign	22	21	39	41	46	68	57	68	51	65	82	79	83	86	87	122	184	181	238
Percent	20	17	19	20	23	27	23	33	23	26	36	33	34	34	32	37	45	40	41

TABLE VI. Citizenship of the Ph.D.'s

	U.S.	Canadian	Foreign	Percent foreign
CS	309	30	238	41%
CE	56	1	110	66%
CS-CE	365	31	348	47%

gree program of the university. On the other hand, the two largest part-time Master's programs had 149 and 100 new part-timers, respectively. The last column gives figures only for departments with between 6 and 50 new part-time master's students. Table X gives the number of new Ph.D. students in CS departments this year and the past three years, with departments grouped by rank.

TABLE VII. Employment of the Ph.D.'s

	Number of Ph.D.'s	Unemployed	Self-employed	Academia: Ph.D. dept.	Academia: Not Ph.D. dept.	Academia: Not CS or CE	Industry	Government	Outside U.S. and Canada	Unknown
CS	577	11	1	229	58	8	167	20	55	28
percent		2%	0%			51%	29%	3%	10%	5%
CS-CE	744	11	1	259	59	20	219	24	73	78
percent		1%	0%			45%	29%	3%	10%	10%

TABLE VIII. Undergraduate and Master's Degrees

	Non-Ph.D. degrees, Ph.D. departments only	Undergraduate 84–85	Undergraduate 85–86	Undergraduate 86–87	Undergraduate 87–88	Undergraduate 88–89	Master's 84–85	Master's 85–86	Master's 86–87	Master's 87–88	Master's 88–89
CS	Number of degrees	10422	10947	10540	10759	10688	2889	3720	3614	4150	4123
	Number of depts. responding	96	116	121	127	127	101	116	123	127	127
	Average per dept.	109	94	87	85	84	29	32	29	33	32
CE	Number of degrees			2103	1928	1958			731	1009	1043
	Number of depts. responding			22	30	30			22	30	30
	Average per dept.			96	64	65			33	34	35
CS-CE	Number of degrees			12643	12687	12646			4345	5159	5166
	Number of depts. responding			143	157	157			145	157	157
	Average per dept.			88	81	81			30	33	33

TABLE IX. New Graduate Students in Fall 1988

New graduate students		Total new graduate students	With CS degrees	Ph.D. program	Master's only program	Part-time Master's students	Part-time Master's in departments with 6–50
CS	Total	4067	1901	1497	2503	1107	708
	Depts. responding	127	118	127	127	125	47
	Average per dept.	32	16	12	20	9	15
CE	Total	1054	162	304	750	562	200
	Depts. responding	29	27	29	29	28	11
	Average per dept.	36	6	10	26	20	18
CS-CE	Total	5121	2063	1801	3253	1669	908
	Depts. responding	156	145	156	156	153	58
	Average per dept.	33	14	12	21	11	16

TABLE X. New Ph.D. Students in CS Departments

Departments	Number of departments	Total				Average			
		1985	1986	1987	1988	1985	1986	1987	1988
Ranked 1–12	12	349	290	287	360	29	24	24	30
Ranked 13–24	12	219	176	207	238	18	15	17	20
Ranked 25–36	12	144	165	176	165	12	14	15	14
All other	62, 81, 85, 91	465	678	760	734	8	7	9	8

Faculty

Table XI contains statistics on departmental faculty in September, 1988. In this table, all figures are in terms of "Full-time equivalents." For example, two half-time appointments count as one position.

CS saw little change over last year in the proportions of faculty at the three levels. CS remains a relatively young field, with fewer full professors (6.5) than assistant professors (7.4) per department. The top 25 departments have about the same number (11.1 and 10.0) of full professors and assistant professors per department.

Hiring for 1988–89

CS-CE departments reported hiring 264 new faculty—1.7 per department. CS departments in the U.S. hired 215—1.9 per department. Salaries were reported for new Ph.D.'s hired for Fall, 1988, by 102 U.S. CS-CE departments, 82 U.S. CS departments, and 7 Canadian departments. Table XII gives this salary information. The data for the Canadian universities are shown separately in the table, in Canadian dollars. Canadian salaries are on a 12-month scale; the Canadian and U.S dollars are different; and there are differences in the amount of consulting that typically can be performed.

The average U.S. salary for a new Ph.D. increased from $36,668 in Fall, 1985, to $38,957 in Fall, 1986, (6.2 percent) to $40,885 in Fall, 1987, (4.9 percent) to $42,653 in Fall, 1988, (4.3 percent). More information is included in Table XIII which gives the number of departments averaging a salary in each $1,000 range for Fall, 1988, and three previous years (numbers are rounded and presented in thousands of dollars).

The departments reported hiring faculty with Ph.D.'s earned in 1982 or later in a field other than computing science/engineering. The fields were: electrical engineering (15), mathematics (4), applied mathematics (2), psychology (2), philosophy (1), physics (1), management sciences (1), applied linguistics (1), and industrial engineering (1). Part of the increase in the number of new faculty with electrical engineering degrees is due to the inclusion of the CE departments in the survey for the past two years.

Faculty Salaries

Table XIV summarizes 9-month faculty salaries in U.S. departments effective January, 1989. Please note that these salaries are given for the 1988–1989 academic year although other information contained in the report reflects the 1987–1988 academic year. The second column of each table gives the number of faculty (in each rank) for which salaries were reported and, in parentheses, the total number of faculty in that rank.

Departments reported the minimum, mean, and maximum salaries of assistant, associate, full professors, and

TABLE XI. Faculty Statistics, 1988–89 Academic Year

Faculty	All CS-CE depts.		127 CS depts.		Top 25 CS depts.		Other 102 CS	
	Total	Average	Total	Average	Total	Average	Total	Average
Tenure-track faculty	2990	19.0	2427	19.1	699	28.0	1728	16.9
Assistant professor	1118	7.1	939	7.4	250	10.0	689	6.8
Associate professor	815	5.2	659	5.2	171	6.8	488	4.8
Full professor	1057	6.8	829	6.5	278	11.1	551	5.4
Non-teaching research faculty	176	1.1	156	1.2	79	3.2	77	0.8
Postdocs	126	0.8	101	0.8	65	2.6	36	0.4
Non-tenure-track teachers	402	2.6	333	2.6	79	3.2	254	2.5
Other faculty (e.g., visitors)	258	1.6	228	1.8	85	3.4	143	1.4

TABLE XII. New Ph.D. Salaries for Fall 1988

	All. U.S. CS-CE depts.	All U.S. CS depts.	Top 24 U.S. CS depts.	Other 103 U.S. CS depts.	12 Canadian CS depts.
Total hired	263	215	44	171	24
Number of departments reporting salaries	102	82	18	64	7
Minimum	$38,000	$38,000	$40,000	$38,000	$34,322
Average (of the averages)	$42,767	$42,653	$43,422	$42,487	$42,846
Maximum	$48,000	$47,000	$47,000	$45,600	$47,300

TABLE XIII. New United States Ph.D. Salaries for Fall 1988 and Three Previous Years

Salary (in thousands)	35	36	37	38	39	40	41	42	43	44	45	46	47	48
1985–86: Number of depts.	2	10	11	11	5	5	1	0	0	0	0	0	0	0
1986–87: Number of depts.	3	1	9	11	16	14	5	4	2	0	0	0	0	0
1987–88: Number of depts.	1	1	1	3	8	13	14	20	4	1	1	0	1	1
1988–89: Number of depts.	0	0	0	2	2	5	13	33	19	11	14	0	2	1

TABLE XIV. Salaries, 113 out of 115 United States CS Departments

Faculty rank	Number	Reported minimums			Average over all salaries	Reported maximums		
		Min	Mean	Max		Min	Mean	Max
Assistant	846 (854)	30000	40932	47800	43959	35312	46479	59600
Associate	564 (568)	28300	45480	54900	50806	41938	54872	71301
Full	705 (717)	34600	54250	77100	67205	48100	79308	130000

the number of faculty in each rank. For minimum salaries (and for maximum salaries), the table shows the minimum, average, and maximum. Finally, the average is given over all salaries in each faculty rank—this is not the average of the means, but the true average.

Comparing this year's CS figures with last year's, we find that the average assistant professor salary rose 4.8 percent from $41,945 to $43,959. The average associate professor salary rose 7.1 percent from $47,428 to $50,806, and the average full professor salary rose 6.6 percent from $63,037 to $67,205. Thirty-five U.S. departments reported a maximum full-professor salary of greater than $90,000.

Tables XV–XVIII supply the same information as Table XIV, but for departments grouped by rank. Table XIX gives salary information for the CE departments. Table XX gives salary information for the 12 Canadian departments. Table XXI gives the information for all U.S. CS and CE departments.

Estimates of Department Growth by 1992–93

The departments were asked to estimate their faculty sizes through 1992–93, given an adequate supply of

TABLE XV. Salaries, 12 of 12 CS Departments Ranked 1–12, United States Only

Faculty rank	Number	Reported minimums			Average over all salaries	Reported maximums		
		Min	Mean	Max		Min	Mean	Max
Assistant	126 (126)	40100	42898	45500	45453	44525	49120	59600
Associate	81 (81)	28300	47887	54900	52515	50300	57656	66300
Full	153 (153)	34600	57677	77100	73588	80793	97533	130000

TABLE XVI. Salaries, 11 of 12 CS Departments Ranked 13–24, United States Only

Faculty rank	Number	Reported minimums			Average over all salaries	Reported maximums		
		Min	Mean	Max		Min	Mean	Max
Assistant	107 (113)	40500	42734	47000	45349	43765	48699	57000
Associate	66 (69)	38300	49070	54400	54822	50800	61510	71301
Full	92 (100)	50200	56090	67919	70850	75500	90338	100000

TABLE XVII. Salaries, 11 of 12 CS Departments Ranked 25–36, United States Only

Faculty rank	Number	Reported minimums			Average over all salaries	Reported maximums		
		Min	Mean	Max		Min	Mean	Max
Assistant	106 (108)	40500	42988	44500	45460	43500	48869	53100
Associate	64 (65)	35800	47133	52800	53798	47764	56479	65040
Full	80 (84)	35100	55191	63300	68129	74500	92880	125000

TABLE XVIII. Salaries, 79 of 79 CS Departments Ranked Below 36 or Unranked, United States Only

Faculty rank	Number	Reported minimums			Average over all salaries	Reported maximums		
		Min	Mean	Max		Min	Mean	Max
Assistant	507 (507)	30000	40097	47800	42980	35312	45436	57375
Associate	353 (353)	32865	44356	53500	49120	41938	53261	70425
Full	380 (380)	36525	53331	76400	63557	48100	73035	111000

TABLE XIX. Salaries, 27 of 30 CE Departments, United States Only

Faculty rank	Number	Reported minimums			Average over all salaries	Reported maximums		
		Min	Mean	Max		Min	Mean	Max
Assistant	170 (177)	32005	40480	45900	43717	38600	45854	56300
Associate	148 (156)	34000	44562	54000	48187	41000	51624	59500
Full	219 (228)	39760	51186	68000	63466	45000	74248	125000

TABLE XX. Salaries, 12 of 12 Canadian CS Departments (Canadian Dollars)

Faculty rank	Number	Reported minimums			Average over all salaries	Reported maximums		
		Min	Mean	Max		Min	Mean	Max
Assistant	85 (85)	34322	43208	52335	45211	41165	49439	59409
Associate	91 (91)	39800	50673	60000	58381	53176	66326	103000
Full	112 (112)	53520	61708	67245	72616	71591	84568	106074

TABLE XXI. Salaries, 140 of 157 CS and CE United States Departments

Faculty rank	Number	Reported minimums			Average over all salaries	Reported maximums		
		Min	Mean	Max		Min	Mean	Max
Assistant	1016 (1033)	30000	40845	47800	43918	35312	46458	59600
Associate	712 (724)	28300	45306	54900	50261	41000	54256	71301
Full	924 (945)	34600	53673	77100	66318	45000	78355	130000

applicants (the lack of applicants has been a problem in the past). The 157 CS-CE departments would like to grow by 927 (33 percent) by 1992–93. The 127 CS departments would like to grow by 778 to a total of 3,255 (25.6 faculty per department); last year, the 123 departments expected to grow to 3,133 (25.5 per department) by 1992–93, so the expected growth has not changed appreciably.

Last year, the 123 departments reported a desire to grow from 2,325 (18.9 per department) in 1987–88 to 2,543 (20.7 per department) faculty members by 1988–89. However, 127 CS departments this year reported growing only to 2,477 (19.5 per department). Tables XXII and XXIII indicate that all departments desire substantial growth, but with the most growth expected in the lower-ranked and smaller departments.

Faculty Losses

Table XXIV gives statistics on faculty losses. The CS departments reported losing 0.7 percent of the faculty through death and retirement, the CE departments, 1.1 percent. We do not expect higher percentages of

TABLE XXII. Desired Faculty Growth

		1988–89	1989–90	1990–91	1991–92	1992–93	4-year increase
CS	Faculty size	2477	2684	2860	2998	3255	(31%)
	Average size	19.5	21.1	22.5	23.6	25.6	
CS-CE	Faculty size	3094	3339	3544	3703	3980	(29%)
	Average size	19.8	21.4	22.7	23.7	25.5	

TABLE XXIII. Average Desired Four-Year Growth in CS Departments

	By rank				By department size				
Per department	1–12	12–24	24–36	rest	1–9	10–19	20–29	30–39	40–49
Number of depts. 1988–89	12	12	12	91	8	67	34	12	5
Average dept. size 1987–88	30	26	21	16	7	14	24	34	43
Average dept. size 1988–89	31	26	23	17	8	15	24	33	43
Average dept. size 1992–93	35	31	30	23	12	22	30	36	50
Average four-year increase	4	5	7	6	4	7	6	3	7
Percent growth (projected)	13%	19%	30%	35%	50%	47%	25%	9%	16%

TABLE XXIV. Faculty Losses

	CS-CE Depts.			CS Depts.		
	w/Ph.D.	w/out Ph.D.	Total	w/Ph.D.	w/out Ph.D.	Total
Died or retired	18	6	24	13	4	17
Were visitors, returned to employer	22	3	25	22	3	25
Teaching elsewhere	70	2	72	60	2	62
Left for non-academic position	48	3	51	45	3	48
Returned to graduate school	0	6	6	0	6	6
Other	16	6	22	13	6	19
Total	174	26	200	153	24	177

retirement in CS for another 5–10 years. Of the other CS-CE 200 faculty who left, at least 35 percent left for other teaching positions, 26 percent left academia, 13 percent were visitors who returned to their employer, and 3 percent returned to graduate school. The percentages for CS were very similar: 35 percent teaching elsewhere, 27 percent were positions outside of academia, 14 percent were visitors, and 3 percent returned to graduate school. This year, 177 faculty left the departments, last year, 179.

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CR Categories and Subject Descriptors: K.0 [**Computing Milieux**]: General; K.3 [**Computing Milieux**]: Computers and Education; K.7 [**The Computing Profession**]

Additional Key Words and Phrases: Computer Science and engineering faculty statistics, Ph.D. production in computer science and engineering

ABOUT THE AUTHORS:

DAVID GRIES is a faculty member of the Computer Science Department at Cornell University. He was its chair from 1982–1987, and has received several awards including the 1985 AFIPS Education Award and, as a co-recipient, the 1976 ACM Programming Languages and Systems Best Paper Award.

DOROTHY MARSH is an administrative assistant in the Computer Science Department at Cornell University. Authors' Present Address: Computer Science Dept., Upson Hall, Cornell University, Ithaca, NY 14853–7501.

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A STUDY

OF FACTORS AFFECTING TURNOVER OF

PEAK PERFORMERS IN ENGINEERING

M.A.H.
S.L.N. 3/85

PRESENTATION OUTLINE

- OVERVIEW OF THE STUDY: HISTORY, PURPOSE, METHOD
- QUESTIONS CONCERNING THE RELEVANCE OF THE STUDY
- SUMMARY AND ANALYSIS OF SURVEY AND INTERVIEW DATA
- DISCUSSION

HISTORY, PURPOSE & METHODS OF STUDY

- THIS STUDY WAS INITIATED IN MAY 1984 BY MAUREEN HARVEY AND SUSANNAH NATHAN AS A MEANS OF GAINING A BETTER UNDERSTANDING OF FACTORS INFLUENCING TURNOVER OF PEAK PERFORMERS IN ENGINEERING.

- THE STUDY WAS DESIGNED AND IMPLEMENTED BY EDMUND MCGRATH, A DOCTORAL STUDENT IN EDUCATION FROM BOSTON UNIVERSITY.

- THE METHODS USED WERE: 1) SURVEY OF ALL #1 RATED ENGINEERING MANAGERS AND INDIVIDUAL CONTRIBUTORS WHO VOLUNTARILY TERMINATED FROM 1/1/82 TO 7/15/84 AND 2) INTERVIEWS OF A SUBSET OF THIS POPULATION WHO WERE IDENTIFIED BY SENIOR ENGINEERING MANAGEMENT AS KEY LOSSES. SEVENTEEN OF THIRTY FORMER EMPLOYEES IDENTIFIED WERE INTERVIEWED.

