Needs assessment of the Oregon forest products industry

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Abstract

During 2007, a needs assessment of the Oregon forest products industry was conducted. Two hundred and eighty-eight responses were compared to 441 responses from a 1995 survey of the educational needs of Oregon forest products firms. Identifying New Markets ranked #1 for both surveys, while Product Pricing ranked #4 in 1995 and #2 in 2007 and Strategic Market Planning ranked #11 in 1995 and #3 in 2007. For those companies with 20 to 100 employees, however, Competitive Positioning and Lean Manufacturing ranked #1 and #2, respectively. For companies with more than 100 employees, Environmental Protection Agency, Department of Environmental Quality Regulations and Safety Regulations ranked #1 and #2, respectively.

It had been 12 years since a comprehensive educational needs assessment of the Oregon wood products industry was completed (Hansen and Smith 1997). Much has changed during this time. Several noteworthy examples include the creation and collapse of a secondary wood products industry association, the takeover of Willamette Industries by Weyerhaeuser Company, closures of additional Oregon mills, primarily sawmills and plywood plants, and the continuation of the U.S. forest products industry divesting its timberlands from its product businesses and selling them to timberland investment management organizations (TIMOS) and real estate investment trusts (REITS).

From 1990 through 2007, Oregon wood products employment declined by almost 36 percent. There was a 28 percent decline for sawmills and wood preservation, about 44 percent for plywood and engineered wood products, and about 33 percent for other wood product employers. During the recession years, 2001 to 2003, the wood products sector lost approximately 4,000 (11%) jobs (Myers 2008). Some of the lost employment may be explained by improved efficiencies as Oregon still ranked #1 among all states in lumber production (WWPA 2007) and plywood production (APA 2008).

Non-response bias

Since we are interested in using the data to design educational programs for the Oregon forest products industry, it is important that we can say, with some certainty, that the returned data are representative of the needs of the industry, even those of the non-response companies. It has been reported for surveys with low return rates, not uncommon for mail and internet surveys such as this one, that non-response bias may invalidate generalizing the response data across the entire sample population (Armstrong and Overton 1977). If respondents differ significantly from non-respondents then it would not be valid to assume that the data received from the survey directly relates to the entire sample population. For this reason, it is important to test for non-response bias before generalizing those results. One method of testing for non-response bias assumes that participants who respond less readily, such as those that respond only after increased stimulus such as a second mailing, are expected to be more like non-respondents. If they are found to be similar to the first respondents, then generalizing the response data across the sample population should be valid (Armstrong and Overton 1977, Hansen et al. 2008).

Comparison with past surveys

The results of this study were compared with the results of similar Oregon studies: one completed in 1988 (Brown and Niemiec 1997) and one completed in 1995. The 1988 survey only targeted sawmills. The information requested in this study was very similar to information requested in the 1995 study except that the 1995 study included information for both Oregon and Virgina (Hansen and Smith 1997).

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Hansen and Smith (1997) reported mailing to 1,286 Oregon firms for the 1995 survey.

Methods

Sampling

A questionnaire, nearly identical to one assessing the needs of Oregon's forest products industry in 1995 (Hansen and Smith 1997), was mailed to 1,532 firms in Oregon. The list of firms was composed of data collected by the Oregon Wood Innovation Center at Oregon State University and consisted of the most inclusive list known to the authors for identifying forest products firms operating in the state.

Questionnaire design

The design of the questionnaire was based on the discrepancy method described by Bratkovich and Miller (1993). A discrepancy need is described as the difference between what is and what should be. Learners will often respond that they need more training or help in subjects that are very important to them, but also in subjects that they currently possess a great deal of information, knowledge, and skills. In the discrepancy method, participants' information, knowledge, and skill level are assessed. A hierarchal list of needs is built by combining what respondents feel are important with what they also respond to as not having enough information, knowledge, or skill. The perceived Educational Need was calculated as: (Importance Rating − Current Knowledge Rating) × Mean Importance Rating (Bratkovich and Miller 1993). The discrepancy method was also used to design the 1995 survey for Oregon and Virginia forest products firms (Hansen and Smith 1997).

