INDUSTRY APPRAISAL OF FOREST PRODUCTS CURRICULUM AT OREGON STATE UNIVERSITY[1]

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ABSTRACT

The Forest Products Department at Oregon State University trains professionals who work mainly in the forest products industry. Therefore a survey was conducted to assess the relevance of our curriculum to the needs of our graduates. A total of 1,183 questionnaires were mailed to persons in industry, of which 730 were completed and returned. Respondents were asked to rank the importance to them of 59 subjects, courses, or disciplines within the university. Other questions related to respondents' type of manufacturing operation, management level in the firm, field of training, length of time with firm, age, level of education, and most helpful sources of education. Analyses were made for Oregon State University graduates in Forest Products as a group, and for groups sorted by management level, type of operation within the industry, and age level of respondents.

Keywords: Education questionnaire, industry survey, curriculum analysis.

The Forest Products Department at Oregon State University (OSU) trains professionals who find jobs mainly in the forest products industry. The curriculum, therefore, should be closely responsive to the needs of those professionals. The relevance of the subject matter taught can be assessed by surveys of the opinions and preferences of random samples of those in the forest products industry, people who can best judge the training most important to them in their careers. The main objective of this study was to obtain an industry assessment of the importance to forest product students of subject matter that (1) is required, (2) is available as electives, or (3) could be included in the curriculum as new material.

PROCEDURE

The procedure was to devise a questionnaire, pretest it, develop mailing lists, estimate sample sizes, stratify samples, draw random samples, mail the questionnaires, tally the responses, and computer-analyze the data.

The questionnaire was devised with guidance from the Survey Research Center, Oregon State University, with reference to texts of Forcese and Richer (1973) and Galtung (1967), and with advice from industry and the faculty at OSU. It was then pretested on the faculty and students at OSU and on a sample of 21 respondents from industry. Suggestions solicited and problems noted in the pretest resulted in final modification to the questionnaire.

An industrial mailing list was compiled from the Directory of Forest Products Industry (1977) and the Directory of Oregon Manufacturers (1976). Names of Forest Products alumni were taken from a list maintained by the OSU Forest

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TABLE 1. *Number of respondents by work area and category.*

Work area	All respon-dents	Gradu-ates[a]	Management			Nonsuper-visory[b]	Below age 40	Over age 39
			Top	Mid	Below mid			
Truss mfg.	3	2	1	1	1	0	2	1
Wood treating	17	6	4	6	2	3	3	14
Laminated products mfg.	5	1	0	3	0	0	1	4
Hardboard mfg.	25	6	0	9	4	7	6	19
Particleboard mfg.	28	5	0	9	12	4	12	16
Paper mfg.	70	15	1	28	19	20	28	42
Green veneer mfg.	18	0	2	10	3	2	10	8
Plywood only mfg.	75	16	5	38	13	9	18	57
Sawmill only mfg.	139	25	16	47	38	9	43	96
Sawmill and plywood mfg.	57	11	9	37	3	6	10	47
Combined mfg.[c]	51	14	12	22	3	6	15	36
Sawmill and veneer mfg.	13	1	1	8	2	2	3	10
Mobile and modular homes mfg.	10	0	2	5	1	1	5	5
Forest product sales	79	31	18	15	2	6	26	53
Millwork, furn., moulding mfg.	40	10	10	21	6	1	8	32
Real estate, banking, insurance	8	6	0	2	0	2	3	5
College or university teaching	7	7	0	0	0	0	2	5
Research	17	17	0	1	0	15	10	7
General forestry	15	6	0	8	2	2	2	13
Miscellaneous	46	36	6	10	3	9	13	33
Nonresponse	7	4	0	0	2	0	0	7
Total	730	219	87	280	116	104	220	510

[a] OSU Forest Products graduates.
[b] Nonsupervisory professional-level respondents.
[c] For example, sawmill, plywood, particleboard; sawmill, particleboard, paper; i.e. three or more major combined operations.