- THE SURVEY INSTRUMENT WAS TESTED FOR FOCUS AND USEFULNESS BY A SAMPLE GROUP OF INTERNAL DEC ENGINEERS AND MANAGERS.

- 106 SURVEYS WERE SENT OUT AND 51 WERE RETURNED. THIS REPRESENTS A VERY HIGH RETURN RATE.

IS THIS STUDY RELEVANT TO DEC'S BUSINESS

- DEC HAS ALWAYS AFFIRMED THAT ITS EMPLOYEES ARE ITS MOST IMPORTANT RESOURCE. ARE THERE THINGS WE CAN DO WHICH WOULD ENABLE US TO KEEP A HIGHER PROPORTION OF OUR KEY PEOPLE?

- AS THE COMPANY MATURES ARE WE IDENTIFYING AND REINFORCING OUR STRENGTHS AND SUCCESSFULLY ADAPTING TO CHANGING CONDITIONS?

- AS DEC EVOLVES DO WE NEED TO CHANGE THE REWARD AND RECOGNITION PRACTICES/PROGRAMS IN ENGINEERING?

FACTORS WHICH HELP DEC RETAIN EMPLOYEES

- STIMULATING AND REWARDING INTERACTIONS WITH PEERS
- RESOURCES AVAILABLE IN A LARGE COMPANY
- GOOD ENVIRONMENT FOR THE SELF-MOTIVATED
- CHALLENGING TECHNICAL WORK AVAILABLE
- GOOD BENEFITS
- GOOD TRAINING PROGRAMS

SUMMARY OF THEMES AND FINDINGS

SENIOR MANAGERS IDENTIFIED

- A POLITICIZED ENVIRONMENT AND DECISION-MAKING
- DISRUPTIVE INTERNAL COMPETITION
- EXCESSIVE BUY-IN REQUIRED TO GET THINGS DONE
- THE ABSENCE OF CLEARLY DEFINED MARKET GOALS & MEANS TO IMPLEMENT THEM
- A LACK OF STRONG TECHNICAL LEADERSHIP

SENIOR ENGINEERS THRU ENGINEERING MGRS. IDENTIFIED

- STOCK OPTIONS AND FINANCIAL REWARDS NOT CLEARLY TIED TO IMPACT ON THE BOTTOM LINE
- ACKNOWLEDGEMENT OF GOOD PERFORMANCE AS HARD TO COME BY
- A NEED FOR BETTER THOUGHT-OUT INCENTIVE PROGRAM(S) BONUSES?
- THAT PROJECTS TAKE TOO LONG TO COMPLETE: NEED BETTER TOOLS AND MORE EFFECTIVE MANAGEMENT SYSTEMS
- A FEELING OF POWERLESSNESS, LACK OF INFORMATION, AND UNCLEAR GOALS

COMMENTS FROM SURVEY RE: MAIN REASON RESPONDENTS LEFT THE COMPANY

24.3% LACK OF MANAGEMENT SUPPORT FOR CAREER DEVELOPMENT & TRAINING

22.9% MISMANAGED PROJECTS: BURNOUT/SHIFTING PRIORITIES

20.0% SALARIES AND REWARDS VIEWED AS INADEQUATE

15.7% EXCELLENCE NOT VALUED; MEDIOCRITY TOLERATED OR REWARDED

14.2% FRUSTRATION WITH INEFFECTIVE MANAGEMENT

2.8% LACK OF DAYCARE AND PROVISION FOR PARENTING

A STUDY

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From: RDVAX::FULLER "Sam Fuller" 5-FEB-1993 15:01:51.36
To: MILPND::STRECKER,MILPND::CHRISTENSEN
CC: PERSON,FULLER
Subj: RE: KEY PEOPLE

people planning / admin

First, the list of critical people in Corporate Research.

This is the "short list" of people that are critical to Digital and at risk of being recruited.

1. Chuck Thacker.

   Numerous startups and others would like Thacker.
   Actions: retention grant in Dec.'92. Working with Walker and Dormitzer to make AN2 a product. Both are critical to keeping Thacker.

2. Butler Lampson.

   Very visible on the outside. Often sought out by companies that want to add depth to their research effort.
   Actions: being used on new STF/STG. Adjunct appointment at MIT effective for Digital and Butler.

3. Richard Swan.

   His long term goal is to lead some business group/unit in the company. To date, no opportunity has worked.

4. There are other critical, externally visible individuals that would be a serious loss if they left, but I am not aware of significant, ongoing efforts to attract them away from the company. They are:

   Patrick Baudelaire
   Brian Reid
   Bob Taylor
   Phil Bernstein
   Mark R. Brown
   Norm Jouppi
   Jeremy Dion
   Louis Monier
   Michel Gangnet

I don't have a list of underutilized, critical people. There is little slack in Research following SERP and then the recent downsizing.

My third list is people who have, in fact, left Digital in the past couple of months that have been a Serious Loss:

1. John Ellis from SRC.

   Went to PARC. Was leading our startup work in mobile computing.

2. Mike Goguen from SRC.

   Chuck Thacker's right hand man in making AN2 happen.
   Went to a new ATM startup.

admin stuff
finance
salary plan

file under
CONFIDENTIAL !!

From SF
TO: Strecker + Christensen
CC Person

From: RDVAX::FULLER "Sam Fuller" 3-FEB-1993 12:13:28.35
To: person,fuller
CC: FULLER
Subj: CONFIDENTIAL*** DAve--please comment. ***Bring to meeting.**** SUE--with Dave's feedback and then I'll send to Bill

title for email: RE: Key People

(SUE: Very Confidential)

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   Actions: being used on new STF/STG. Adjunct appointment at MIT effective for Digital and Butler.

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Brian Reid
Bob Taylor
Phil Bernstein
Mark R. Brown
Norm Jouppi
Jeremy Dion
~~Louis Monier~~ LOUIS MONIER
~~Michael Gagnet~~ MICHEL GANGNET

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2. Mike ~~Gogen~~ (sp?) GOGUEN. From SRC. Chuck Thacker's right hand man in making AN2 happen. Went to a new ATM startup.

f: Strecker
memo

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I N T E R O F F I C E M E M O R A N D U M

Doc. No: 012302
Date: 27-Jan-1993 03:52pm EST
From: BILL STRECKER
STRECKER.BILL
Dept: VP Engineering
Tel No: 223-3726

TO: See Below

Subject: KEY PEOPLE

One of the H.R. agenda items that was reviewed last week at staff was to focus on key people who could be at risk of leaving Digital, as well as key people not being fully utilized. In that light, I would like each of you to send me, in confidence, these two lists by February 9th. Along with the lists of people's names, please include your plans for either retention or improved utilization.

I assume that you are implementing the plans as you can within your business and will identify the specific help you need from me or others in the corporation. Ralph Christensen and I will look for common issues in our system that need to be changed, and to get you whatever other help you need.

Thank you for your efforts in this very important area.

Distribution:

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From: RDVAX::FULLER "Sam Fuller" 8-MAR-1991 10:19:22.16
To: NM%BAYDEC::SUTTER,NM%DECSRC::TAYLOR
CC: DELUCA
Subj: RELOCATION AUTHORIZATION

Approval is given authorizing payment of standard relocation for Bart Locanthi.

Sam Fuller
Vice President of Research

From: RDVAX::FULLER "Sam Fuller" 16-JAN-1991 16:09:29.82
To: NM%SALEM::JSANTOS
CC: NM%RICKS::GRONDALSKI,PERSON,DELUCA
Subj: Moving Bob Grondalski into engineering cost center.

I do not know why paperwork is slow in moving. Following the discussion with Bob and Jack Smith several weeks ago I initiated actions to move Bob out of Transition and into my research cost center (3C6). I have just hired a new personnel manager (Dave Person) and it may take him a today or two to sort this out. In any case, Bob should not be in transition and if you could call Dave Person here in the Mill, dtn 223-9173 to sort out any needed paperwork I would appreciate it.

Sam Fuller

From: CRDCRA::DELUCA 17-JAN-1991 14:38:16.36
To: NM%BOGART::GRONDALSKI
CC: DELUCA
Subj: SAM FULLER

Bob - Sam asked me to let you know that he's read your mail. He believes that you're being moved out of the transition program into 3C6. Thinks that we're all set.

Do you still need to have a conversation with Sam (per your message left yesterday)?

Iris

From: CRDCRA::DELUCA 16-JAN-1991 13:23:08.69
To: SALEM::JSANTOS
CC: PERSON,DELUCA
Subj: RE: ROBERT GRONDALSKI

John, below is the information you requested per Sam Fuller:

cost center:	3C6
c.c. effective date:	1/11/91
work site:	same as old site
mail stop:	same as old site
pay site:	same
job code:	same
job title:	same

Dave, ad hoc interim step (approximately two months) till Grondalski goes over to new job.

From: SALEM::JSANTOS 11-JAN-1991 14:01:59.06
To: RDVAX::DELUCA,CRA::FULLER
CC: JSANTOS
Subj: ROBERT GRONDALSKI

MY NAME IS JOHN SANTOS. I'M A MANAGER IN THE TRANSITION ORGANIZATION (TMP). Bob gave me your name as the person to contact to give me information so I can transfer him. What I need is;

supervisors name and badge#
Cost center
C.C. effective date
work site
mail stop
pay site
job code (if different than what he is now)
job title (")

Thanks for any help you can give me,
John

From: RDVAX::WATSON "Jenny Watson 223-9173" 7-NOV-1990 13:24:23.13
To: NM%HAVOC::PICARDI,FULLER,DELUCA
CC: WATSON
Subj: NOVEMBER 12TH NUMBERS

CC: Sam Fuller
Iris DeLuca

313 -- End Q2

329 -- End FY91

0 -- +/- Full Year

-- OUTPLACE WITH PACKAGE

4 --By Q2

0 --By Q4

4 --Total

CRA>

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I N T E R O F F I C E M E M O R A N D U M

Doc. No: 005066
Date: 19-Mar-1990 02:48pm EST
From: Sam Fuller
FULLER.SAM
Dept: Corp. Research & Arch.
Tel No: 223-3710

TO: Dick Farrahar (FARRAHAR.DICK)
TO: Jack Smith (SMITH.JACK)

CC: Remote Addressee (WATSON @RDVAX@VAXMAIL)

Subject: HIRING PROCESS FOR RESEARCH

I thought it would be a good idea to write down the process I am now using with regard to candidates for the research group.

At the present time I am directing the research labs not to go beyond the already explicitly approved hires for the remainder of this fiscal year. This means we are now down to seven pending offers that have been approved but not yet accepted. We will only proceed with a new candidate when one of the outstanding offers for an approved position has been declined.

When an offer is made to someone finishing their graduate work, it can be anywhere from three to nine months before they complete their work and come to Digital. Already we have at least one person who has accepted our offer some time ago, but in fact will not report to work until after the start of FY91.

Later in Q4, when budgets are more stable for next year, we will need to get an agreement on how Research will operate with respect to hiring new researchers. We will have to keep the door open to exceptional candidates. However, it's probably most productive to talk about next year once the budgets for next year are approximately known.

/id
90.1.6

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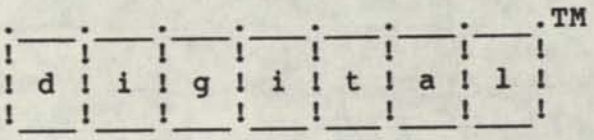

Interoffice Memo

SHF:90.2.93

TO: Jack Smith

CC: Dick Farrahar
Jenny Watson

DATE: 26 January 1990
FROM: Sam Fuller
DEPT: Corp. Research & Arch.
EXT: 223-3710
LOC: ML012-2/T7
ENET: RDVAX::FULLER

SUBJECT: RESEARCH GROUP HIRING

At our meeting yesterday I described why the Research Group needed to proceed with the hiring of five persons. They are:

Frank Schmuck: for SRC. From Cornell, strong systems person.
Paul Beebe: for SRC. Person to work with Chuck Thacker on computing environment.

Jim Miller: for CRL. Worked with us before as a summer intern.

Glenn Trewitt and Phillip Prindeville: for NSL (Network Systems Lab). Strong in TCP/IP -- area where Digital has serious weakness.

At our meeting I also indicated that over the course of the Winter/Spring, Research should hire a few more persons (between five and ten more). While you agreed these first five made sense, you said you'd like to see this memo before commenting on these future hires.

All of this is being done within the constraints of CRA's reduced budget for this year (42.8M) and our "5%" budget for next year of $45M. To meet next year's budget I am in fact planning to stop or reduce some of the non-research areas of CRA. However, even as I ramp down some efforts, to run research we've got to be able to recruit and attract the most outstanding researchers as they become available. This memo is a request to continue to do this restricted recruiting for the remainder of this fiscal year.

/id

DIGITAL CONFIDENTIAL Document

I N T E R O F F I C E M E M O R A N D U M

Doc. No: 004577
Date: 09-Jan-1990 02:48pm EST
From: Dick Farrahar
FARRAHAR.DICK AT A1 at CORA @ CORE

Dept: MEM PERSONNEL
Tel No: 223-7738

TO: See Below

Subject: WORLDWIDE HIRING FREEZE GUIDELINES

THE ATTACHED IS FYI --

Distribution:

TO: DICK YEN @TAO
TO: DAVID STONE @GEO
TO: FRANK MCCABE @CORE
TO: KEATING @PIPE@VMSMAIL
TO: BILL HEFFNER @CORE
TO: SAM FULLER @CORE
TO: FRIEDRICH @STAR@VMSMAIL
TO: JIM CUDMORE @CORE
TO: HENRY CROUSE @CORE
TO: GEORGE CHAMBERLAIN @CORE

DIGITAL CONFIDENTIAL Document

DIGITAL CONFIDENTIAL Document

I N T E R O F F I C E M E M O R A N D U M

Date: 09-Jan-1990 01:43pm EST
From: Jack Smith
SMITH.JACK AT A1 at CORA @ COR
E

Dept: ENG/MFG/PROD MKT ADMIN
Tel No: 223-2231

TO: See Below

Subject: WORLDWIDE HIRING FREEZE GUIDELINES

Attached, please find the Operational Guidelines for external hiring. The Exception Approval Process and related information are in effect until futher notice from this office.

WORLDWIDE EXTERNAL HIRING OPERATIONAL GUIDELINES

Offers Outstanding

- Written offers made on or before December 22, 1989, are considered valid.
- Verbal offers require written documentation that the verbal offer was made on or before December 22, 1989.

Agency/Contract Workers

- Revisit all existing temporary requisitions to validate current need.
- After review, existing requisitions will continue until their expiration date.
- No requisitions for contract workers/temporaries will be approved or extended unless the Exception Approval Process is utilized. (See below.)
- Current U.S. consultants impacted by the U.S. Consultant Conversion process will be allowed to convert to contract worker status (U.S. only).

Exception Approval Process

- Each external hiring request will be reviewed by the appropriate Corporate Operations Committee member and respective PMC representative.
- The Corporate Operations Committee member will be responsible for obtaining my approval of the external hire.

NOTE: Actions taken due to these guidelines must be in compliance with the existing laws of the respective country in which a subsidiary resides.

Distribution:

Grant Saviers	(SAVIERS.GRANT AT A1 at CORA @ CORE)
BOB PALMER	(PALMER.BOB AT A1 at CORA @ CORE)
Ken Olsen	(OLSEN.KEN AT A1 at CORA @ CORE)
Willow Shire @ CORE	(SHIRE.WILLOW AT A1 at CORA @ CORE)

Dick Farrahar	(FARRAHAR.DICK AT A1 at CORA @ CORE)
BRUCE J RYAN @CORE	(RYAN.BRUCE J AT A1 at CORA @ CORE)
Bill Johnson	(JOHNSON.BILL AT A1 at CORA @ CORE)
PETER SMITH	(SMITH.PETER AT A1 at CORA @ CORE)
BILL STRECKER	(STRECKER.BILL AT A1 at CORA @ CORE)
BILL HANSON	(HANSON.BILL AT A1 at CORA @ CORE)
DONALD ZERESKI	(ZERESKI.DONALD AT A1 at CORA @ CORE)
Russ Gullotti @ CORE	(GULLOTTI.RUSS AT A1 at CORA @ CORE)
DICK POULSEN	(POULSEN.DICK AT A1 at CORA @ CORE)
Dave Grainger	(GRAINGER.DAVE AT A1 at CORA @ CORE)
PIER CARLO FALOTTI @GEO	
Dom LaCava	(LACAVA.DOM AT A1 at CORA @ CORE)
Bob Glorioso	(GLORIOSO.BOB AT A1 at CORA @ CORE)
Bill Demmer	(DEMMER.BILL AT A1 at CORA @ CORE)
Jack Smith	(SMITH.JACK AT A1 at CORA @ CORE)

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Interoffice Memo

SHF:90.2.89

TO: Dick Farrahar
Jack Smith
CC: Agnes Connors
Jenny Watson

DATE: 10 January 1990
FROM: Sam Fuller
DEPT: Corp. Research & Arch.
EXT: 223-3710
LOC: ML012-2/T7
ENET: RDVAX::FULLER

SUBJECT: SUMMER INTERNS IN CORPORATE RESEARCH

Based on our discussion of a year ago (memo attached) I am continuing to look at the summer intern program in CRA as part of doing the regular business of research, not new hires. In keeping with the policy of a hiring freeze, I will ensure that the number of interns in 1990 is not larger than the program in 1989.