The questionnaire was designed to assess 36 subject areas in terms of importance and knowledge (**Tables 1 and 2**). The difference between the 1995 and 2007 questionnaires was the addition of three topic areas to the 2007 questionnaire: lean manufacturing, customer relationship management, and biomass/biofuels. Demographic data collected from the survey included primary product line and company size based on the number of employees.

Survey administration

An initial cover letter, questionnaire, and return envelope were sent to 1,532 firms in Oregon. The mailing list was compiled from a comprehensive database of primary and secondary forest products manufacturers in Oregon. For this study, participants were given two options to complete the questionnaire. They could return it to Oregon State University in the enclosed self-addressed metered envelope or they could access a website and complete the questionnaire online. After approximately 4 weeks, non-respondents were sent a second identical questionnaire along with the original cover letter and a second letter explaining that this was the second and final request. The first mailing allowed participants to opt out of the survey by returning the questionnaire unanswered. Respondents were asked to rate the importance and knowledge of company personnel in a subject, based on a 5-point scale (1 = level of lowest importance and 5 = level of highest importance).

Non-response bias was tested using the method described by Armstrong and Overton (1977). The first 30 respondents were compared to the last 30 respondents by each category of firm size, that is, the number of employees. Independent t-tests were used to compare differences in means of the two subsamples (Hansen et al. 2008).

Table 1. — Ranked mean rating by 288 Oregon wood products manufacturers of the importance of 36 subject areas to the success of their operations.

Subject area	Mean rating[a]	Rank
Quality and process control	4.33	1
Product pricing	4.30	2
Safety regulations	4.18	3
Salesmanship	4.11	4
Customer relations management	4.04	5
Inventory control/product scheduling	4.03	6
Basic problem solving skills	4.01	7
Motivating personnel	4.00	8
Total quality management	3.95	9
Plant management and finance	3.88	10
Plant maintenance	3.87	11
Product promotion	3.87	12
Basic wood properties	3.81	13
New product development	3.75	14
Public relations	3.70	15
Identifying new markets	3.70	16
Competitive positioning	3.62	17
Product distribution	3.61	18
Finding market information	3.60	19
Sawing – cutting technology	3.57	20
Strategic market planning	3.56	21
Dealing with changing raw materials	3.55	22
Lumber grading	3.50	23
Developing business plans	3.43	24
Wood–water relationships	3.34	25
EPA DEQ regulations[b]	3.29	26
Lean manufacturing	3.04	27
Green marketing – certification	2.97	28
Sanding/abrasives	2.93	29
Gluing – joining	2.93	30
CAD – CAM – CNC[c]	2.88	31
Finishing – coating	2.87	32
Machine vision technology	2.84	33
Utilizing composite products	2.55	34
Biomass – bio-fuels	2.29	35
International marketing	2.18	36

[a] The relative frequency of responses, by company size, was used to weight the means.
[b] Environmental Protection Agency, Department of Environmental Quality.
[c] Computer aided design – computer aided manufacturing – computer numerically controlled.

Results and discussion

One-hundred and seventy-six questionnaires, out of 1,532 mailed, were returned unanswered for one of the following reasons: incorrect/undeliverable address, not a forest products manufacturer, or opted out by returning an unanswered survey. Two-hundred and eighty-eight questionnaires, 21.2 percent (adjusted response rate), were returned and comprised the data for this study. Of these, 155 were returned after the first mailing, including those that answered using the Internet, and 133 were returned after the second mailing. Nine respondents chose to access the Internet for completing the questionnaire (**Table 3**).

Table 2. — Ranked mean rating by 288 Oregon wood products manufacturers of their knowledge of 36 subject areas to the success of their operations.