Products Department. The directories gave, besides names, information on type of industry, type of operation within the industry, and management level of individuals, which aided decisions on sample stratification. Sample sizes were based on estimates of statistical parameters developed from the pretest. Samples were computer-drawn by a random-numbers procedure from the name-lists previously prepared.

A total of 1,183 questionnaires were mailed, and 730 were completed and returned, a 62% response. Responses were coded and tallied for computer analysis, made mainly by chi-square goodness-of-fit tests or by chi-square contingency analysis.

The most important part of the questionnaire was rating of the importance of 59 subjects, courses, or disciplines within the university with respect to their importance to the individual in his or her present job. Respondents were given choices of "very important," "important," "not too important," or "not important at all."

Other questions related to the respondents':

1. type of manufacturing operation
2. most helpful sources of education
3. professional or management level
4. number of years of employment with present firm

TABLE 2. *Ranking of Forest Products courses or subjects as "important" and "very important" or as "not too important" and "not important at all."* [a]

| Course or subject | All respondents | Graduates[b] | Management | | | Non-supervisory[c] | SWC[d] | Paper[e] | Below age 40 | Over age 39 | Mean |
			Top	Mid	Below mid						
Plant layout	8	7	9	9	9	6	9	8	8	8	8.1
Residue utilization	7	7	7	8	8	7	8	6	7	8	7.3
FP merchandising	8	7	10	8	7	5	9	3	7	8	7.2
Strength properties	7	7	8	8	7	6	8	3	6	8	6.8
Physical properties	7	7	7	7	7	7	7	4	7	8	6.8
Wood identification	7	6	7	7	8	6	8	5	6	7	6.7
Lumber mfg.	7	6	9	7	6	5	9	1	6	8	6.4
Forest product markets	7	7	8	7	5	5	8	2	6	7	6.2
Wood chemistry	6	5	5	5	6	7	5	7	5	6	5.7
Plywood mfg.	6	6	8	6	4	5	7	1	5	7	5.5
Kiln drying	6	6	8	6	5	4	7	0	5	7	5.4
Adhesives	6	6	6	6	5	5	6	2	5	6	5.3
Wood treating	6	6	7	5	5	5	6	2	5	6	5.3
Wood anatomy	5	6	5	5	5	6	6	4	5	5	5.2
Pulp and paper mfg.	4	4	3	4	4	5	3	10	4	4	4.5
Coatings and overlays	5	5	5	4	4	5	4	2	5	5	4.4
Composition board mfg.	5	5	6	4	4	4	4	1	4	5	4.2
Timber design	4	5	6	4	3	3	4	0	4	5	3.8
Glulam mfg.	4	5	5	4	2	3	4	0	3	4	3.4
Mean	6.1	5.9	6.8	6.0	5.5	5.2	6.4	3.2	5.4	6.4	
Approximate total of respondents[f]	700	200	80	260	110	100	320	70	210	460	

[a] A rank of 7 means that 70% of respondents ranked the subject "important" or "very important." 30% "not too important" or "not important at all."
[b] OSU Forest Products graduates.
[c] Nonsupervisory professional-level respondents.
[d] Respondents employed in "Solid Wood Conversion," e.g., manufacture of lumber, plywood.
[e] Respondents employed in pulp and paper manufacture.
[f] Number of responses to course or subject categories varied.

5. age and number of years since graduation
6. level of education
7. school or university attended
8. fields of training

DISCUSSION OF RESULTS

Table 1 identifies respondents by work area and age group. OSU graduates in Forest Products were sorted and analyzed as a group to see if those in industry who had been through our program of study would rate subject matter differently than other groups. We also sorted respondents by management levels, reasoning that the level might affect preference for subject matter in the curriculum. The large group of respondents who did not have supervisory responsibility also was sorted and analyzed separately.