Att.
/id

d i g i t a l

Interoffice Memo

SHF:1.78

TO: Dick Farrahar
Jack Smith

DATE: 29 March 1989
FROM: Sam Fuller
DEPT: Corp. Research & Arch.
EXT: 223-3710
LOC: MLO12-2/T7
ENET: RDVAX::FULLER

SUBJECT: HIRING RESTRICTIONS

I understand the reasons and need for the current hiring freeze. I believe we need to do the following with respect to the Research Group:

1. Continue the Summer Research Intern program at the same headcount as last year. These interns are graduate students at various universities, often continue to work on research problems at the universities in collaboration with Digital employees within the research groups, and become a source of future researchers for Digital. These are long term working relationships, not just three month summer job opportunities.

Consistent with the intent of stopping summer hiring, research will not hire undergraduates, or others, for nonresearch/support jobs this summer.

2. Even in the midst of hiring freezes, I assume one aspect of my job is to continue to look for exceptional people to join Digital. In addition, we are now in the middle of getting two labs, CRL and PRL up to critical mass.

Proposal: Over the next year we agree CRA will not hire more than 24 people without specific approval from the two of you. In each of these hires, we will apply the same rigorous standards we have used during the past several years.

During this year, we have hired 45 people. Based on the most recent count from personnel, this is substantially less than virtually all other groups in engineering and is also less than our original plan.

Attached is a more complete description of these two points by Jenny Watson. I will check with both of you in several days to see if you agree with this plan.

Att.
/id

digital

Interoffice Memo

TO: Sam Fuller

DATE: 28 March 1989
FROM: Jenny Watson
DEPT: CRA Personnel
EXT: 223-9173
LOC: MLO1-3/B10

SUBJECT: HIRING RESTRICTIONS

I am asking for an exemption from the recently imposed restrictions on intern, college and headcount additions for Corporate Research. Adhering to the restrictions would cripple our efforts in numerous ways.

For CRA, the internship program is an integral part of the way we do business. It is part of the cost of doing business as a research organization. Each of the Labs seeks to attract the best MAS/PHD candidates to work in each of the Labs during the summer. The intent is to:

* Help us develop a better understanding of the research communities from which they come;
* Help us maintain a flow of new ideas into the centers;
* Help them understand more about research as an industrial enterprise;
* Help us with future recruiting of themselves and of their peers by giving DEC more visibility on their campuses when they return.

The interns provide a potential permanent employee pool. When we find a graduate student whose work and credentials meet our standards, we will extend an offer to the individual upon completion of their degree program. Once again, cancelling college hiring does not make sense given what CRA will already have invested in the individuals over the course of several summers.

I believe we are making these commitments responsibly. We will commit to ensure that we will not hire beyond the number of interns forecast for FY'89, which is 34. Indeed, to be totally honest, we have already extended offers to 20 interns who are set to start in May.

Although we are in the midst of ramping up the Cambridge and Paris Labs, CRA's personnel growth this past year has been modest. We will have added 45 people; proportionately fewer than any other engineering group with the exception of Strecker's central group and MBS which closed out Seattle, thereby having a negative number. Since we continue to try to attract only the best research staff members for Cambridge and Paris, and to selectively round out our

capabilities at SRC and WRL, CRA expects to add only 24 permanent employees in FY'90.

Because of the length of the search and courtship time required to bring qualified senior researchers into Digital, we must take a measured approach to finding the right candidates. Digital's research organization must be viewed as open to hiring on a continual basis by the external community or we close off too many opportunities. I would like the ability to pursue hiring quality, innovative researchers without having to ask for an exception to flat headcount growth each time.

I look forward to your response so that we can conclude our summer hire program in good shape.

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Interoffice Memo

SHF:90.2.90

TO: Dick Farrahar
Jack Smith
CC: James Cudmore
Jenny Watson

DATE: 10 January 1990
FROM: Sam Fuller
DEPT: Corp. Research & Arch.
EXT: 223-3710
LOC: MLO12-2/T7
ENET: RDVAX::FULLER

SUBJECT: COLLEGE HIRES IN A TOUGH YEAR

My understanding is that our 1990 college hiring program has been cancelled, or put on indefinite hold. I think this is a mistake. It makes sense to cut back the college hire program in hard times, but not to stop it entirely.

When we stop college hiring completely, we suffer the following consquences:

1. In bad years, as in good years, numbers of exceptional students graduate. We should ALWAYS be trying to get such exceptional people. Maybe we need a tougher filter in the tough years, but we should still try and get the best that are graduating.

2. As we stop hiring from colleges in tough times, we break our connection to the placement/hiring departments of the colleges. Getting these connections reestablished costs us more in the long run than we save in the short run.

PROPOSAL: Set a limit somewhere between 1/2 to 1/4 the regular college hire rate for use in tough times. Then ask the college hire office to help us tighten the college hiring process so that the smaller numbers that we do hire are the students we really are prepared to bet on as new employees.

/id

From: RDVAX::FULLER "SAM FULLER, ML12-2" 8-JAN-1990 08:34:51.61
To: DELUCA
CC:
Subj: print and file in "hiring policy/exceptions/Admin"

From: RDVAX::WATSON 4-JAN-1990 17:21:53.13
To: FULLER
CC:
Subj: intern prog memo to staff

From: RDVAX::FULLER "SAM FULLER, ML12-2" 29-MAR-1989 09:07:39.23
To: WATSON,DELUCA
CC:
Subj: hire memo

Subject: Hiring Restrictions

I understand the reasons and need for the current hiring freeze. I believe we need to do the following with respect to the Reserach group:

1. Continue the Summer Reserach Intern program at the same headcount as last year. These interns are graduate students at various universities, often continue to work on research problems atthe universities in colloration with Digital employees within the Reserach groups, and become a source of future reserchers for Digital. These are long term working relations, not just 3 month summer job opportunities.

Consistent with the intent of stopping summer hiring, Reserach will not hire undergraduates, or others, for nonreserach/support jobs this summer.

2. Even in the midst of hiring freezes, I assume one aspect of my job is to continue to look for exceptional people to joion Digital. In addition, we are now in the middle of getting two labs: CRL and PRL up to critical mass.

Proposal: Over the next year we agree CRA will not hire more than 24 people without specific approval from the two of you. In each of these hires, we will apply the same rigorous standards we have used during the past several years.

During this year, we have hired 45 people. Based on the most recent count from presonnel, this is substancially less than virtually all other groups in engineering and is also less than our original plan.

Attached is a more complete description of these two points by Jenny Watson. I will check with both of you in several days to see if you agree with this plan.

From: RDVAX::FULLER "SAM FULLER, ML12-2" 8-JAN-1990 08:55:24.99
To: DELUCA
CC:
Subj: print and put in hiring file.

From: RDVAX::WATSON 4-JAN-1990 17:26:38.30
To: FULLER
CC:
Subj: sam, actuals as of today. will work the issue w/Donna B. jw

From: RDVAX::BARRY 4-JAN-1990 11:56:30.48
To: NM%HUBIE::OFRIA,WATSON
CC: BARRY
Subj: WORLDWIDE HEADCOUNT FOR DECEMBER

WORLDWIDE POPULATION - DECEMBER 1989
CORPORATE RESEARCH & ARCHITECTURE - ENGINEERING

	BEG. POP.	HIRES	TERMS	TRANSFERS IN	TRANSFERS OUT	END POP.
PERMANENT:						
U.S.	225	1	1	3	2	226
EUROPE	40	0	0	0	0	40
PERMANENT TOTAL:	265	1	1	3	2	266
OTHER:						
U.S.	21	9	1	0	0	29
EUROPE	5	0	1	0	0	4
OTHER TOTAL:	26	9	2	0	0	33
TOTALS	291	10	3	3	2	299

COMMENTS:

PERSONNEL/POPULATION RATIO REPORT
CORPORATE RESEARCH & ARCHITECTURE - ENGINEERING

PERMANENT POPULATION: 266

PERSONNEL POPULATION: 3

PERSONNEL RATIO: 1 : 89

ADDITIONAL REQUESTED DATA:

1) Q3 AND Q4 Forecast for the "REGULAR" personnel population to define ratio is "0".

2) For Q2 ending, the number of "OTHER" in personnel was "0".

3) For Q3 and Q4 the forecast for "OTHER" is "0".

From: RDVAX::FULLER "SAM FULLER, ML12-2" 26-DEC-1989 14:29:12.41
To: @CRA
CC:
Subj: Hiring Freeze and how we'll manage in CRA

Last week Jack Smith send out a memo to his entire staff saying that due to expenses continuing to grow, and revenue not growing at any significant rate that the company has instituted an across the board, world wide hiring freeze. (I will try and have the actual memo forward to all of you in the coming week.)

I have met will Jenny, and Agnes, and here is how CRA can proceed in the coming months (i.e. Q3FY90).

1. We are at the critical, initial stage of setting up NSL. I encourage Dave Crocker to continue on his current plan of growing NSL to 12 persons as soon as possible. I'll take new offers for the NSL to Jack Smith and Dick Faraharr individually, or in a block. Given the critical need for persons with TCP/IP knowledge I do not expect we will be stopped building NSL.

2. In addition, I will also take forward as an exception any candidate that is within the plans of one of the labs. and has the potential to be an outstanding contributor to reserach (i.e. our standing criteria for new members of the research staff.)

3. Other open requisitions for staff support or operations will be put on hold. Probably for the duration of Q3.

Well will no doubt consider updates to this hiring policy at the CRA staff meeting Jan. 22/23. However do not wait until then if exceptions to hire are needed (i.e. items 1 and 2 above.). I will be out on vacation from tomorrow (Dec. 27) through Jan. 3. I should then be in the office, and able to work on exceptions, until I leave for our staff meeting on Jan. 22.

We will obviously continue to process and honor offers outstanding. (This includes the hardware person Thacker is trying to hire from Illinois or CMU, even though an actual offer letter is not yet out the door.)

Sam Fuller
ex

Sam Fuller
Forward to Watson
1/3/89

d	i	g	i	t	a	l

INTEROFFICE MEMORANDUM

TO: JFS STAFF

DATE: 12/22/88
FROM: DICK FARRAHAR
ED COTTER
DEPT: PERSONNEL

CC: MEM PMC

SUBJECT: JEC REVIEW PROCESS FOR MEM

The following outlines the process that will be used to review the results of JEC during Q3. This outline incorporates input from the MEM staff collected during individual briefings over the last three weeks.

The review will have three dimensions:

o Functional Review

Functional reviews have been established in all job families to review classification decisions across the corporation and assure that they are consistent in the application of evaluation guidelines.

o Group Review

Each group has established its own organization review to check intra-group results against expected outcomes and to integrate functional input to assure consistent application.

o MEM Review

Sub-committees will be organized to review cross-organization results for the MEM and Manufacturing Staffs. These committees will represent each respective staff and approve the final results. The Marketing organization will participate in both the MEM review as well as the Corporate Marketing review.

Functional and Group reviews are being scheduled during January and February. A working strawhorse for the membership of the Functional Review Teams is attached. Personnel Managers are the focal points for these teams. The MEM reviews will take place in March. Membership and coordination of these groups will be managed by Dick Farrahar (MEM), Linda St. Clair (Mfg.), and Willow Shire (Marketing). A working strawhorse of the membership for these teams is also included.

We appreciate your support and participation in this key phase of JEC implementation.

****
* FUNCTIONAL *
* REVIEW TEAMS *
****

MEM

(Working Document)

FUNCTION	LINE	PERSONNEL	COMPENSATION
Materials, Purchasing, Distribution	K. Melia R. Payne (Materials BOD)	P. Kelly	G. Vollmuth C. Gilpatric
Manufacturing	L. Gaviglia (Membership to be determined)	H. Greenfield	G. Vollmuth C. DeCamp
Technical	D. LaCava D. Thorpe B. Keating R. Dormitzer F. McCabe S. Gault	L. Koch	B. Smith P. Lavallee
Marketing	P. Smith (PM Staff) (BPM Mgrs)	W. Shire	N. Lagerquist
Finance	G. Chamberlain (MEM Finance Staff)	J. Bahrnes	R. Green
Personnel	D. Farrahar (MEM PMC)	M. Vanderpot	L. Rak
DIS	D. Infante (Staff Sub-Committee)	S. Milne	D. Woodhouse

****
* ORGANIZATIONAL *
* REVIEW TEAMS *
****

(Working Document)

ORGANIZATION	LINE	PERSONNEL	COMPENSATION
MEM	F. McCabe	D. Farrahar	B. Mulkey
	D. LaCava		
	K. Friedrich		
	B. Palmer		
	B. Johnson		
	B. Glorioso		
	P. Smith		
	B. Hanson		
Manufacturing	L. Gaviglia	L. St. Clair	G. Vollmuth
	K. Melia		
	M. Prokopis		
	D. Jennings		
	G. Plakias		
	F. McCabe		
	B. Robinette		
Marketing	P. Smith	W. Shire	N. Lagerquist
	B. Hughes		
	J. Witmore		
	J. MacKeen		
	H. Weiss		

FM

INTEROFFICE MEMORANDUM

Date: 6-Apr-1988 02:39am EDT
From: Peter Phillips
PHILLIPS.PETER AT A1 at MAR

R at CFO

Dept: Corp. Identity & Design
Tel No: 251-1515 CFO1-1/M37

TO: SAM FULLER @MLO

CC: Judy Steul (STEUL.JUDY AT A1 at MARKER at CFO

Subject: Electronic Mail Addresses on Business Cards

The Company Identity Committee has reached a final decision on including electronic mail addresses on business cards. This decision was reached after lengthy discussion and extensive research.

The decision not to allow DTN prefixes and any internal Digital node information on business cards stands. Public electronic mail addresses, such as MCI, TELEX and FAX will be allowed if there is a good business reason to include such public electronic address information. A Cost Center Manager must personally approve every request to include Public Electronic Addresses on Digital Business Cards.

The business reason needs to be a strong one due to the fact that if the practice is extremely common within the company, we lose the ability to demonstrate reasonable caution in protecting access to our various internal networks.

This decision is being formally written and will be widely publicized during the month of May. I know that your group has had a strong interest and wanted to be sure you received the information right away.

With your approval, individuals in your group who have strong business reasons to include an electronic address on their cards may do so as long as internal node information is not revealed in the address.

Regards,

Peter Phillips
for The Company Identity Committee

TO: Taylor
HORNING
Johnson
MORE EDWAS? I INFER THE REASONING IS THAT THEY DO NOT WANT TO ADVERTISE NODE NAMES -- A WEAK BUT MAYBE REAL LEVEL OF SECURITY.

ANY WAY TO ALLOW MAIL ADDRESSES WITHOUT NODE NAMES?
E.G. -- put in a node DECMAIL & then simply autoforward from DECMAIL to DECSRC -- or whatever.
fam

APPLICATUION FOR EXCEPTION

EMPLOYEE NAME: ANGELA SIDDALL
EMPLOYEE BADGE: 155684
SITE: UCT
COST CENTER: 36D

EXCEPTION REQUEST:

THE SUM OF $713.17 TO BE PAID TO THE TERMINATING EMPLOYEE. ANGELA HAS BEEN A VALUED EMPLOYEE FOR THE PAST FOUR YEARS AND COULD BE WITHOUT MEDICAL INSURANCE COVERAGE FOR A THREE MONTH PERIOD. THIS WILL ALLOW HER TO BRIDGE THE PERIOD WHEN HER COVERAGE THROUGH DIGITAL ENDS, MAY 30, 1988, AND THE DATE WHEN SHE AND HER DEPENDENTS CAN BE ADDED TO HER FUTURE SPOUSE'S INSURANCE PLAN, SEPTEMBER 1, 1988.