Subject area	Mean rating[a]	Rank
Quality and process control	3.86	1
Safety regulations	3.78	2
Basic problem solving skills	3.78	3
Product pricing	3.74	4
Basic wood properties	3.71	5
Customer relations management	3.64	6
Inventory control – product scheduling	3.62	7
Plant maintenance	3.57	8
Salesmanship	3.56	9
Motivating personnel	3.49	10
Total quality management	3.42	11
Plant management and finance	3.39	12
Lumber grading	3.37	13
Public relations	3.37	14
Product distribution	3.33	15
Product promotion	3.29	16
Sawing – cutting technology	3.18	17
New product development	3.17	18
Dealing with changing raw materials	3.14	19
Developing business plans	3.08	20
Finding market information	3.02	21
Wood–water relationships	3.00	22
Competitive positioning	2.97	23
EPA DEQ regulations[b]	2.96	24
Sanding/abrasives	2.92	25
Strategic market planning	2.89	26
Gluing – joining	2.86	27
Identifying new markets	2.83	28
Finishing – coating	2.74	29
Green marketing – certification	2.66	30
Lean manufacturing	2.59	31
Machine vision technology	2.54	32
Utilizing composite products	2.50	33
CAD – CAM – CNC[c]	2.43	34
Biomass – bio-fuels	2.14	35
International marketing	2.02	36

[a] The relative frequency of responses, by company size, was used to weight the means.
[b] Environmental Protection Agency, Department of Environmental Quality.
[c] Computer aided design – computer aided manufacturing – computer numerically controlled.

Firm demographics

One hundred and twenty-eight questionnaires (44%) were answered by firms identified as 0 to 9 employees, 25 were answered by firms with 10 to 19 employees (9%), 76 were answered by firms with 20 to 100 employees (26%), and 59 were answered by firms with more than 100 employees (20%) (**Table 3**). Percent response by firm size was very similar to those reported from the 1995 study. In 1995, 40.9 percent were answered by firms with 0 to 9 employees, 16.8 percent by firms with 10 to 19 employees, 23.7 percent by firms with 20 to 100 employees, and 18.7 percent by firms with the most employees—combining the 101 to 500 employees category with the more than 500 employees category (Hansen and Smith 1997).

Table 3. — Number of questionnaires returned after the first and second mailings, by firm size.

Firm size by no. employees	Mailings	
	First[a]	Second
0 to 9	70	58
10 to 19	12	13
20 to 100	34	42
100+	39	20
Total	155	133

[a] Includes nine internet responses.

Measuring educational need

A high ranking Educational Need in a subject area was calculated as one that was important but not well known. A subject area that was ranked high in importance but also ranked high in subject knowledge would not receive a high Educational Need ranking. For example, Safety Regulations was rated high in Importance (3 out of 36) but also rated high in Current Knowledge (2 out of 36) for all of the reporting firms. Therefore, the Educational Needs rating for Safety Regulations was 14 out of 36. Competitive Positioning ranked #17 in Importance but because of its low ranking (23 out of 36) in Knowledge, it ranked higher as an Educational Need than Safety Regulations, a rank of 4 vs. a rank of 14 for all of the reporting firms (**Tables 1, 2, and 4**).

A subsample of first respondents was compared with a subsample of second respondents to assess the issue of non-response bias. Independent sample t-tests showed no significant difference (p-values ≥ 0.05) between the first 30 respondents and the last 30 respondents. This provides some evidence that the response data are valid across the entire sample population (Steel and Torrie 1960).

For all of the firms, Quality and Process Control was ranked #1 in Importance but also ranked #1 in Knowledge (**Tables 1 and 2**). Because of the high Knowledge ranking, Quality and Process Control ranked #11 as an Educational Need (**Table 4**). This compares to an overall ranking of #7 by all of the reporting firms in 1995. It is interesting that Quality and Process Control ranked #1 for Importance and #2 for Knowledge in the 1995 study (Hansen and Smith 1997). Obviously, this subject area remains very important to the Oregon wood products industry. It is also interesting that Total Quality Management (TQM) ranks higher as an Educational Need then Quality and Process Control, 8 vs. 11 (**Table 4**). TQM also ranked higher than Quality and Process Control as an Educational Need in 1995, 6 and 7, respectively. A 1988 survey, targeted and designed to assess educational needs of Oregon sawmills, identified Quality Control, Safety, and Manager Training in Communication and People Skills, and Maintenance as the top priorities (Brown and Niemiec 1997) Again, this illustrates that the industry views TQM and Quality and Process Control as very important subjects for their businesses.