Ranking of courses, subjects, or disciplines

Ranking of courses related to forest products is shown in Table 2. Row and column means have been included, but the reader is cautioned that all such means are not independent. For example, "Graduates" are sorted from "All Respon-

TABLE 3. *Contingency analysis of ranking of selected forest products courses or subjects as "important" and "very important" or as "not too important" and "not important at all."* [a]

	Courses or subjects						
Groups	Coatings and adhesives	Wood chemistry	Timber design	Lumber mfg.	Composition board[b]	Paper	Residue utilization
Top management	5	5	6	9	6	3	7
Midmanagement	4	5	4	7	4	4	8
Below midmanagement	4	6	3	6	4	4	8
Nonsupervisory	5	7	3	5	4	5	7
Total of respondents	545	548	539	556	527	536	551
χ^2 calculated	1.00	7.33	22.5[c]	39.4[c]	9.92[c]	7.74	4.87

[a] A rank of 7 means that 70% of respondents rated the subject "important" or "very important." 30% "not too important" or "not important at all."

[b] Includes hardboard, particleboard, softboard.

[c] Book value of $\chi^2 = 7.82$ at the 5% level with 3 degrees of freedom. Therefore one concludes that the 4 levels of management ranked these subjects differently.

dents," solid wood conversion ("SWC") contains all levels of management, and "Age" contains all other categories. However, the means do give a general indication of the order of importance to the various categories. For example, it is obvious that those employed in pulp and paper manufacture considered forest products courses much less important than did top management. It is also obvious from the row means that regardless of how groups were sorted, timber design was not thought to be as important as plant layout.

We assumed that the top and midmanagement groups are responsible for hiring most of our Forest Products graduates, 80% of whom entered the industry either in the below midmanagement or in the nonsupervisory groups. It is interesting to compare the views of these four groups on importance of courses in the Forest Products curriculum. The results of a contingency analysis performed for the four groups on seven selected subjects are in Table 3. This analysis can be made because the groups are independent, whereas all the respondent categories shown in Table 2 are not. The seven courses or subjects were selected because they represent varied ranges of ranking. From Table 3 one can judge whether the four groups ranked the subjects the same or differently. If the calculated value of χ^2

TABLE 4. *Ranking of communications skills courses as "important" and "very important" or as "not too important" and "not important at all."* [a]

			Management								
Course	All respondents	Graduates[b]	Top	Mid	Below mid	Nonsupervisory[c]	SWC[d]	Paper[e]	Below age 40	Over age 39	Mean
English	9	10	9	9	9	10	9	9	9	9	9.2
Report writing	9	9	7	9	9	9	9	10	9	9	8.9
Speech	9	9	9	9	8	9	9	9	9	9	8.9
Mean	9.0	9.3	8.3	9.0	8.7	9.3	9.0	9.3	9.0	9.0	

[a] A rank of 7 means that 70% of respondents rated the subject "important" or "very important." 30% "not too important" or "not important at all."

[b] OSU Forest Products graduates.

[c] Nonsupervisory professional-level respondents.

[d] Respondents employed in "Solid Wood Conversion," e.g., manufacture of lumber, plywood.

[e] Respondents employed in pulp and paper manufacture.

TABLE 5. *Ranking of business courses as "important" and "very important" or as "not very important" and "not important at all."* [a]

Course or subject	All respon-dents	Gradu-ates[b]	Management Top	Management Mid	Management Below mid	Non-super-visory[c]	SWC[d]	Paper[e]	Below age 40	Over age 39	Mean
Economics	9	8	9	9	9	8	9	9	8	9	8.7
Production management	8	7	9	9	9	7	9	9	8	9	8.4
Management science	8	8	9	8	8	7	8	8	7	8	7.9
Accounting	8	7	10	9	7	6	9	6	7	8	7.7
Finance	8	7	10	8	6	5	8	6	7	8	7.3
Marketing	7	7	9	8	6	5	8	3	6	8	6.7
Business law	7	6	9	7	5	5	7	4	6	7	6.3
Data processing	5	5	6	5	4	5	5	5	5	5	5.0
Mean	7.5	6.9	8.9	7.9	6.8	6.0	7.9	6.3	6.8	7.8	