Angela N. Siddall	ANGELA N. SIDDALL	155684	4/6/88
EMPLOYEE SIGNATURE	PRINTED NAME	BADGE	DATE
R W Taylor	R W. Taylor	149405	6 Apr 88
COST CENTER MANAGER	PRINTED NAME	BADGE	DATE
Andrea M Brott	Andrea M Brott	19970	April 7, 1988
PERSONNEL REPRESENTATIVE	PRINTED NAME	BADGE	DATE
Wat	JENNY WATSON	95745	April 20, 1988
		BADGE	DATE
Samuel W. Fuller	SAM FULLER	73954	4/20/88
		BADGE	DATE
Dick Farrahar	DICK FARRAHAR	7859	4/21/88
		BADGE	DATE

March 1988

THE INSTITUTE

VOLUME 12 □ NUMBER 3

Graduate student got inside look at advanced Soviet computing

He reports design more original than expected

An advanced, 32-bit Soviet microprocessor module has been tested at the Computer Center of the Siberian Division of the Academy of Sciences in Novosibirsk, according to a U.S. graduate student who was briefed on the project by Soviet computer scientists in Tallin.

Called Kronos, the module was designed as the building block for a multiple-processor computer named MARS (for the Russian for modular asynchronous expandable system). MARS is believed to be essential to Soviet work in artificial-intelligence and fifth-generation computing, areas in which Soviet efforts lag behind programs in the United States, Japan, and western Europe.

According to Seymour E. Goodman (A), a professor at the University of Arizona in Tucson and a leading expert on Soviet computing, the MARS and Kronos projects are noteworthy for two reasons. They are largely indigenous efforts, and they have been carried out with an unusual degree of cooperation among a number of top Soviet research institutions.

"I don't think either [MARS or Kronos] is a pretty close copy of anything in the West, which is pretty unusual for them," Goodman said. Virtually all significant Soviet minicomputers and mainframes of the 1960s and 1970s were copies of U.S. systems from IBM, Digital Equipment, Hewlett-Packard, and others. For example, the most widely used Soviet mainframe lines, the Ryad I and Ryad II, are copies of IBM's 360 and 370 model computers.

A prototype MARS could be tested as early as this spring, according to Peter Wolcott, the U.S. student who visited the USSR last June. A computer incorporating some of the principles and technologies of the MARS design, called mini-MARS, was tested several years ago at the Academy of Sciences division in Novosibirsk. Mini-MARS does not use the Kronos microprocessor, but it will be connectable to the MARS computer as an auxiliary processor.

Wolcott met with Soviet computer scientists at the invitation of Enn Tyugu, a Soviet software specialist who is working on software for the Kronos. Wolcott, also of the University of Arizona, saw a Kronos-based system in operation at the Institute of Cybernetics of the Estonian Academy of Science in Tallin, some 600 miles northwest of Moscow on the Gulf of Finland.

Four research centers involved

Computer scientists from both the Tallin and Novosibirsk centers are helping build the MARS computer as part of a temporary scientific technical task force called Start. The group was specially convened for the project and is staffed with some of the most talented computer scientists and engineers from

(Continued on p. 4, col. 2)

Aviation experts endorse an independent FAA

Washington, D.C.—While the Federal Aviation Administration should be an independent agency, its functions do not belong in the private sector, according to speakers at a recent Air Traffic Control Association symposium on the FAA.

Separating the FAA from the Department of Transportation, several said, would be the first step toward restoring the authority and confidence needed if the FAA is to cope with the aviation industry's increasingly complex problems.

Former FAA chief J. Lynn Helms was moderator, and two other former administrators, Najeeb Halaby and Langhorne Bond, were among the 11 speakers, who included congressional staff and representatives of various Federal agencies and private aviation associations.

All speakers acknowledged that simply separating the FAA from the DOT would not solve the agency's problems, but agreed that it would be the best way to start reforming the agency. However, most also firmly argued that a private corporation would not have the public's best interests at heart.

Several speakers recalled that rocky relationships between various FAA administrators and concurrent secretaries of transportation have been at the root of many FAA difficulties. A complaint voiced several times was that while the secretary has authority to make decisions affecting the FAA, the administrator is held responsible for the consequences of those decisions—a division that results in ineffectiveness and lack of accountability. Jonathan Howe, president of the National Business Aircraft Association, advocated legislation clarifying the roles of the administrator and the secretary.

Confusing and volatile

Since the FAA became a part of the DOT in 1966, personality conflicts between the secretary and the administrator have added to the confusing and volatile situation, said Henry Duffy, president of the Air Line Pilots Association.

The FAA has had its hands tied particularly in procurement issues, said James Landry, general counsel of the Air Transport Association. "It's hard for the FAA to do anything quickly when its decisions are second-guessed by [Congress's] General Accounting Office, the [Administration's] Office of Management and Budget, and the DOT," he said. Several others expressed concern that relative newcomers to aviation were passing judgment on technical projects.

Moreover, they said, the approval

(Continued on p. 2, col. 5)

Women lose faith in engineering: fewer enter college and many leave jobs

The assault on the engineering profession by women is taking a break. Newly released Engineering Manpower Commission figures on the proportion of women majoring in engineering show a significant drop in 1986, the first since the women's movement took hold in the 1970s.

The data has prompted speculation that at 15 percent, the proportion of women entering engineering in the United States has reached saturation. The possibility is particularly disturbing to many experts who had counted on women and minorities to fill a shortfall of engineers predicted for the year 2000.

Some believe innovative recruiting techniques and better academic and psychological preparation will lure more women into the fold. Betty M. Vetter, executive director of the Commission on Professionals in Science and Technology, Washington, D.C., told THE INSTITUTE that poor preparation, along with discouragement from teachers, advisors, or co-workers, has caused women not only to avoid engineering, but to drop out of the field before graduating and after entering industry. Retention in the engineering curriculum nationwide is 6 percent lower for women than the 64 percent rate for men, according to Bill LeBold, director of Purdue University educational research.

But some evidence indicates innate factors as well. Studies of personality types show that fewer women than men evince introversion, an analytical outlook, and other characteristics that predominate in most people who stay with engineering. Thus, the push to attract women to engineering may be pulling in some whom the profession makes no attempt to welcome.

Entry level downturn

"I thought there were more women out there who, given the opportunity, would love to go into engineering," Vetter said. "I thought we would get up to at least 25 percent."

Women went from 2 percent of U.S. freshmen engineering majors in 1970 to 17 percent in 1983, according to Engineering Manpower Commission figures. But in 1984 and 1985 the percentage slipped a bit to 16.5 percent and in 1986 skidded to 15.3 percent. Meanwhile, the proportion of all bachelor's degrees awarded to women has exceeded 50 percent, matching their proportion of the U.S. population.

The proportion of minority enrollments in engineering also slid. For blacks the change from 1985 to 1986 was to 4.3 from 4.6 percent. Minorities encounter many of the same difficulties in engineering that women do, but each group has unique problems.

Overall, engineering majors have declined by 3 to 4 percent because engineering job opportunities and *the number of college students have*

(Continued on p. 6, col. 1)

Purdue University Photography Department

A high school student tries her hand at building a circuit in a summer engineering seminar at Purdue University. Though such courses have helped increase the number of women entering engineering in college, their influence may have peaked if the percentage of women entering engineering should continue to decline.

Ethics code procedures come under question

Saying the ethics code extension approved by the IEEE Board of Directors in November could have a "chilling effect on criticism, real or implied," the administrative committee of the Society on Social Implications of Technology (SSIT) has voted unanimously to urge the Board to rescind its action.

But George F. Abbott (SM), the Board Member who first drafted the change, thinks the charge is unfounded. "Any comments made by one member about another, which are known to be false, should be 'chilled,'" he said. "With free speech comes responsibility."

Anthony Robbi, president of the 2700-member SSIT, also has criticized the board's process of approving the change, which he called "evidently secretive . . . shocking and deplorable." The IEEE Ethics Committee, a standing committee of the U.S. Activities Board Career Activities Council, should have been consulted, Robbi said, but instead "was completely bypassed."

Henry L. Bachman (F), who was IEEE president when the change was made, said he personally would have felt better if the proposal had been referred to the Ethics Committee. However, he said, board members felt that there was no need to "agonize over further wordsmithing;" since the board had unanimously approved the change, first proposed at its meeting in August.

The controversy centers on an extension to the code's preamble and on the creation of Article V. A sen-

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I ON THE NEWS

I ON THE PROFESSION

Women find engineering a tough path to follow

(Continued from p. 1, col. 4)
declined. Vetter attributes the proportionately greater female slide largely to the increasing number of non-U.S. faculty (more than half of doctoral degrees are now awarded to non-U.S. students). Many of the predominantly male faculty come from cultures that have not felt women's liberation. "They do not view women as colleagues," she said.

Vetter also cited a halt in some recruitment programs and the continuing lack of role models as deterrents to women joining the field. Calling engineering a traditionally "macho field," she said the professional community has been reluctant to accept women. "Business welcomes women more than engineering does," she said, noting that many women get engineering degrees only to enter an MBA program directly afterward. Law and medicine have also done well in attracting women, she added.

One woman's case

Sandra Bidwell (M), who left electrical engineering a year ago after an 18-year career, agrees with Vetter's charge. The sole woman graduating with an EE degree from the University of Arizona in 1969, Bidwell experienced the now extinct variety of discrimination; she was told flat out by companies she applied to that they didn't want to hire a woman because it would upset their office routine. "A woman in engineering was different, odd, and they didn't want to deal with it," she said. She went to work for Philco Ford Communications and later for Goodyear Aerospace, General Motors, and Hughes Aircraft.

Bidwell said although there is very little discrimination and women's salaries are on a par with men's at the entry level, the changes have yet to infiltrate higher levels. Promotions come much less quickly for women than for men, she said.

George Brewster, manager of recruiting at Corning Glass Works, Corning, N.Y., concurs. "While we have brought more women into the engineering field, I am not sure we are as good at challenging them and moving them up the mobility curve," he said. "That leads to frustration."

An informal survey of 115 women engineers to be presented at the 1988 American Society of Engineering Education conference found that most of them saw covert discrimination and subconscious male resistance as major obstacles to their careers. Fifty-three had left jobs because of lack of job satisfaction or promotions, and 44 said their bosses, rather than promote them, either distributed their responsibilities to two or more engineers or reassigned these duties to a single male at a higher position.

Bidwell recalled applying for a supervisory position at a company she declined to name. The manager wanted to hire her as an engineer, not as supervisor. When she reiterated that she was applying for the supervisory position, he responded, according to Bidwell, "What do you expect me to do, hire a whole group of women engineers just so you can be a supervisor?"

"It didn't even occur to him that a woman could supervise men," Bidwell said.

The pressure to star

With the spotlight on her, Bidwell also felt pressure to be exceptional at her job. "With respect to men's attitudes to their jobs, you see a whole spectrum—some men who devote their entire lives to their jobs as I did, and some who clearly have other priorities—their family or other things come first. They work solid eight-hour days and don't want to travel," she said. "Women don't really have that option. As a female engineer, if you act like that, it's assumed you don't take your job seriously." Bidwell left engineering last year as a manager of product design for tactical guided missiles to pursue her long-time interest in philosophy of science.

The attitudes are deeply ingrained, Bidwell said, and what is more, most men feel women's adjustment to engineering is not their problem. "Each of my co-workers felt he got to where he was on his own qualifications," she said. "They just don't recognize that those positions are there to fill because there are no women or minorities competing for them."

In response to calls for women to pull themselves up by their bootstraps, Bidwell counters, "I'd like to point out to engineers, who should be familiar with the principles of physics, that that's not possible. Women simply aren't the ones who have the clout. They're not the ones in the executive suite."

Misogyny in the '80s

An IEEE member and lead engineer at the microelectronics center at Harris Corp., Melbourne, Fla., who did not want her name used, experienced the same impotence as Bidwell in 1981 when relatively large numbers of women began coming out of engineering schools. Working on microelectronic hardware design at a large company, she eventually concluded that though her boss thought he was being fair, he really didn't like women. "He didn't take me seriously," she told THE INSTITUTE. "He would often get up and leave when I was in his office talking to him."

Though he told this IEEE member she was doing a good job, her boss assigned her production engineering tasks that had less status than design tasks. Later, she complained to him when she did not receive a promotion promised when she joined the company more than a year earlier. His reply: "If you were happier at home, you'd be happier here," referring to her recent separation from her husband. She said he added, "If I only have a certain amount of money to give, I'm going to give it to men because they have wives and children."

She registered complaints with his manager and the personnel department, but both were ineffectual, and the actions only worsened her relationship with her boss.

"I did not realize that personnel fixes the problem by either ignoring it or eliminating the source of the conflict, which they see as the lower of the two people—almost always the female," she said. The personnel department interviewed her coworkers about her—not about her boss—and told her that they all thought highly of her; therefore, there was no problem. "By not stopping my boss's behavior, the company condoned it," she said.

She left the company in January 1983 and considered filing suit, but her male engineer associates advised against it. "You might want to come back," she quoted them as saying. "Don't burn your bridges."

What's the IEEE doing?

Bidwell is particularly concerned that the IEEE is not using its power to change things. "If the IEEE is going to represent a profession and talk about ethical conduct, it must look at this problem," she said, "and the white male engineers have to look at it, not the people who are being discriminated against. They need to see that this poisons a profession like engineering. We have no profession if opportunity in our work is not based on merit."

Bidwell was an early member of the IEEE Committee for Professional Opportunities for Women, but she said the group was given no real power and did not change anything. The IEEE Women and Minorities Committee is now in limbo, allowed to continue with only a $5000 budget and no chairperson until the end of 1988 when its fate will be decided. It may be merged with the Age Discrimination Committee or disbanded altogether.

Harb Hayre (SM), chairman of the United States Activities Board Careers Council, which handles the Women and Minorities Task Force, believes a merger would dilute the committee's impact. "The climate in USAB is not terribly positive in pursuing women's and minorities' needs," he said. "We are oftentimes politicized by individuals who have strong corporate backgrounds and who hold high positions . . . . Instead of working out a compromise we have played the ball game of doing away with committees, changing their names, changing their direction."

Purdue University Photography Department

Jane Daniels, director of Purdue's women-in-engineering programs, counsels women in the freshman engineering department.

Carleton Bayless (SM), 1987 USAB vice president, said the reasoning behind a merger of groups is that many IEEE female engineers objected to being "separated out—they don't want to be seen as needing special care."

Funding dried up

"A lot of funding to encourage women to enter engineering has dried up," said Jane Daniels, director of Purdue's women-in-engineering programs, who has seen company contributions plummet to a third of what they were eight years ago. She blames the change on the country's more conservative climate and on companies' belief that women's problems have been solved or that other efforts, such as getting minorities into engineering, are in greater need of their funding.

Society's role in the problem is also indicted. "Stereotypes still exist whether we like it or not," Daniels said. "We don't encourage little girls to be problem solvers."

"We treat them differently from the moment of birth," Vetter said. In high school, she said, counselors still discourage girls from taking rigorous courses. "Most women are not psychologically and academically prepared for engineering when they reach college," she said.

Bidwell, who was not permitted to take drafting or shop in high school, was the only student in her class who hadn't taken the courses and who didn't know what a Philips screwdriver was. "It certainly was a noticeable disadvantage, but it didn't occur to me that I'd been wronged in any way," she said. "I turned it on myself; I assumed it was all my fault until the women's movement got going around 1970."

Some are luckier

Many women engineers, however, report no problems in engineering school. Sue Hudson Abreu, who graduated from Purdue University with a biomedical engineering degree in 1978, said she encountered no adjustment problems herself or among her female classmates. However, seeing that doctors had the real power to get things done in the biomedical world, she pursued an M.D. directly after graduation. Now a nuclear-medicine specialist at Walter Reed Army Medical Center in Washington, D.C., she still considers herself an engineer first and says she has met with no discrimination.

Other women, like Collete Hoglund, who worked for 1 1/2 years as an electrical engineer for Boeing Military Airplane Co. in the early 1980s, became disillusioned with engineering itself, rather than any discrimination or lack of advancement. Speaking before the 1986 American Society for Engineering Education conference, she said that she felt betrayed by career counseling. As an engineer, she confronted overwhelming paperwork, found little opportunity to use the mathematics and theory she learned in college, and lacked close contact with people. She eventually left the field to pursue a graduate degree in psychology.

But women aren't the only ones disillusioned. "There are a lot of dissatisfied men, too," said Michael Finn, senior economist of Oak Ridge Associated Universities in Tennessee. Surveys show that 20 years later, only a third of engineering graduates are still in engineering, though many of these have simply made the logical move to engineering management.

Nature or nurture?

The inherited characteristics of the two sexes may shed some light on why women are not jumping at the opportunity to pursue engineering and why others leave. Psychological studies of the engineering personality indicate that the traits of engineers who stick with the profession are found in larger proportion in men than in women. It is unclear whether the differences are societal or genetic. Vetter believes they are almost all societal.

The Center for Applications of Psychological Type (CAPT) Inc., Gainesville, Fla., completed a five-year study last year for the American Society for Engineering Education. It involved 4484 students at 10 U.S. engineering schools. Using the Myers-Briggs Type Indicator, a questionnaire based on the theories of psychologist Carl Jung, CAPT rated the students' personalities in four areas: introverted or extraverted; analytical or feeling; practical or intuitive; and organized or spontaneous.

The study indicated that the majority of engineers are introverted, analytical, and organized. They are split almost equally between practical and intuitive personalities. Practical types typically excel on the job, whereas intuitive types do well in school or in theoretical or innovative work.

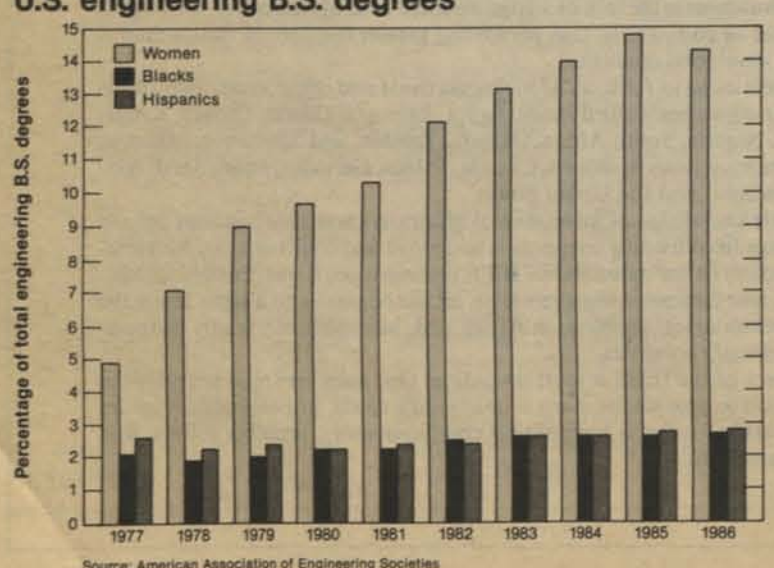
The best indicator of an engineer is the analytical tendency, which an estimated three-fourths of engineers have, according to CAPT president Mary McCaulley. In the general population, she said, about 60 percent of men and 40 percent of women are analytical types. In addition, women tend to be less introverted than men. A large proportion of women—35 percent—are both feeling and extraverted compared with only 18 percent of the male population in general and 11 percent of engineers.

While there are definitely women who fit the predominant engineering type—61 percent of women en-

(Continued on p. 7, col. 1)

I ON BUSINESS

Women, blacks, and Hispanics as percentages of U.S. engineering B.S. degrees



Source: American Association of Engineering Societies

Space university to be launched from Boston

The International Space University—a new interdisciplinary institution of higher learning dedicated to cultivating international leaders for space research and development—will be opening its doors on June 20 to admit the first 100 students from 12 countries. The students, all recent graduates or postgraduates, will be selected at the end of this month from up to 5000 applicants.

The university's purpose is to "educate a new generation of excellent young academics who have expressed interest in playing a leading role in their countries in space research and development, either in politics or the private sector," said one of ISU's cofounders, Robert D. Richards. "We hope to create a sort of elite 'club' of space leaders who, when they grow into their positions, will maintain the ties they made at ISU and enhance international cooperation in space."

The Boston-based university will at first hold only summer sessions, this year at the Massachusetts Institute of Technology. During the nine weeks, all students will take eight introductory courses designed to give them a working knowledge of various disciplines needed for the development of space: space engineering, satellite applications, space science, space architecture, resources and manufacturing, business and management, policy and law, and human performance in space. In addition, the students will apply their new skills to a joint design project: designing an international lunar research and industrial facility.

The faculty comprises about 30 engineers, scientists, and other specialists—including two former astronauts—from the European Space Agency (ESA), Harvard University, McGill University, MIT, the National Aeronautics and Space Administration, other international government agencies and universities, and aerospace corporations.

Scholarships and funding

The International Space University was founded in last April, under the leadership of administrator Todd B. Hawley, deputy administrator Peter H. Diamandis, and associate administrator for development Christopher D. Mau. Now, less than a year later, it has a 10-member international advisory board, including Dean Burch, director general of Intelsat Organization; Yasuhiro Kuroda, cofounder of the National Space Development Agency in Japan; Reimar Lüst, ESA director general; Roald Z. Sagdeyev, director of the USSR Institute for Space Research; Tadahiro Sekimoto, president of NEC Corp. in Japan; and the writer Arthur C. Clarke.

Its 16-member board of directors includes Lew Allen, director of the Jet Propulsion Laboratory and vice president of the California Institute of Technology; Frederic d'Allest, director general of France's National Center for Space Research (CNES) and president of Arianespace; Jack L. Kerrebrock, associate dean of engineering at MIT; and Andrew J. Stofan, associate administrator for space station, NASA headquarters.

In addition, the university has received founding grants totaling over $200 000 from Aeritalia, ESA, NASA, and several private foundations, plus pledges for another $450 000 from two dozen corporations, including AT&T, General Dynamics Corp., McDonnell Douglas Corp., and NEC Corp.

Each of the 100 students will be supported by a $10 000 scholarship sponsored by companies and other sources within his or her country.

The next four summer sessions will be held in various countries, said Hawley. In 1992, which may be designated International Space Year by the United Nations, the organizers of the International Space University will consider the feasibility of establishing a permanent year-round facility.

"Eventually we want access to the space station for student research," said Richards. "And our dream for the long term is to have our own facility in space." —*Trudy E. Bell*

Austin is Sematech's pick

In a decision that caught many industry analysts by surprise, Sematech, the semiconductor industry consortium, picked Austin, Texas, as home for its research and development effort. Sematech announced Jan. 6 that it will settle in a plant formerly occupied by Data General Corp., where it hopes to be operating by September.

Speculation had centered on Massachusetts as the likely choice. The state had lobbied hard, offering Sematech some $400 million in incentives and putting a research facility, the Massachusetts Microelectronics Center, Westborough, at the consortium's disposal.

Although Austin's $68 million package was smaller, the city offered other inducements, such as a depressed real estate market with cheap housing for Sematech employees. But more important, according to analysts, was the presence in Austin of another industry consortium, the Microelectronics and Computer Technology Corp. (MCC). "There are many of us that are members of both Sematech and MCC," Sematech chairman Charles Sporck said.

Even more in favor of Austin was that four key Sematech members—Motorola, Advanced Micro Devices, Texas Instruments, and IBM—have operations there. But tipping the balance, in the view of many, was politics: the legendary power of Texas legislators. One of them, House Speaker James C. Wright (D), was pivotal in rescuing $100 million in Congressional funding for Sematech from rampant budget cutting last December.

Personal shepherd

Wright has promised to shepherd Sematech's future funding requests through Congress personally. And Texas governor William Clements (R) said that House Ways and Means Committee member J.J. Pickle (D), whose district includes part of Austin, was "point man" in bringing Sematech to Texas.

Sporck said only that "Texas had the most solid proposal across the board." But he has also said that Pickle and Wright were "very effective in bringing us the funding."

While Sematech has been allocated its start-up money, the funding is contingent on a memorandum of understanding between the consortium and the Defense Department. That document will spell out how money will be divided among Sematech's projects in semiconductor-manufacturing technology, and is scheduled to be submitted to Congress by March 31.

Meanwhile, IBM and AT&T announced Jan. 26 they will turn over to Sematech proprietary designs and processes so that Sematech can start its research and development with some of the world's most advanced circuits. IBM is donating its 4-megabit dynamic RAM chip and AT&T its 64-kilobit static RAM. Accordingly, Sematech will reconstruct, on a smaller scale, the semiconductor fabrication facilities of IBM and AT&T, and both companies will loan engineers to the consortium. —*Katherine Wollard*

Women leave

(Continued from p. 6, col. 5)

gineers are analytical types, for example—22 percent of women engineers are extraverted and feeling, double the proportion for engineers in general.

Gerald MacDaid, director of research at CAPT, said many women who leave engineering are extraverted-intuitive-feeling types. Engineering may be losing valuable talent, he said, by not encouraging these types since they can be effective managers and communicators.

Intuitive-feeling types are very bright academically, see a world of possibilities for themselves, and are powerfully influenced by social revolution, MacDaid said. Women like Hoglund, who become disillusioned with engineering because of the drudgery, lack of theoretical requirements, and lack of contact with people, were, he guessed, in this category.

McCaulley hypothesized that after the 1960s, women affected by environmental and feminist movements went into law, engineering, and business even though they were not really interested in those areas because they realized that to change things they had to be where the power was. Such women may feel alienated because they operate differently from their co-workers. "Analytical types aren't very much for patting you on the back," McCaulley said. "They tend to criticize, and if you're a feeling type, it can be demoralizing."

Use the differences

Instead of trying to be second-class men, McCaulley said, women could contribute qualities lacking in the majority of engineers, such as persuasiveness, enthusiasm, and the ability to boost morale. MacDaid added that intuitive-feeling personalities have a greater tendency to assess the consequences of technology since they are high in social conscience. They are more likely to forecast negative impacts, such as environmental pollution, during the design stage.

"There are roles for all types in engineering," MacDaid said. "Engineering training programs should have enough diversity and skill in attending to the different learning styles that they don't turn off minority types."

—*Karen Fitzgerald*

Engineering successes lead to Hall of Fame

In 1939, baseball players became the first sports professionals honored in a Hall of Fame; such halls have since proliferated and now the list includes one for outstanding technologists—the Engineering and Science Hall of Fame in Dayton, Ohio.

A group of five Dayton-area engineers and scientists launched the idea in 1979. After a few years of research, in 1982 they chose Charles F. Kettering, R. Buckminster Fuller and Jonas Salk as the first honorees for their new project, then used the publicity to solicit nominees from around the world in all fields of science and technology.

Of the 18 so far named, three are IEEE Fellows: Charles H. Townes (named in 1983), Rear Admiral Grace Murray Hooper (1984), and David Packard (1987). Three others belonged to IEEE's predecessor, the American Institute of Electrical Engineers (AIEE): Kettering, Thomas A. Edison (1983), and George Westinghouse (1986).

Working with funding from the Engineering Science Foundation of Dayton, which contributes a large part of the Hall of Fame's $40 000-a-year budget, the organization mails out up to 200 ballots a year requesting biographies on nominees from hospitals, universities, and companies worldwide. Without concentrating on any particular discipline, the 40-member board of trustees researches nominees for *individual accomplishments and overall contributions to society*—popularity is not considered.

While it requires only one nomination per candidate, only 10 or 12 out of hundreds of candidates make the final biography packets voted on by the board, which includes doctors, professors, lawyers, bankers, engineers, and scientists. Eight executive members then make the final choices, which can run anywhere from one to five a year. Orville and Wilbur, the Wright brothers, George Washington Carver, and Linus Pauling were also among those admitted during the Hall of Fame's first six years.

Upholding one of the institution's goals in recognizing individual contributions by engineers and scientists is the practice of inviting high school and college students to the annual ceremony that celebrates the new awardees, thereby encouraging students to pursue careers in engineering and science.

James L. Custer, president of the Hall of Fame, said its main goal is to recognize "great individuals in science and to make those fields interesting to future engineers and scientists." Said Custer: "People are motivated by public rewards."

Those who enter the Hall of Fame receive no honorarium, only a medallion hanging in a unique wood sculpture carved by a Dayton artist. The sculpture's beauty is said to have inspired Admiral Hyman G. Rickover, father of the nuclear submarine and famous for his silence, to speak for nearly 20 minutes.

The board is now collecting memorabilia to exhibit at the Hall of Fame, and is working toward a fund to provide grants for individual *scientists' research equipment. The 1988 nomination requests have already gone out, but anyone may enter a nomination. Contact: Engineering and Science Hall of Fame, 140 E. Monument Ave., Dayton, Ohio 45402; 513-228-2148.*

—*William Mott*

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f: corporate strategy

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digital

DIGITAL CONFIDENTIAL

EXECUTIVE SUMMARY

1. **FIVE YEARS FROM NOW, WHAT BUSINESS WILL DIGITAL BE IN?**

   We'll have a full line of distributed processing products, that are integrated with new products created at a much faster rate of development (time to market) than we have today.

   In addition to advancing our current stream of business, we will offer to our customers any and all services required to support their use of our products and to optimize their competitive advantage.

   The nature of "product" will change to include all that we know, all of our experience, and all of the ways we have learned to help each other e.g., Enterprise Integration Services.

2. **WHAT WILL BE OUR COMPETITIVE ADVANTAGE?**

   Our competitive advantage is who we are. We need to build on our flexibility and responsiveness, our entrepreneurial spirit, and not try to over-fix our weaknesses by over-planning, over-controlling and over-managing every process. We should be a first rate Digital, rather than a third rate IBM.

   We should capitalize upon our strengths: our headstart in networking our knowledge of distributed processing, our experience in using integrated products, our success with strategic alliances of all sorts that enable us to deliver the best total solutions to varied markets and customers.

   We value differences: computing environments, people, style, and approaches. The evidence is our internal organization. What is important is not that it's perfect, but that it's changeable.

3. **HOW SHOULD WE BE ORGANIZED TO SUPPORT THIS BUSINESS?**

   We need to abandon the cultural assumption that the best way to organize is by function. What is required to meet the customers' needs cannot be done by function, but must be done interdependently across functions and organizations.

   We should have more top level support for the fostering of interdependence of the stovepipes. Therefore, we need more business strategy development at the top, more flexibility and freedom for implementation.

   The starting point for organization design should be the

DIGITAL INTERNAL USE ONLY

business.

- o Match our measurement process to our business goals.
- o Reward doing what's right by the customer, as opposed to meeting metrics.
- o Recognize and optimize the long term and the whole, as well as the short term and the pieces.
- o Get closer to customers.
- o Insure speed by flexibility.
- o Create a worldwide operations focus.

4. **DO YOU THINK OUR CULTURE AND VALUES ARE CONGRUENT/ APPROPRIATE?**

The fundamental Digital culture promotes doing whatever is required to meet the customers' needs within the values of honesty, integrity, and highest quality.

People experience an inability to do that. They report:

- o Being immobilized by fear
- o Infighting at senior level
- o Decrease in creativity and risk-taking
- o Good ideas get prematurely squelched
- o Ineffectiveness, redundancy, out-of-date processes and standards
- o Getting bogged down in bureaucracy
- o Influx of managers who do not value the fundamental culture

5. **WHAT WILL BE OUR MAJOR INTERNAL AND EXTERNAL CHALLENGES?**

Our greatest challenge will be ourselves. We have grown to become a very large company with a costly infrastructure that is inappropriate. We need a well thought out approach to managing our people: their orientation, utilization, motivation, development, skill mix, and reward systems. We need to change the way work is done to achieve an efficient company, not impose controls.

6. **WHAT FACTORS WILL BE CRITICAL TO OUR SUCCESS?**

External forces are requiring internal changes. What

should drive our internal changes should be our marketplace, not history or inertia. The measure of goodness should be our values. If we do that, we will have no external issues.

7. **WHAT STRATEGIES WILL WE NEED TO EMPLOY TO ENSURE DIGITAL'S FUTURE WORLDWIDE LEADERSHIP?**

We need truly to become an international player. As we respond to the requirement for presence in the countries in which we do business, we should learn to speak their languages while we educate ourselves on global socio-economic and political issues.

A supportive action, showing the sensitivity we feel to international issues would be to ensure international membership of our most senior committees.

8. **WHAT DO YOU AND OTHER SENIOR MANAGERS NEED TO BEGIN DOING NOW TO ENSURE THAT THIS FUTURE SCENARIO WILL BECOME A REALITY?**

Create and/or take advantage of opportunities to meet together in open cross-functional forums to share ideas, grapple with issues, and influence strategic decisions. Additionally, job rotations, temporary assignments, episodic collaborations, sabbatical programs and task forces are ways to break through habitual stove-piped thinking to refresh and revitalize us.

While senior managers recognize that their responsibility is probably 90%, the vital 10% belonging to the Executive Committee is to initiate and support those additional opportunities.

THEMES

SENIOR MANAGEMENT INTERVIEWS

1. FIVE YEARS FROM NOW, WHAT BUSINESS WILL DIGITAL BE IN?

- We'll be business-focused, providing integrated business solutions to the total enterprise.
- We'll be very service oriented with strong account management.
- We'll offer a full line of products around a proprietary operating system, and a family built around an open system.
- We'll be in the same business, networks, hardware and software, plus the way we integrate with other people's solutions.
- We'll have lots of alliances of all forms.
- We'll be in the distributed processing business, with powerful desktop workstations, connected to a set of servers on-site, interconnected by a peer-to-peer communications network with distributed programs and data with local access.
- We'll have to customize every product for the customer.
- We'll sell networking and integration services (gateways, bridges, database manipulation tools, data conversion, network management, consulting.
- There will be a more even mix of technical and commercial products and services reflecting industry standards.
- Full organization service. Serving the organizational work group to the entire enterprise.
- Offer full service as a commodity.
- We will make tools.
- The business will be very different. We will still deliver hardware and software, but in five years all hardware and some software will be commodities. Customers will want to buy our processes such as: the product development process (Phase Review); JEC; KO marketing process; and the forums process.
- The business in five years could be called the Knowledge Business. We have to be interactive with our customers rather than reactive. We need a set of interactive services rather than high value-added services.