[a] A rank of 7 means that 70% of respondents rated the subject "important" or "very important," 30% "not too important" or "not important at all."
[b] OSU Forest Products graduates.
[c] Nonsupervisory professional-level respondents.
[d] Respondents employed in "Solid Wood Conversion," e.g., manufacture of lumber, plywood.
[e] Respondents employed in pulp and paper manufacture.

is less than 7.82, one concludes that the four levels of management rated the same on the importance of a subject matter area or a course. If χ^2 is greater than 7.82, rankings were different. For example, one concludes that management levels agreed on the importance of residue utilization but disagreed on lumber manu-

TABLE 6. *Ranking of basic courses or subjects as "important" and "very important" or as "not too important" and "not important at all."* [a]

Course or subject	All respon-dents	Gradu-ates[b]	Management Top	Management Mid	Management Below mid	Non-super-visory[c]	SWC[d]	Paper[e]	Below age 40	Over age 39	Mean
Statistics	8	8	8	8	7	8	8	7	8	7	7.7
Psychology	6	5	6	7	6	6	7	6	6	6	6.1
Operations research	6	6	7	7	5	6	7	5	5	6	6.0
Physics	5	7	5	5	5	6	5	7	4	6	5.5
Critical-path scheduling	5	5	5	5	5	5	5	5	5	5	5.0
Electronics	4	4	4	4	6	4	5	4	4	4	4.3
Linear programming	4	5	5	4	5	4	5	3	4	4	4.3
Computer programming	4	5	5	4	4	5	4	3	4	4	4.2
Computer simulation	4	4	5	4	5	4	4	4	4	4	4.2
Organic chemistry	3	5	3	3	4	6	2	7	3	3	3.7
Inorganic chemistry	3	4	3	2	3	5	2	7	3	3	3.5
Sociology	3	3	3	3	4	3	4	3	4	3	3.3
Botany	2	3	3	2	2	3	2	1	2	3	2.3
Calculus	2	2	2	2	3	3	2	2	3	2	2.3
Differential equations	2	2	1	2	2	2	2	2	2	2	1.9
Mean	4.1	4.4	4.3	4.1	4.4	4.7	4.3	4.4	4.1	4.1	

[a] A rank of 7 means that 70% of respondents rated the subject "important" or "very important," 30% "not too important" or "not important at all."
[b] OSU Forest Products graduates.
[c] Nonsupervisory professional-level respondents.
[d] Respondents employed in "Solid Wood Conversion," e.g., manufacture of lumber, plywood.
[e] Respondents employed in pulp and paper manufacture.

TABLE 7. *Ranking of several disciplines as "important" and "very important" or as "not too important" and "not important at all."* [a]

| Disciplines | All respondents | Graduates[b] | Management | | | Non-supervisory[c] | SWC[d] | Paper[e] | Below age 40 | Over age 39 | Mean |
			Top	Mid	Below mid						
Industrial engineering	5	5	5	6	5	4	6	7	5	5	5.3
Mechanical engineering	5	3	4	5	6	3	5	6	4	5	4.6
Forest management	4	3	6	5	4	3	6	2	4	5	4.2
Structural engineering	4	4	4	4	3	4	4	2	3	4	3.6
Chemical engineering	3	3	3	3	4	4	2	8	3	3	3.6
Forest engineering	4	3	5	4	3	2	5	1	3	4	3.4
Electrical engineering	3	2	3	4	3	2	4	3	2	4	3.0
Civil engineering	3	3	3	3	3	2	3	3	2	3	2.8
Mean	3.9	3.3	4.1	4.3	3.9	3.0	4.4	4.0	3.3	4.1	

[a] A rank of 7 means that 70% of respondents rated the subject "important" or "very important." 30% "not too important" or "not important at all."
[b] OSU Forest Products graduates.
[c] Nonsupervisory professional-level respondents.
[d] Respondents employed in "Solid Wood Conversion," e.g., manufacture of lumber, plywood.
[e] Respondents employed in pulp and paper manufacture.

facturing, with top management placing the greatest importance on the latter subject.