- We will have to offer the complete range of products and services from commodities to systems integration. We will deliver something that is very different from what we deliver today; and we will be responsible for it meeting the customers needs and expectations.

- The company who will win in the 90's is the company who can integrate heterogeneous machines and provide the enabling software to link the machines that is truly transparent.

- Our value will be more in the final stages of the value chain. We will have to offer a broader set of products and services, and it won't be possible to build everything. We will have to establish more partnerships with consulting, marketing, and software firms, which will allow us to concentrate more on what really should be done.

- The characteristics of the way we will do business will also change. Engineering will need a faster create and development cycle to be able to react more quickly.

- We will need a totally different way to manage systems integration projects. We have lots of dreams, but don't have the people who know how to manage a number of these projects.

- The business will be pretty much the same, and there will be no dramatic change in products. The profile will be skewed to software and services.

- Future of DEC is in the networking business. DEC's competitive advantage is in its technology and its manufacturing ability. It has an edge now and can keep it.

- DEC should not become just a service business, bad for the economy.

- On a number of previous occasions when DEC thought it could buy more cheaply than make, the manufacturing organization was able to respond and show that it could cut costs enough without sacrificing quality to be competitive.

- Automation has not always been the answer to cost reduction. When they had lines and carousels, workers were often idle. They could do better by "simplifying" the manufacturing process and using the intelligence of the workers to figure out how to be more efficient and get higher quality.

- Networks and communications.

- Systems integration.

- Enterprise services.

- Providing complete solutions to information problems.

- Providing a full range of products from commodities in some areas to turn key solutions to others.

- The solutions business.

- The business of partnerships.
- Fulfilling whatever information and data needs customers want solved.

2. WHAT WILL BE OUR COMPETITIVE ADVANTAGE?

- Networks, hardware and system software. Integrated platforms and integrated solutions.
- Strategic partnerships with firms that develop software applications for our business solution packages.
- The ability to use the technology.
- High performance, low cost, superior function.
- Support, not service.
- VAX and VMS will still be key but they'll have to look different.
- A worldwide focus.
- Reducing manufacturing costs, improving manufacturing processes and skill base.
- Larger investments in technology. That will demand patience and long term strategy.
- To differentiate ourselves in the technical community and effectively compete in the business community.
- Our VAX/VMS strategy will eventually drop off. Will start making money in software, service, CSS and integration.
- Software will be the major part of our business.
- Our advantage will be our processes; and our cultural approach gives us a better starting point. Our culture supports the way we work. Our network infrastructure makes us immune to organization changes because the network has allowed us to become independent of structure.
- Our advantage will be:

    1. Our third party relationships, because we can't do everything. We need to recognize how important this is. We handle these relationships better than our competition.
    2. Our strong installed base.
    3. We are not afraid to say we made a mistake.
    4. Our Europe and GIA experience.

- DEC's advantage is its willingness to entertain buying other companies' products to sell, because we can't do all of it, and we must not see this as a failure.

- No competitive advantage for the low end products, and no advantage for systems integration. We are not good at pulling together a sophisticated plan and going forth. We have taken a long time to get as far as we have, because we are a ready, fire, aim company.

- Digital's competitive edge can be valuing differences--the awareness of, and the behavior of valuing differences. We must create an environment where people want to join DEC and stay. It is critical to our ability to succeed in other countries.

- Other than IBM, we have a 7 year lead on all workstation contenders. Digital is ideally positioned in the workstation market to even surpass IBM due to:

    1. Our headstart in networking, our strategic acceptance of heterogeneous computing, and our enthusiasm to link all computers in a seamless manner.

    2. Our huge existing organization that can provide support to customers all over the world in terms of training, software, and field service.

    3. Digital's integration--we can do everything from chips to complete systems.

- For the systems integration business, the Arthur Anderson's will be our competition. Our advantage is that we have a knowledge of the technology and strengths in networking, etc. that allows us to do what they don't understand yet. Also, we are possibly better at integrating other vendors hardware. AA's advantage over us is that they have a reputation, an entree into organizations, and experience advising at management levels that we are not recognized for.

- Our advantage will be our size, financial clout, loyalty of customer base, breadth of services, reputation, quality, established distributed networks, and alliances of various natures.

- To remain competitive, DEC must be organized differently, specifically, it must break down barriers between engineering, manufacturing, and marketing. Company does not now have good mechanisms for connecting people. There is not enough communication as things have gotten bigger and geographically more dispersed. Not enough people working in proximity to each other so they can solve problems. In one organization, manufacturing and engineering have learned to work together and it has saved a lot of time and increased quality. Need more "co-locations."

- DEC networks other businesses, but does not do a good job on itself. Need more teleconferencing, travel to other locations, senior staff visits to the remote facilities, and ultimately product divisions to bring marketing and sales into the picture as well.

- The Digital culture, i.e., we are a networking company.
- Talent and expertise of our workforce.
- Flexible workforce.
- Technological innovation.
- Our size and assets.
- Our culture.
- Our experience with personal and electronic networks.
- Our strategic alliance.
- Our committed workforce.

3. HOW SHOULD WE BE ORGANIZED TO SUPPORT THIS BUSINESS?

- Flatter organizations, with fewer levels of management.
- Simpler customer interface, account management like IBM.
- Need one well managed marketing focus.
- Broaden the top of the pyramid.
- Very decentralized.
- Simplify matrix, fewer dimensions.
- Organize by industry, business solution, area; or organize by product (or product set).
- Need to create metrics that support integrated solutions across functions.
- Need a more business focused structure --- divisions or business segments, plus a functional cut of internal excellent/consistent, improved processes that work for us today.
- Senior managers need more control of their own product decisions, and planning. Not executive committee.
- The Executive Committee should deal with strategic issues and partnerships.
- Sales should be measured on margins, not bookings. What they sell should be tied to Corporate strategy.
- The European area works better ... model after it!

- There is renewed interest in bringing back the management committee or an operations type group to take charge of the problems identified.

- We should be organized vastly different from today--distributed. We are too centralized now. The form should be branch offices; smaller than today, but many more of them. Each would have all the functions, including inventory (products will be much smaller). They would be mini DECs. The network would tie everything together, except for special expertise. The skills needed would be more like Enfield's. Everyone would be able to do every job in the office: build product, engineer and sell.

- We will need small group improvement activities--multidisciplinary teams. The teams would need a diversity of skills rather than organized functionally or geographically. The teams need to start together and march in parallel, instead of handing over work to others.

- We should create an International Leadership Group with fewer than 100 people, and with either a Sales or Marketing focus. Everyone else should belong to an area (geography). The composition of the leadership group should be international, whereas the current business influence is from the U.S. Each area would have all functions. The functions would share information across areas and would meet periodically.

- The areas should report totally into one international headquarters, not one in GIA and one in Geneva.

- To have 12 people form an Operations Committee reporting to the Executive Committee. The Operations Committee would thrash out two year qualitative and quantitative measurements (e.g. for the delivery of major product developments; for customer satisfaction); would report to the Executive Committee four times a year on their progress; and they would be measured collectively.

- We need to change behaviors, not reorganize.

- We need speed and discipline--quick decisions can't be made with massive committees.

- We need to organize in a way that addresses our business at the end of the value chain. The Field needs to be organized even closer to the customer. We need more DEC people working more closely with the customer, and identifying customer needs.

- The systems integration business should become a second SBU. Several projects should be managed from this SBU; when one is finished, they would move on to the next. The SBU should have profit and loss responsibility, and it should be allowed to contract with external people, if cheaper.

- We will need a much greater account orientation; and a less matrixed environment. We don't need five different managers of five different functions (SWS, Sales, F/S)--this needs to be more streamlined.

- Current structure - twin towers - doesn't work.

- o Need an Executive Committee to work strategic issues and an Operations committee to work current issues.
- o Need international representation on both committees.
- o Should have a separate U.S. Operations Committee.
- o More people/functions included on the committees.
- o Marketing organizations are too complex and need to be simplified.
- o Need to reduce the barriers to cross-functional integration.
- o It doesn't matter as long as we can communicate across whatever organization we choose.
- o The European model seems to be working well.
- o We must eliminate the stovepipes.
- o We should be more account oriented.
- o The focus must be more external - customer, markets, etc.
- o Any way that presents the fewest barriers to communication and cooperation.

4. DO YOU THINK OUR CULTURE AND VALUES ARE CONGRUENT/APPROPRIATE?

- o Need to re-transmit key values.
- o Our organizations are incredibly stove piped with a turf-growing mentality. We need to move people around.
- o We need new reward systems to replace expectations of rapid vertical mobility, substantial increases, adrenalin high of big new projects, heroic entrepreneurial culture.
- o Erosion of values. Too much in-fighting at senior levels. Many people immobilized and fear driven.
- o Have to do more to adapt to countries we're doing business in.
- o Need to reinforce, reward, and model cross-organizational and cross-functional teamwork.
- o Need more control. We need a $12 billion revenue stream. Wall Street is pushing us. We're becoming more financially driven.
- o There's a lot of bureaucracy, and redundant, cumbersome, ineffective processes.

- We avoid risk, and if something looks like a failure we annihilate the risktakers. So we lose good people and get safe, marginal products.

- People with good ideas find it hard to find a forum without getting squelched.

- We're not challenging or motivating our people like we used to.

- The no-layoff policy has gotten to the point of keeping many non-contributors who are maintaining bureaucracy. We're doing nothing to reskill them.

- No. "The risk is saying what your boss does not want to hear, there is no risk in not meeting your goals."

- No, political loyalty gets in the way of decision making. People at the senior level do not do what is right only what is politically expedient.

- Our culture and values are congruent/appropriate, but they are rapidly disappearing. Innovation not valued; working smarter not valued; solving an issue before it becomes a problem is not valued. We reward for how many people work for a manager, not doing more with less; mediocrity; averages; turf; not performance.

- We hired grey hairs from IBM and HP who are inflexible and incapable of learning. We did this consciously, not knowing. They will be promoted and will be in a position to keep this future scenario from becoming a reality.

- If you believe we value differences, then the answer is no. We probably don't value differences enough to be a truly international company.

- Today, Ken can't correct the negative spirals that our business has on employee morale like he used to. He used to be able to give stock to employees after there had been a negative period to raise morale.

- Our values are congruent, but the culture has gone a bit mad. We have let the words freedom, understanding, and choices run rampant. "Understanding" has become "rationalization." We are not dealing with problem performers, and they should be weeded out.

- We have lost the sense of internal competitiveness.

- Our culture and values are absolutely appropriate, but we need to give our senior managers a dose of culturism and get them to put programs and measurements in place.

- We are no longer valuing the "crazy" people who make valuable contributions. People are not allowed to take risks as much because measurements are on short term results. We should stop penalizing those who take risks.

- Our culture and values are very congruent; and we are a model firm in this regard.

- In the systems integration business we will have a lot of trouble with our culture. Our competition has hire/fire cultures, and we have to come to grips with this. We need to clearly establish that we will have sub-contractors that we will use on a time limited basis for specific projects. We must manage this business correctly, or we will have very negative financial results.

- The culture in the Engineering organization needs to change; which will be drastic and painful. Engineering internally has good communications, but it doesn't look outwards and doesn't look at customers. They know intellectually that they should talk to customers, but doing it is another thing.

- The culture has changed--not much paternalism left. Pure size and decentralized organizations will not allow closeness and family.

- Need to preserve and teach some of the basic values to new people, that's why it is important for some of the senior east coast people to come and talk to the employees.

- Values--honesty with customers, caring for people, doing the right thing in the sense of really figuring out what is best for the solution to a problem, pushing back and telling the truth rather than hiding information (this one is on the wane and needs to be reinforced).

- Need to keep people talking to each other, stimulating disagreement so that problems can be solved better.

- It is tough to socialize people who have not had the Maynard experience, and it is tough to get Maynard "elders" to come to appreciate cultural and regional diversity so that DEC can benefit from the west coast culture.

- Values not as good as they used to be.

- We are no longer encouraged and rewarded for taking risks.

- They are what make us what we are.

- We take fewer crazy risks now - that is the sign of a maturing company.

- Not only are they adequate, they are our value added in the future.

- They aren't perfect, but they are better than any others I've seen.

- Things are not as easy and free-flowing as they used to be.

- The stovepipes have impacted the culture; doing the right thing is now not as valued as covering your ass and making the boss happy.

- The culture is at risk from all the new hires; we must find a way to assimilate new managers better.

WEST COAST CULTURE

- DEC is a small player and not well known.
- People not loyal to company so much as to a technology or the task.
- People jump jobs a lot for more money and because they do not trust companies that promise employment security.
- Workers feel insecure and that they should get what they can.
- Recruits don't believe DEC's statements that they are in it for the long haul.
- Contract recruiters who work for different companies use sleazy methods which further undermines confidence of recruits.
- High cost of housing makes employees very money conscious.
- People not really laid back, work their asses off.
- People are very hierarchic, want to know who their boss is, how they fit into the hierarchy, probably for money reasons.
- DEC not getting enough out of its west coast presence by not using common services such as banks.
- Does DEC need to be in the west--definitely because of the kinds of technologies that are available, and the sales potential.

5. WHAT WILL BE OUR MAJOR INTERNAL AND EXTERNAL CHALLENGES?

- Ourselves. We're too large, bureaucratic, losing people's ability to take risks. We've got 20-40% of the people unproductive, two sides of the company competing.
- It's very difficult to keep all our employees turned on.
- We have a huge cost infrastructure that is inappropriate, and can't compete with leaner and meaner competitors.
- Lack of clarity of organizational roles and overlapping responsibilities.
- We have too many people. Utilizing the ones we have better, downsizing, retraining, redeployment.
- We need to deal with mediocre and poor performers, and bring in top quality young people to spark creativity and innovation.
- We're facing tougher competition from both ends.
- Moving our focus from internal to external.

- We need a clear corporate strategy.

- To preserve the culture and to preserve innovation given our size and external pressures.

- To learn to act like a major worldwide player, cognizant of standards, finance, politics, the socio-political climate.

- To target more than 177 of the top 500 companies in the United States.

- Employ the managers to achieve the P&L statement.

- Effective rewards and recognition systems that recognizes cross-functional integration.

- To use senior managers to their fullest:
  - Cross-training.
  - For cross functional work.

- To reduce "finger pointing" for the problems we are in. Some think it is a product problem, some say a sales and marketing problem and others claim there is no problem.

- Sooner or later we must value our own learning--experiential learning.

- We need a new vision that is clearly understood from top to bottom. The JEC process, the forum process, or the DECworld type process could be used to create the vision from all the employees.

- One challenge will be how we will handle our aging workforce. We have too many people who are aging, most are in the GMA and they don't want to move, and many have obsolete skills and are undisciplined. They have become mentally retired.

- We are still not skilled in many areas. We are not skilled in the commodities business; and we don't even have the ability to write large contracts for delivering sophisticated products for integrated business solutions that are highly technical and have enormous legal issues.

- Digital needs to conduct business in a way that people see value in collaboration. Digital needs to implement "episodic collaboration", which is a strategy for providing continuous opportunities for people to be on temporary teams. The challenge is that the kind of people we typically hire are not really team players, they are individuals.

- Digital needs to view re-skilling as an ongoing business strategy. We need to identify where the skill short falls will be. Management needs to view skill acquisition as additive to the skill base, not as a replacement of skills or as an end state.

- We consistently do the right thing two years too late.

- The challenge will be conducting business on a world wide scale, and being a world wide employer, and building truly international products.

- To be a big company and move quickly to make changes. There is no role model for this.

- The sales cycle is lengthening because of selling projects (systems integration). The sales force is torn now. The customer wants big projects, but our metrics are short term, so our sales people either walk away from the project; or carve off hunks of big projects, install some system, and then decide to worry about it later.

- Internal challenge will be instilling discipline; making people own up to decisions they make; getting rid of people who are abusing the system.

- External challenge will be maturation. Failure to understand the competition early on.

- External challenge will be from the Japanese, and from IBM.

- We must learn how to compete in the international market place.

- Internal challenge is our ability to effectively work cross-functional issues.

- Need to develop a balance between innovation and stability.

- Need to revise our business model to keep our cost under control.

- Becoming more account/customer oriented.

- Targeting more than 179 of the top 500 companies.

- Managing cross-functionally (mentioned by many).

- Figuring out and delivering enterprise-wide solutions.

- Focusing outside to customers, suppliers, universities, competitors.

- Utilizing our people better at all levels.

6. WHAT FACTORS WILL BE CRITICAL TO OUR SUCCESS?

- We need to be a marketing driven company and drive the organizations from a customer needs direction.

- Investor confidence. We'll have to change our cost infrastructure to deal with sensitive margins.

- Investment in leading edge technology, internally and externally.

- We need to demonstrate that we use our own strategies, systems, solutions, and be good at it.