Table 3 serves a broader purpose. To reduce computing costs, contingency analyses of all 59 subjects were not made. However, the reader can examine the individual courses or subjects in Table 2 and Tables 4 through 8 in light of the results in Table 3 and make his own judgments about reactions of management levels.

Communication skills (Table 4) were ranked among the highest of all subjects by all groups. Obviously those in industry believe that ability to communicate effectively is a prerequisite to technical and professional effectiveness.

Business courses (Table 5) were in general ranked highest by top management, the level of importance declining with decreasing management responsibility.

TABLE 8. *Ranking of miscellaneous courses or subjects as "important" and "very important" or as "not too important" and "not important at all."* [a]

| Course or subject | All respondents | Graduates[b] | Management | | | Non-supervisory[c] | SWC[d] | Paper[e] | Below age 40 | Over age 39 |
			Top	Mid	Below mid					
Management and labor relations	9	8	9	9	10	7	9	9	9	9
Environment	8	8	8	9	10	8	9	10	8	8
Plant safety	8	7	8	9	9	7	9	9	8	8
Power generation	6	5	6	7	7	5	7	8	6	6
Scaling and cruising	5	4	5	6	5	3	7	1	4	5
Logging methods	5	3	5	5	4	3	7	1	4	5

[a] A rank of 7 means that 70% of respondents rated the subject "important" or "very important." 30% "not too important" or "not important at all."
[b] OSU Forest Products graduates.
[c] Nonsupervisory professional-level respondents.
[d] Respondents employed in "Solid Wood Conversion," e.g., manufacture of lumber, plywood.
[e] Respondents employed in pulp and paper manufacture.

TABLE 9. *Mean of rankings of courses, subjects, or discipline groups as "important" and "very important" or as "not too important" and "not important at all."* [a]

Groups of courses, subjects, or disciplines	All respondents	Graduates[b]	Management			Non-supervisory[c]	SWC[d]	Paper[e]	Below age 40	Over age 39
			Top	Mid	Below mid					
Communications	9.0	9.3	8.3	9.0	8.7	9.3	9.0	9.3	9.0	9.0
Business	7.5	6.9	8.9	7.9	6.8	6.0	7.9	6.3	6.8	7.8
Forest products	6.1	5.9	6.8	6.0	5.5	5.2	6.4	3.2	5.4	6.4
Basics	4.1	4.4	4.3	4.1	4.4	4.7	4.3	4.4	4.1	4.1
Disciplines	3.9	3.3	4.1	4.3	3.9	3.0	4.4	4.0	3.3	4.1

[a] A rank of 7 means that 70% of respondents rated the subject "important" or "very important," 30% "not too important" or "not important at all."
[b] OSU Forest Products graduates.
[c] Nonsupervisory professional-level respondents.
[d] Respondents employed in "Solid Wood Conversion," e.g., manufacture of lumber, plywood.
[e] Respondents employed in pulp and paper manufacture.

With a few exceptions, "basic" courses (Table 6) were ranked lowest by most groups. Statistics, operations research, critical-path scheduling, psychology, and physics were exceptions ranking fairly high.

Study in forest management and the engineering disciplines (Table 7) were in general ranked low. Industrial engineering, mechanical engineering, and forest management disciplines are the leaders in this relatively low-preference group. A notable exception to the low rankings is from those in the paper industry, who ranked chemical, industrial, and mechanical engineering relatively high, probably because 32% of respondents in the paper industry were engineers and an additional 15% had some engineering training. Top management and those in solid wood conversion placed highest emphasis on training in forest management.

Means are not shown for rows and columns in Table 8. The courses and subjects are too dissimilar to classify together. All groups placed high priority on training in labor relations, environmental considerations, and safety. Power generation also seemed important to respondents. Respondents in solid wood conversion ranked scaling and cruising, and logging methods highest. Forest products

TABLE 10. *Percent of respondent groups employed by industry type upon graduation from college.*

Industry type	All respondents	Graduates[a]	Management		SWC[b]	Paper[c]
			Top	Mid		
Forest products	59.1	70.9	50.0	55.1	65.7	18.3
Pulp and paper	12.1	6.9	10.0	12.6	6.7	60.0
Forestry	7.8	7.4	15.0	7.8	9.0	3.3
Military	2.1	3.0	1.7	2.4	2.2	1.7
Construction	2.3	1.0	1.7	3.6	0.6	1.7
FP education	2.5	3.0	1.7	1.8	1.7	1.7
Other State or Fed.	0.4	0.5	0	0.6	0.6	1.7
Miscellaneous	13.6	7.4	20.0	16.2	13.5	11.7
Number of respondents	472	203	60	167	178	60

[a] OSU Forest Products graduates.
[b] Respondents employed in "Solid Wood Conversion," e.g., manufacture of lumber, plywood.
[c] Respondents employed in pulp and paper manufacture.

TABLE 11. *Percent of respondents by first job type and present job type.*

Job category	All respondents		Graduates[a]		SWC[b]		Top management		Paper[c]	
	First	Present	First	Present	First	Present	First	Present	First	Present
Top manager	1.7	9.8	1.5	10.1	1.8	9.0	6.0	100.0	0	1.4
Manager	4.8	44.9	4.5	27.1	5.4	52.5	9.5		1.5	31.4
Superintendent	1.6	16.9	1.0	5.5	2.1	18.0	1.2		0	34.3
Foreman	10.8	4.7	10.0	6.5	11.3	5.8	4.8		7.3	2.9
Nonsupervisory, professional	31.3	12.1	49.0	29.6	22.4	7.2	17.9		66.7	24.3
Educator	0.4	0.9	1.5	2.5	0	0	0		0	0
Forest products sales	8.2	5.7	9.5	7.5	5.4	4.1	10.7		0	1.4
Blue collar	40.1	2.8	20.5	3.0	51.3	3.2	46.4		24.6	4.3
Miscellaneous	1.2	2.3	2.5	8.0	0.3	0.3	2.4		0	0
Number of respondents	694	704	200	199	335	345	84	84	69	70

[a] OSU Forest Products graduates.
[b] Respondents employed in "Solid Wood Conversion," e.g., manufacture of lumber, plywood.
[c] Respondents employed in pulp and paper manufacture.

graduates as a group ranked these two courses relatively low, and only 10% of paper industry people considered them important.

The means in Table 9 show the overall average ranking of the courses, subjects, or discipline groups in Tables 2, 4, 5, 6, and 7. In general, communications were ranked highest, followed in order by business, forest products, basics, and disciplines.

The respondent's industry and job

Over 70% of all respondents polled indicated that forest products graduates were employed by their firms. Solid-wood-conversion and paper groups employed about 79% and 85%, respectively.

Table 10 shows the industry of first employment of college graduates. About 81% of the OSU Forest Products graduates found jobs in the forest products field, including 6.9% in the paper industry and 3% in education. If one adds the closely related field of forestry, an average of about 88% of OSU Forest Products graduates have found employment in their field over the past 55 years. If the

TABLE 12. *Percent of respondents by present description of work function.*

Employment category	Respondents	Graduates[a]	SWC[b]	Paper[c]	Below age 40	Over age 39
Top-management	12.4	14.1	13.0	1.4	3.7	16.3
Midmanagement	39.9	21.6	47.0	40.6	32.9	43.0
Below midmanagement	16.5	10.0	18.0	27.5	22.2	14.0
Nonsupervisory, professional	14.8	33.2	9.9	29.0	26.9	9.5
Forest products sales	12.5	10.6	11.3	1.4	10.2	13.6
Miscellaneous	3.8	10.6	0.9	0.0	4.2	3.7
Number of respondents	702	199	345	69	216	486

[a] OSU Forest Products graduates.
[b] Respondents employed in "Solid Wood Conversion," e.g., manufacture of lumber, plywood.
[c] Respondents employed in pulp and paper manufacture.