- Be selective in growth areas. Avoid redundancies and overlaps.

- Continued organizational renewal and people renewal via short term assignments, activities outside the stovepipes, capabilities.
- We have to become a manufacturing leader and we've never been.
- Most serious problem is not having a well thought out approach to people development and succession planning.
- Effectively working cross-functional issues. Currently, cross functional issues not being worked. People give up on working them. They crawl back into their stove pipes.
- Lack of trust was mentioned by at least two folks as a reason for the lack of coordination.
- Profitability is the key issue. Have to reduce the cost.
- We will need to exercise prudence in determining which part of the value chain we should invest in.
- We will have to be smart enough to pick and use the right partnerships.
- Having the right people to project manage the systems integration projects, and with true P&L experience.
- New product development and time to market.
- Enterprise services business.
- Success of our semi-conductor business.
- Joint partnerships and strategic alliances
- Low cost manufacturing.
- Human resource planning.
- Reskilling our workforce.
- Management training and development.
- Encouraging and rewarding risk taking and innovation.
- Effective succession planning, particularly for K.O.
- Learning to work cross-functionally.
- Finding a way to re-train/re-skill our workforce as needed to keep pace with changes.
- Determining what the customer wants and satisfying it.
- Not trying to be everything to everybody (selected products/markets/services).

- The right partnerships with software writers, universities, vendors, customers, and even competitors and governments.

- A comprehensive human resource plan which includes re-skilling, controlled hiring, valuing differences, job-sharing, on-going training, full utilization.

- New business models which allow us to control costs as we grow sales.

7. WHAT STRATEGIES WILL WE NEED TO EMPLOY TO ENSURE DIGITAL'S FUTURE WORLDWIDE LEADERSHIP?

- Internal excellence.

- Develop manufacturing and physical technologies and place them quickly in China and emerging third world countries.

- We need to learn to speak other languages.

- We need to plan strategically around the impact of Europe 1992 on our European business.

- Need to select key Cooperative Marketing Partners rather than a whole bunch. Most are not crisp solutions.

- Metrics ... there are not any on the personal level, and the ones that are measure the wrong type of behavior. Measure the bottom line. Hold managers accountable for results. Reduce the number of metrics.

- Work cross organizational issues.

- Digital must build new business. A lot of attention is paid to our current customers and not to getting new customers.

- We must grow the European and GIA business before our competitors do, particularly in areas such as Korea and India.

- We should not have GIA headquarters in Acton, Mass. GIA must truly focus on the GIA geography.

- We will have to focus on sourcing and developing our future workforce since the population behind the baby boomers is very small.

- We must become a worldwide supplier to our customers. Many of our major customers are based in Europe and clearly are international companies.

- We need to think about which third world country will be important 5-10 years out. We tend to look at relative worth as being constant; but we could get blindsided by some entity that we haven't paid attention to. We need to make partnerships with their governments so we will benefit rather than be hurt.

- Expanded international membership on the Executive Committee and elsewhere in planning arenas.

- Think worldwide, not just Maynard.
- Focus externally - customers, countries, competition, cooperative partners.
- Capitalize on our culture - everyone is becoming more distributed and networked. We aren't perfect, but we know how to do it better than anyone else.
- Be a worldwide employer - move decisions away from Maynard as much as possible.

8. WHAT DO YOU AND OTHER SENIOR MANAGERS NEED TO BEGIN DOING NOW TO ENSURE THAT THIS FUTURE SCENARIO WILL BECOME A REALITY?

- All strategy and future plans should come from this level.
- Start reducing unhealthy conflict and competition between segments of the organization.
- Take more of a corporate perspective. Think optimization of the whole.
- Create senior management forums or advocacy groups to explore issues and plan changes kicked off by this process.
- Support significant cross-organizational projects. May need senior managers whose whole job is to facilitate this.
- Be much clearer around goals, direction, people selection and development, roles and responsibilities.
- Address these issues in our own organizations.
- Need to expose our M & E people to international competition and Digital customer base. 1-3 year job rotations, swaps, temporary assignments, sabbatical programs would be great.
- Do not allow the Executive Committee to delegate the change process to senior managers. People feel different levels are required but all feel the Executive Committee has to initiate or sponsor major change efforts.
- There is some notion of the need for another type of forum where senior managers can actually get together. Maybe face-to-face. However, it is also dependent on Executive Committee sponsorship.
- Many feel that if the problems stated in our summary were "severe" enough, we would solve them.
- So simple. Get out and work with customers. To not broadcast (make presentations) or just meet with them, but to work with them.

- Senior managers should spend a month with a customer or a supplier, and have their managers reciprocate with us. This would help us value what we take for granted (i.e. we think everyone has a network).

- Managers need to learn another language, and therefore learn another world view. Differences in language and culture will begin to have a large scale impact.

- The Executive Committee should invite selected senior managers who have good, creative ideas to a meeting, or individual meetings, to have a free wheeling discussion -- like the senior management interview process, but not filtered through so many people. The Executive Committee would first have to set a framework for the discussion, and set boundaries for the content of the discussion. A formal pitch would not be expected, but instead have an interactive discussion.

- All international managers should have representatives attending Executive Committee meetings. Currently, the managers only get their information by reading mail on Easynet, and they don't have the opportunity to provide input to the Committee.

- We need to drive programs that will again enable entrepreneurship and initiative, encourage risk taking, encourage competition between groups, and tolerate failures. We need the uniqueness of the company to come back.

- We need to change the measurements. Develop metrics that have longer term implications.

- Need crisp, clean decision making. We have been too used to bottoms up decisions and committee orientation.

- More cross-functional communication.

- Develop new business model.

- Control cost, manage growth.

- Develop better and closer ties to our customers.

- Stop turf battles.

- Learn to implement our plans.

- Renew and continue our commitment to excellence.

- We must knock down the stovepipes.

- We need to get engineers talking to customers again.

- We must construct a comprehensive re-training and re-skilling program for large segments of our population.

- We need more cross-functional forums to work issues.

- We need to do away with obsolete processes and procedures (phase review).
- We need to evaluate all of our programs often and eliminate those that overlap or aren't paying off (not just once a year at budget time).

Sam Fuller

RECEIVED
AUG 31 1989
SAM FULLER

d i g i t a l

Interoffice Memo

TO: JFS Staff

CC: MEM PMC

DATE: 8/29/89
FROM: DICK FARRAHAR
DEPT: MEM PERSONNEL
EXT: 223-7738
LOC/MAIL STOP: ML012-2/T8

SUBJECT: Employee Involvement Program

Attached is some background information for the "Employee Involvement" presentation to JFS Staff on Sept 7th.

Included is a copy of the presentation made to the Executive Committee and additional information to help the JFS Staff discussion for implementing in MEM.

®lm
Attachment

Route to CRA
FYI

returned
9/4

**** PRESENTATION ****

made to Executive Committee

EMPLOYEE INVOLVEMENT -

QUALITY, COST AND PRODUCTIVITY

PROBLEM STATEMENT:

Digital Equipment needs to become more effective in using its people to manage cost in support of its overall quality and productivity goals. By doing so, we will:

- Continue the company's competitiveness through the 90's

- Have the company achieve its full potential which can only be accomplished with the involvement of all of our employees

- Have employees achieve an optimal level of personal contribution

SCOPE: The effort should meet the following principles:

- o Worldwide - all organizations
- o Involve all employees
- o Provide timely feedback to employees on their ideas
- o Put a premium on local participation and management
- o Be upbeat and fun
- o Be congruent with other business activities

  Company profitability
  Transition efforts
  etc.

- o Be easy to communicate
- o Focus on desired behaviors, not rules

TWO PART PROGRAM:

I. Employee Involvement Program--e.g. "I Want to Contribute."

- o Establish a Corporate Goal

  Suggest $500 million

  Executive Committee and Direct Reports own achievement of their piece of the $500 million

  Establish a process for local management to run

  Each individual group's goal should be established at the local level and should follow a bottoms-up approach. We should not merely hand out a percentage goal to each group

- o Foster an environment that mobilizes employees to come forward with quality and cost improvement ideas and which provides a framework in which managers can support those ideas.

- o Establish a program which recognizes individuals for their contribution to reducing cost or improving quality.

  Publicize ideas achieving major definable cost savings or quality improvement

  Individual and staff recognition for ideas

- o Flexible local guidelines and local management but with corporate message related to resumption of salary increases.

- o Communication of broad, overview results monthly

- o Program duration one year

TWO PART PROGRAM:

II. Education and Training Programs:

- o For the individual - what is an individual's responsibility, how and what to look for while doing one's job

- o For entry and middle management - basics of cost, how to manage for improved quality and results

- o For senior management - systemic approaches to organizational effectiveness

NOTE: Teams consisting of intact work groups focused on quality, cost and productivity improvements form a related subject although not a part of this proposal. A number of such project teams are currently operating in the Company.

NEXT STEPS:

Establish a program manager reporting to the PMC who would work on the program full time for 3 - 4 months.

Establish a small cross Company work group with a representative from SSMI and MEM to design and manage start-up activities. The committee would define processes and guidelines, not run the program. First meeting by 7/14.

Other groups (not all inclusive):

- o Corporate Quality
- o Corporate Purchasing
- o Corporate Information Systems
- o Manufacturing
- o Engineering
- o Corporate Employee Communication
- o Corporate Finance
- o Sales & Services
- o International
- o Management Education
- o Organization Consulting Group
- o Personnel Management Committee Member
- o Corporate Personnel Staff
- o PMC Members to identify team members

NEXT STEPS:

Define start-up activities to include:

- o Role of Committee
- o Work to be done
- o Implementation plan and schedule
- o Worldwide communication strategy
- o Measurement and follow-up

Start-up Q1 FY90

* * *

"YOU MAKE A DIFFERENCE"

* * *

EMPLOYEE INVOLVEMENT

AT

DIGITAL EQUIPMENT CORPORATION

August, 1989

"YOU MAKE A DIFFERENCE"

MY ROLE

- FRAMEWORK, STANDARDS, TOOLS

- COMPANY-WIDE EMPLOYEE COMMUNICATIONS
  - -- Theme "You Make A Difference"
  - -- Logo

- LINK EFFORTS THROUGHOUT COMPANY
  - -- Consistency
  - -- Minimize redundancy

- MANAGE PROCESS FOR COMPANY-WIDE IDEAS

- ONGOING CONSULTING
  - -- Direct
  - -- Through Design Team

- CONTINUING EMPLOYEE COMMUNICATIONS SUPPORT
  - -- Publicizing Success Stories
  - -- E.I. Messages via DVN, Video, Newsletters

EMPLOYEE INVOLVEMENT
"YOU MAKE A DIFFERENCE"

IMPLEMENTATION PLAN-NEXT STEPS

- FORMULATE/PUBLISH EMPLOYEE COMMUNICATIONS PLAN
- IDENTIFY IMPLEMENTATION MANAGERS (E.I. LEADERSHIP TEAM) FOR EACH E.C. MEMBER AND/OR ORGANIZATION
- BRIEF KEY PEOPLE (E.I. DESIGN REVIEW TEAM, PERSONNEL MANAGERS)
- PROVIDE TRAINING AS REQUESTED
- DETERMINE PROCESS FOR HANDLING COMPANY-WIDE IDEAS
- DEVELOP RECOGNITION GUIDE
- FINAL REVIEW WITH E.I. LEADERSHIP TEAM (9/6)

- KICK-OFF SEPTEMBER 11

= =

- CONTINUE CONSULTING AND ASSESSING
- COLLECT & PUBLICIZE REPORTS AND SUCCESS STORIES
- MANAGE COMPANY-WIDE IDEA PROCESS
- CONTINUE CONNECTION WITH EI LEADERSHIP TEAM

EMPLOYEE INVOLVEMENT "YOU MAKE A DIFFERENCE"

ORGANIZATION	STATUS	LEADERS	SYSTEM
SSMI: U.S.	Design in Process	Dave Grainger/Jim Pitts	Propose & Do Idea System
GIA	Design in Process	Dick Poulsen/Bill Forgione/ Rob Katz	
EUROPE	Implemented	Pier-Carlo Falotti/ Giorgio Corsi	Idea System
HQ GROUPS		Jack Shields	TBD
LAW	Design in Process	Marty Hoffman/ Cary Armistead	Letter--Hoffman to all Law employees
STRATEGIC RESOURCES	Design in Process	John Sims/ Carol Burke	Cascade
FINANCE	Design In Process	Jim Osterhoff	Integrate w/other planned systems
CORPORATE OPERATIONS		Win Hindle/TBD	Cascade
MANUFACTURING			
ENGINEERING			
PRODUCT MARKETING			
CORPORATE PERSONNEL		Dick Walsh/Sy Sackler	TBD

SEP 1 [illegible] 1989

CRA ROUTING SLIP -- PLEASE CIRCULATE

NAME	LOCATION	DATE RECEIVED
PATRICK BAUDELAIRE	PRL	✓ copy req rest
AGNES CONNORS	MLO1-3/B10	9/12/89
TOM GANNON	MLO1-3/B10	✓ "
JACK MCCREDIE	ML01-3/B11	[signature]
JOHN MCDERMOTT	DLB5-3/E3	✓ "
RON SMART	ML010-1/F41	✓ "
RICHARD SWAN	UCO-4	✓ "
BOB TAYLOR	UCT	✓ "
VICTOR VYSSOTSKY	CRL	✓ "
JENNY WATSON	MLO1-3/B10	[signature]

PLEASE FORWARD TO NEXT PERSON ON THE LIST WITHIN 5 DAYS OF RECEIPT.

RETURN TO:

SAM FULLER MLO12-2/T7

1/26/89
Doc.1.18

****
* DIGITAL *
****

SUBJECT:

DATE: March 5, 1987
FROM: Lynne Braley
DEPT: Executive Search
EXT: 225-4552
ENET: SNICKR::BRALEY

TO: Distribution

A series of discussions will be held with Victor Vyssotsky, on Friday, March 6th, on the subject of Sam Fuller's Western Research Lab Director and East Coast Research Lab Director positions. The schedule of the day is as follows.

Please send your feedback directly to Sam Fuller on ENET RDVAX::FULLER and Deb Germaine via ENET on Snickr::Germaine.

9:00 - 9:30	OVERVIEW - DEB GERMAINE Manager, Executive Search	HLO2-3/M09 Angstrom C.R.
9:30 - 10:15	JACK McCREDIE Director, External Research Programs	HLO2-3/M09 Angstrom C.R.
10:15 - 11:15	DEB GERMAINE Manager, Executive Search	HLO2-3/M09 Angstrom C.R.
11:15 - 12:00	TONY LAUCK Manager, Distributed Systems Architecture and Advanced Development	HLO2-3/M09 Angstrom C.R.
12:00 - 1:00	SAM FULLER Vice President, Corporate Research & Architecture	HLO2-3/M09 Angstrom C.R.
1:05	Travel to Maynard, Main St. Entrance	
1:30 - 2:15	JESSE LIPCON Manager, MicroVAX Program	MLO12-2/15B Sarah Nyman C.R.
2:15 - 2:45	WIN HINDLE Senior Vice President, Corporate Operations	MLO12-1/A53
3:00 - 4:00	BUTLER LAMPSON Senior Consultant, Software Engineer	MLO12-2/15B Sarah Nyman C.R.
4:00 - 5:00	MAHENDRA PATEL Technical Director, Distributed Systems Architecture and Advanced Development	MLO12-2/15B Sarah Nyman C.R.
	IRIS DELUCA to escort to Main St. Lobby	
5:00	Travel to Hudson Facility (HLO2)	
5:20 - 6:00	Wrap-up with SAM FULLER and DEB GERMAINE	HLO2-3/M09 Angstrom C.R.
6:05	Helicopter to Logan	

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Victor Vyssotsky, Executive Director/Research Science Division,
AT&T Bell Labs, N.J.

Summary: BS Liberal Arts. MS Math, University of Chicago/

AT&T Bell Labs

1957 - Present: Executive Director Research Information Division responsible for R&D activities covering computer science, math, statistics, speech processing, synchronizers, rechronization, AI, Robotics, Human Factors, ETC. Responsibility for 200 plus employees with a budget of 40 million plus.

March 3, 1987

Victor Vyssotsky
18 Springfield
Cranford, New Jersey 07016

Dear Vic:

This letter is to confirm your visit to Digital Equipment Corporation in Maynard, Massachusetts on Friday, March 6, 1987. Enclosed are your travel arrangements to Digital. If you have any questions regarding these arrangements, please feel free to call me collect at (617) 568-4552.

I am looking forward to meeting you.

Sincerely,

Lynne Braley

MONDAY - MARCH 6, 1987

Your tickets are prepaid and can be picked up at the airport ticket booth.

Depart 7:00 A.M. from NEWARK - Continental Flight #4180,
Arrive BOSTON - 8:10 A.M.