TABLE 13. *Percent of respondents by age class.*

Age class. years	All respondents	Graduates[a]	Management Top	Management Mid	Management Below mid	Nonsupervisory[b]	SWC[c]	Paper[d]
20–29	9.6	16.7	0	3.6	16.4	23.1	9.1	4.3
30–39	20.9	19.6	9.2	21.5	25.0	36.7	19.1	35.7
40–49	25.0	22.0	23.0	30.8	24.1	14.4	25.7	22.9
50–59	33.0	27.8	41.4	35.1	32.8	24.0	35.1	32.9
60–69	9.6	9.6	25.3	8.6	1.7	4.8	9.4	4.3
70–79	1.8	4.3	1.1	0.4	0	1.0	1.1	0
80–89	0.1	0	0	0	0	0	0.3	0
Number of respondents	719	209	87	279	116	104	350	70

[a] OSU Forest Products graduates.
[b] Nonsupervisory professional-level respondents.
[c] Respondents employed in "Solid Wood Conversion," e.g., manufacture of lumber, plywood.
[d] Respondents employed in pulp and paper manufacture.

paper industry is considered as part of the forest products field, about 60–65% of top and midmanagement college graduates, 72% of graduates in solid wood conversion, and 68% of graduates in pulp and paper began employment in the forest products industry. When all respondents who graduated from college are combined, 71% found their first professional job in forest products and paper industry.

Table 11 shows how respondents classified their positions on their first and present jobs. About half of OSU Forest Products graduates entered industry in a nonmanagerial professional role. About 21% entered industry as blue-collar workers. Only 3% remained in the blue-collar class, however. Managers came mainly from the initial nonsupervisory and blue-collar classes. Most top managers began as blue-collar workers. In the paper industry also, nonsupervisory and blue-collar groups supplied most of the future managers.

TABLE 14. *Percent of respondents by number of years with present firm.*

Years	All respondents	Graduates[a]	Management Top	Management Mid	Management Below mid	Nonsupervisory[b]	SWC[c]	Paper[d]	Below age 40	Over age 39
0–4.5	20.6	30.3	14.0	14.7	21.6	33.7	19.7	14.3	40.6	11.7
5–9.5	18.4	17.7	22.1	17.6	19.8	18.3	15.6	25.7	34.7	11.0
10–14.5	16.7	14.6	12.8	19.7	19.0	12.5	15.6	17.1	16.0	17.0
15–19.5	14.7	14.6	10.5	17.2	12.9	12.5	14.5	11.4	6.4	18.4
20–24.5	11.2	6.6	10.5	10.8	11.2	12.5	13.9	12.9	1.8	15.3
25–29.5	10.3	6.6	18.6	13.6	6.0	4.8	11.3	10.0	0.5	14.7
30–34.5	4.7	3.0	4.7	3.9	6.0	3.8	5.8	2.9	0	6.7
35–39.5	1.7	2.0	1.2	1.4	1.7	1.0	1.4	2.9	0	2.5
40–44.5	1.6	1.0	5.8	1.1	0.9	1.0	2.0	2.8	0	2.2
45+	0.3	0.5	0	0	0.9	0	0.3	0	0	0.4
Number of respondents	708	198	86	279	116	104	346	70	219	489

[a] OSU Forest Products graduates.
[b] Nonsupervisory professional-level respondents.
[c] Respondents employed in "Solid Wood Conversion," e.g., manufacture of lumber, plywood.
[d] Respondents employed in pulp and paper manufacture.

In Table 12, we classified the same persons from a written description of their work function to check responses shown in Table 11 and because the responsibilities of a superintendent or a manager, for example, are not the same in each operation. Although the two tables show differences, there is general agreement. We used the categories in Table 12 to sort and analyze data.