Follow the signs to Terminal #B, (next to the U.S. Air terminal). Meet your 8:30 helicopter arriving at 8:45 at our Parker St. facility in Maynard. Debra Germaine will pick you up at the helipad and bring you to our Corporate Headquarters. At this time, Debra will give you a complete overview on your day, which consists of 8:45 to 6:00 discussions.

Sam Fuller will drive you back to the helipad where to meet your 6:05 P.M. helicopter arriving in Boston at 6:25 P.M..

Depart 7:30 P.M. from BOSTON - Continental Flight #367,
Arrive NEWARK at 8:49 A.M.

****
* D I G I T A L *
****

f: Vyssotsky

SUBJECT:

DATE: March 5, 1987
FROM: Lynne Braley
DEPT: Executive Search
EXT: 225-4552
ENET: SNICKR::BRALEY

TO: Distribution

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Token Ring

① CRG
② 180K
③ 2500 Regular

1000 fast
regular

Jack Questions:

① Why do I work for you.

②

From: SONORA::SVIRSKY "Bill Svirsky" 27-FEB-1987 10:39
To: rdvax::fuller, sonora::feir
Subj: swan-I think Mike Powell covered the base well

Mike's answer was excellent. My earlier comment that things are beginning to unravel is still valid. Sam, the directorship situation needs to be resolved asap.

------- Forwarded Message

To: svirsky
From: powell (Michael L. Powell)
Replied: 27 Feb 87 07:37
Date: Thu, 26 Feb 87 18:19:57 pst
Subject: What I sent about Richard Swan

>From powell Thu Feb 26 17:46:20 1987
To: wrl-staff
Subject: Richard Swan

I just spoke with Richard Swan on the phone for almost an hour and I came away with a more optimistic feeling than perhaps Brian did. Although it is true that he did see the need for us to increase our interactions with the rest of the company, he was still seriously interested in the director position.

There were two things we discussed that might be of general interest. First, he asked if we were willing to spend more effort interacting with the rest of the company. I told him that we were, that there was some disagreement as to how much and how, but that it was generally accepted that the new director was going to share more of that activity with the rest of the lab than Forest did.

The second thing he mentioned was that knowledge of the Titan, although present at the higher levels, had not trickled down to the technical people. It seems to me we might want to package some of our Titan experience in a form that is accessible to a wider audience (e.g., make a Titan benchmark technical report).

One interesting predicament he mentioned was that people frequently asked him about the work that is going on at WRL. We haven't even hired him yet, and he is already representing us! He expressed interest in coming by and finding out more about what we are doing, as well as meeting the rest of us.

The current schedule is for him to talk to Sam Fuller next Wednesday (Sam is out of the country until next week). By then, Sam will have the reports from the various people who talked to Richard. Richard said he will probably want to come by WRL to talk to more people the end of next week.

Mike

------- End of Forwarded Message

From: SONORA::POWELL "Michael L. Powell" 26-FEB-1987 17:40
To: rdvax::fuller
Subj: Brian and Richard Swan

Sam,

I'm afraid that in his current frame of mind, Brian is doing more damage than good in his discussions with Richard Swan. The enclosed is a message Brian sent to the lab.

Mike

------- Forwarded Message

From: reid (Brian Reid)
Message-Id: <8702262232.AA01648@woodpecker.DEC.COM>
Date: 26 Feb 1987 1432-PST (Thursday)
To: wrl-staff
Subject: report from Richard Swan

I just received a phone call from Richard Swan, who has returned from a 3-day interview in the east. He talked to vice presidents, senior staff, and other important folks.

The purpose of his call was to tell me that he was really shaken by what he learned. He said that there is a huge amount of entrenched hostility towards WRL among the upper reaches of the company, and that absolutely nobody that he talked to had the remotest idea of what was happening at WRL, or why. He said that every one of them mentioned that SRC was very cooperative with the folks "back east" and that SRC spent a lot of time sending envoys back to talk and listen, but that WRL did not communicate with the rest of the company.

Swan's reaction was, in summary, that he wasn't at all sure he would want to take the job if it were offered to him because there would be so much fence-mending and so much remedial communication to be done in order to restore normal relations. He also said that he saw a significant danger of having the lab just be dissolved in a year or two if this problem didn't get a lot better very soon.

Brian

------- End of Forwarded Message

From: SONORA::SVIRSKY "Bill Svirsky" 26-FEB-1987 18:24
To: rdvax::fuller
Subj: swan's negative reaction to eastern interview process

We sure didn't need this kind of a message going out to the lab. Things are beginning to unravel here. Help.

------- Forwarded Message

To: wrl-staff
From: reid (Brian Reid)
Date: 26 Feb 1987 1432-PST (Thursday)
Subject: report from Richard Swan

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Brian

------- End of Forwarded Message

From: SONORA::SVIRSKY "Bill Svirsky" 26-FEB-1987 19:06
To: rdvax::fuller, sonora::feir
Subj: more on swan

A copy of my message to Brian is attached. Mike Powell is trying to contact Swan now to get more specifics. We need to get some facts to the lab quick. Be aware, too, that there is a serious riff developed between Brian and Mike that Randy and I are trying to heal. But this latest development did not help anything.

------- Forwarded Message

To: reid
From: svirsky (Bill Svirsky)
Date: 26 Feb 1987 1603-PST (Thursday)
Cc: svirsky
Subject: richard swan

Brian, what was the intended purpose of sending that message about swan? Perhaps it was to reinforce the importance of strengthening the ties between the lab and the rest of the company. But my guess is that the message will have a very unsettling effect on a very nervous lab. I would much have preferred that the information from Richard be qualified more as to sources and specifics so that it could be given to the lab with more context. All in all I feel it was premature.

------- End of Forwarded Message

From: SONORA::SVIRSKY "Bill Svirsky" 26-FEB-1987 19:20
To: rdvax::fuller, sonora::feir
Subj: Brian's response to me. Progress? Too little, too late.

------- Forwarded Message

To: svirsky
From: reid (Brian Reid)
Date: 26 Feb 1987 1621-PST (Thursday)
Subject: Re: richard swan
In-Reply-To: svirsky@decwrl (Bill Svirsky) / 26 Feb 1987 1603-PST (Thursday).
<8702270003.AA02789@ocean.dec.com>

Grumble. I guess you're right. I couldn't find anybody around to talk
to about it, and I feel very much under attack for my interest in PR in
the first place. I guess this is why the constitution guarantees people
a right to a speedy trial.

------- End of Forwarded Message

From: THUNDR::GAUBATZ "24-Feb-1987 1339" 27-FEB-1987 14:35
To: RDVAX::FULLER,LIPCON,GAUBATZ
Subj: RICHARD SWAN - WRL CANDIDATE

Sam,

I'm sending this to you because I don't have the address of the other person.

I talked with Dick before he went in to see Dom LaCava, and I went to lunch with Jesse and Dick.

My basic reaction is this: Richard Swan is NOT the person to carve out a new charter, and to implement that charter for WRL. His preliminary view of the job was that there was an ongoing charter/function, and that he could continue with it.

Most of us don't believe that that is the case.

Swan did not seem to have much of a grasp of what the current issues are in computer systems design, such as software for parallel machines, memory bandwidth, to name a few. We found ourselves in the position of telling the research candidate what the research topics should be.

Also, it is clear to all of this that the job at WRL is a "fight for your life/ fight for the group's life" type of positiong, and it's not clear that he has what it takes to execute that set of tasks in the DEC environment.

One key indication of this is that he did NOT make the best use of his exposure to us in pulling out of us just what would be required to make the job an outstanding success.

I would have expected him to have figured out what the "job" really was at WRL, this being the second day of his interviews here, and, consequently, I would have expected him to get us to design a "can't fail" charter.

Lacking this ability to quickly size up a situation, and exploit the enviroment/opportunities to the fullest, it is even worse that he has NOT been active in research community for about 7 years. He therefore does NOT have the momentum of an ongoing research project to carry him over his first days at WRL.

Positive - he did have a good sense of the people at WRL after his visit(s) there. He felt he could rely on them for technical input.

Those of us over here at MSD regard the WRL job as a real opportunity, that could grow to be a unique part of the DEC research/adv dev community, but we'd really worry about WRL ever becoming that if Dick Swan took the job.

The other thing that concerned me is that, as a VP who built up a company, he is used to being "in charge", and controlling a relevant part of his destiny. He obviously wouldn't have that feeling at WRL for some time, and it might be very frustrating to him.

The next manager of WRL will make the operation a success, or it will probably disappear.

Jesse and I both like the guy, but I, for one, don't think this is a good match.

Please let me know if any amplifications/qualifications on the above would be useful.

Don

From: RDVAX::FULLER "SAM FULLER, ML12-2" 23-FEB-1987 14:59
To: DELUCA
Subj: print and hold in Richard Swan file.

From: RICKS::RUBINFELD 23-FEB-1987 13:17
To: RDVAX::FULLER
Subj: Feedback on Richard Swan

I met with Richard Swan and we talked for almost a hour as we eat breakfast. I hadn't seen him for over eight years and we spent most of the time catching up on where our respective careers have taken us. It is interesting to note that he was busy designing sophisticated VLSI tester while I was busy designing chips which could be tested on his tester. I explicitly asked him why he is considering leaving Megatest to which he replied something to the effect that he was tired of building testers (seven years is enought) and he wished to pursue his real technical interest, computer design and computer architecture. I believed his reply. He was very interested in my impressions about WRL. Unfortunately, I have had little exposure to WRL and could only offer him my personal opinion on how WRL fits into Digital. In general, I still found Richard personable and hope that he does join Digital. If there is anything else I could do for the cause, let me know.

Paul Rubinfeld

From: RDVAX::FULLER "SAM FULLER, ML12-2" 24-FEB-1987 10:44
To: DELUCA
Subj: print and file in Swan

From: SONORA::DION "Jeremy Dion" 23-FEB-1987 20:53
To: rdvax::fuller
Subj: Richard Swan etc.

Sam,

Richard came around for the second time last Thursday. I had a chance to talk to him, and he gave a slightly rambling description to the group of the MegaOne tester. Those of us who have grilled him like what they have seen of technical background and interest, but those who only heard the talk were less impressed. I think Mike summed it up by saying "I like the station but the volume needs to be higher". That is, we are all quite positive about Richard, and our doubts are mostly as to whether he could be an effective spokesman for the lab rather than on his potential as a technical contributor. (Hearing that he's interested in high-speed computer design was music to our ears.) The talk he gave did not show him to be an effective public speaker, at least in this instance, and I hope that this was just due to his being asked for an informal talk in a more formal situation than he expected. I'd be happy to work with Richard technically, but I hope he would also be able to stand up better than I did to occasions like the TMC meeting. So far, I'm not so sure.

We had a drop-in visit from Ivan Sutherland about 10 days ago, which was extremely interesting. He made it sound as if he and Bob Sproull are a two-man package, and that if Bob were interested in coming here, he'd like to look into it as well. I was impressed with him, and I could see that he was very impressed with Norm's VLSI work; there was electricity between those two. It also seemed that there was a good contrast of ideas between their asynchronous design style and Norm's synchronous highly optimized style, and that something good could come out of it. Because of the visit, I am very much in favour of encouraging them to come to WRL for a year. These are obviously first-rate people, and are working in an area which is close enough to ours that there is a good possibility of really exciting work. Don't let them drift off somewhere else if you can help it! I am less interested in having them just give a course here, since that would be more formal and less practical. Having them try their work in practice could open up new areas for both them and us.

Final point: I am going on holiday as of tomorrow for three weeks (to Trinidad). Scott Gordon phoned up about possible follow-ups to the TMC meeting, and suggested that WRL might be reviewed again on March 3rd or 4th. I have passed out deputy badges to Mike Powell and Norm Jouppi for this purpose, but as yet they don't know if they'll have to go. Dileep was here today, and left agreeing that the MultiTitan was worth doing - or at least that he had no objections to it - so that seems to be one down. Mike and Norm are responding by mail to Alan Kotok.

Back on March 18th. Hope your holiday was relaxing.

Regards,

Jeremy

From: RDVAX::FULLER "SAM FULLER, ML12-2" 24-FEB-1987 10:34
To: DELUCA
Subj: print and file in Richard Swan

From: AVOID::WALKER "Larry Walker 225-5288" 23-FEB-1987 17:30
To: RDVAX::FULLER,SELF
Subj: Richard Swan impressions

Richard struck me as an interesting guy - he has a background which makes him particularly well suited for the WRL position (I assume the position in question is the manager/director, right?). They've been scored over the last few years for relevance to DEC products, not technical competence, and Richard appears to have an unusual combination of academic technical experience with real nuts-and-bolts product development work. I was looking forward to my talk with him, therefore.

Unfortunately, I felt strongly that he didn't deliver on the promise I saw in the resume. He was nervous, I thought, and that could have affected things, but....

I asked him first about his philosophy about research in a corporation like ours. Besides citing PARC as an example of what he'd avoid, however, he didn't offer any insights into the things that we WOULD do to ensure coordination. Even at the level of mechanical tasks that he'd take on, he came up with nothing more than 'I'd travel back and forth to the East alot and have brainstorming sessions'. What I was looking for were institutionalized mechanisms like engineer exchange programs, technical review (e.g., design review) committees, publications, etc.

Next, we went to his picture of what a research lab should do. Again, his answer was the sort of vague generality that most anyone could have come up with ('we'll target certain aspects of CS to study that would affect DEC products'), while I was hoping for a few SPECIFICS (multiprocessors, new compiler ideas, new architecture). I base my hope on the observation that only those who can find or generate new visions and then forcefully pursue them can really make contributions from research.

Next, his manangement practices: recruiting, budgeting, environment. On the first, he described a stock college recruiting flow but pointed out (right!) that grilling them is the right way both to judge them and to inspire them. Not much experience on recruiting more senior people. On the second, his model is less developed, but he hasn't yet been in the situation that WRL is in (budgeting in a nebulous world rather than the sharply defined one he's used to at Megatest). On the third, he described some good basic habits (recognition events in the park, making sure his people, not him, are exposed as the contributors).

Finally, we talked some about multiprocessor futures. He's convinced that single stream uniprocessor performance will remain very important, as re-coding for parallelism will remain an infrequently-practiced option. Massively parallel machines will attract some application-munging, he thinks, but will not by any means replace general purpose machines. Seemed very well grounded in all levels of the concepts.

His personal style didn't strike me as that of a visionary leader but rather that of a well-developed technical contributor. I have a hard time thinking of him passionately driving a new concept into the corporation.

In short, he seems to me a good guy but not for this job.

/Larry

From: RDVAX::FULLER "SAM FULLER, ML12-2" 24-FEB-1987 15:06
To: DELUCA
Subj: print and put ain Swan file

From: SONORA::REID "Brian Reid" 23-FEB-1987 18:01
To: rdvax::fuller
Subj: Opinions on Richard Swan for WRL director

Summary of my position: he's great. Hire him.

Notes: Swan has the necessary breadth, depth, and intellect to be an intellectual leader of WRL; he has the necessary management experience to be the administrative leader of WRL, and he has a temperament that fits in well with the group. He is a little young (just under 40) but I think his management experience will make up for his slight lack of years.

Further note:
I believe that it is urgent that some director be hired soon; the inevitable chaos and infighting that always starts to happen in an organization when the boss leaves has begun to set in in WRL. If we don't have a director on board within the next 3 months I believe that irreparable damage will be done to the lab. I think that the likelihood of finding someone more qualified than Swan anytime soon is very slim.

Brian Reid

858 Hierra Ct
Los Altos, Ca. 94022
415 941 3010 (hm)
408 437 9700 (wk)
November 17 1986

Dr. Samuel H. Fuller
Vice President
Research and Architecture
Digital Equipment Corp.
146 Main St (ML012 -1/17)
Maynard, Ma. 01754 - 2571

Dear Sam,

It was good to see you last May. It was a pity we had so little time to catch up on events since CMU. It seems that you have been extraordinarily succcessful in establishing research groups on the West Coast.

Although I still enjoy my work at Megatest, I am considering leaving the ATE industry for wider horizons. Beginning in 1980, I developed an Engineering Team with 70 software, digital, analog and mechanical engineers. After preliminary market analysis and feasibility studies, we developed a new architecture for a VLSI Test System. It is targeted for testing large, complex VLSI devices with up to 256 pins and data rates in excess of 80 MHz. The system can make timing measurements with a resolution of 3 ps. The MegaOne was first shipped early in 1985. The latest annual sales exceed $26M.

In addition to managing this large systems development project, I have had considerable involvement with Marketing, Sales and Manufacturing. Immediately after the initial shipment of the MegaOne I temporarily became Manufacturing Manager and so now have a hands-on knowledge of modern manufacturing operations.

Sam, as you know I have quite broad interests. Do you know of any suitable positions in the Bay Area, with Digital or otherwise?

I will greatly appreciate any assistance you can give me. Please note that my possible departure from Megatest is not public and will require an extended notice period. Please use your discretion if discussing this with others.

Sincerely

Richard

Richard Swan