Age and length of employment

Table 13 shows respondents by age class and Table 14 by length of employment with present firm. It is obvious that increase in management responsibility increased with age and experience. About 80% of OSU Forest Products graduates are under age 59, 30% have worked less than 5 years for their present employer, and nearly 50% have worked for their present employer from 5 to 20 years.

Education of respondents

Nearly 100% of the OSU Forest Products graduates rated college training and work experience helpful in their first and present jobs. About 90% of the same group rated on-the-job training helpful, and 70% to 80% rated independent study helpful in first and present jobs. All groups evaluated their education about the same as the OSU Forest Products graduates.

About 19% of the respondents in this survey did not attend college, 66% graduated from college, and 15% attended college but did not graduate. Of those who attended but did not graduate, about 70% attended 2 years or less. The proportions of college or university graduates by groups were 87% in paper, 72% in top management, 61% in midmanagement, and 51% in solid wood conversion.

Four hundred eighty respondents graduated from a college or university. For those college or university graduates trained in only one field (306 respondents), 41% were in forest products, 26% in business, 13% in engineering, 11% in general forestry, and 8% in all other fields. For those trained in two fields (174 respondents), 76% listed forest products as one of their fields of training. Forest products-business was by far the most popular two-field combination, selected by over two-thirds.

The highest level of education of respondents was high school 15%; trade school, technical school, and community or junior college 6%; and college or university 79% (figure includes those who attended, but did not graduate). Nearly 40% of the OSU Forest Products graduates attended graduate school. The breakdown of OSU Forest Products alumni by highest degree held shows bachelor's degree 70%, master's degree 21%, and doctor's degree 9%. Top management had the fewest master's and doctor's degrees, 12% compared to about 21% for all respondents.

The universities attended by respondents were: Oregon State University about 60%, University of Oregon about 6%, University of Washington about 5%, other major universities with forest products programs about 11%, and all others 18%.

Written comments

A total of 296, 41% of the respondents, returned written comments with their questionnaires. I was able to categorize about half (162) of the written comments. Ten percent commented that professors should get practical industrial experience before or during their teaching careers. Twelve percent said that summer indus-

trial work programs and other work experience for students should be continued or expanded. Thirteen percent said that courses in business or business options or minors should be continued or increased. Ten percent said communications skills should be emphasized, improved, or increased; and 9% emphasized that more or better training was needed in certain of the "basic" courses.

APPLICATION OF SURVEY RESULTS

I do not intend to make recommendations for a forest products curriculum. A curriculum committee should make these judgments after comparing subject matter now in the curriculum with the needs of industry. If we are teaching subjects ranked low by industry and not teaching subjects rated high by industry, we should consider changing. However, before curriculum changes are made, several things should be considered.

Unless we increase the time students spend attaining a forests product degree, new material in the curriculum must be balanced by deleting material. Therefore, for each proposal to add material, we must answer the question, "In lieu of what?" to make a sound judgment.

Evaluation of subjects is relative. If only 30% of the respondents view a subject as important, should we drop it? 40%? 50%? What if only 30% of respondents think inorganic chemistry important, but 70% of those in the paper industry rate it important?

A subject may be ranked low, such as calculus, but the skills learned in that subject may be partly or wholly necessary in mastery of subsequent subjects ranked higher, such as wood chemistry, physics, or strength properties.

We in a university should be responsive to new developments and impending changes within industry and should adapt our curriculum to meet needs. However, new trends may not be generally evident to many in industry, and such trends would not be indicated by a survey. Therefore, we must rely on informed individuals in industry to apprise us of new trends, or we must maintain close contact with industry so that we ourselves may recognize changes. If we in the university become aware of powerful new tools, techniques, or subjects of future value to industry, we must consider introducing training in these areas into the curriculum. Because, in such an instance, those in industry might be unaware of the capabilities of such tools or techniques, the "new" probably would rate low on a survey. It therefore falls upon educators to anticipate as well as be responsive to needs.

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