For all of the firms, the top five Educational Needs identified from this study were Identifying New Markets (also ranked #1 in 1995), Product Pricing (ranked #4 in 1995),

Table 4. — Ranked educational need of 36 subject areas based on 288 Oregon forest products industry respondents surveyed in 2007 compared with 33 subject areas based on 441 Oregon forest products industry respondents surveyed in 1995. Educational Need is defined for both studies as (Importance Rating − Knowledge Rating) × Mean Importance Rating.

Educational need	2007[a]	1995[b]
Identifying new markets	1	1
Product pricing	2	4
Strategic market planning	3	11
Competitive positioning	4	8
Salesmanship	5	2
Product promotion	6	13
New product development	7	10
Total quality management	8	6
Finding market information	9	9
Motivating personnel	10	5
Quality and process control	11	7
Plant management and finance	12	3
Inventory control – product scheduling	13	14
Safety regulations	14	19
Customer relations management	15	Not asked
Dealing with changing raw materials	16	12
Sawing – cutting technology	17	17
Lean manufacturing	18	Not asked
CAD – CAM – CNC[c]	19	24
Public relations	20	26
Developing business plans	21	15
Plant maintenance	22	23
Wood–water relationships	23	25
EPA DEQ regulations[d]	24	18
Product distribution	25	21
Basic problem solving skills	26	16
Green marketing – certification	27	31
Machine vision technology	28	20
Lumber grading	29	32
Basic wood properties	30	28
Finishing – coating	31	30
International marketing	32	22
Biomass – bio-fuels	33	Not asked
Gluing – joining	34	27
Utilizing composite products	35	29
Sanding/abrasives	36	33

[a] Based on 288 responses.
[b] Based on 441 responses.
[c] Computer aided design – computer aided manufacturing – computer numerically controlled.
[d] Environmental Protection Agency, Department of Environmental Quality.

Strategic Market Planning (ranked #11 in 1995), Competitive Positioning (ranked #8 in 1995), and Salesmanship (ranked #2 in 1995) (**Table 4**).

As expected, there was a difference in the ranking of Educational Need by size of firm. For the smallest firms, 0 to 9 employees, the top five Educational Needs identified were: Identifying New Markets, Product Pricing, Product Promotion, Plant Management and Finance, and Strategic Market Planning. Identifying New Markets also ranked #1 for firms with 10 to 19 employees. This was followed by Competitive Positioning, Motivating Employees, CAD/CAM/CNC (computer aided design – computer aided manufacturing – computer numerically controlled), and Strategic Market Planning. Firms reporting 20 to 100 employees ranked Competitive Positioning as #1. Lean Manufacturing, Strategic Market Planning, Identifying New Markets, and Motivating Employees ranked #2 through #5, respectively. For the largest firms, EPA/DEQ (Environmental Protection Agency, Department of Enviornmental Quality) Regulations ranked #1. This was followed by Safety Regulations, Identifying New Markets, Strategic Market Planning, and New Product Development (**Table 5**).

The 1995 study described firms as small (less than 20 employees) and large (those with 20 or more employees). In 1995, the Educational Need calculated #1 for Oregon's small firms was Identifying New Markets, followed by Motivating Personnel, Quality and Process Control, Dealing with Changing Raw Materials, and Total Quality Management. Product Pricing, Plant Management and Finance, Identifying New Markets, Sales Abilities, and Finding Market Information were the top five Educational Needs calculated for large Oregon firms in the 1995 study (Hansen and Smith 1997).

Dealing with Changing Raw Materials ranked #4 as an Educational Need by large firms (20 or more employees) in 1995. It ranked #9 for the largest firms (more than 100 employees), #15 for firms with 20 to 100 employees, #13 for firms with 10 to 19 employees, and #19 with small firms of 0 to 9 employees in 2007. During the 1990s, Oregon forest products companies were beginning to use non-native and less-used species to replace those species that historically came from federal lands. By 2007, it seems probable that many firms had become more experienced using alternate species as a replacement for those historically used (e.g., using radiata pine as a replacement for ponderosa pine). Interestingly, biomass and bio-fuels ranked low in both Importance and Knowledge (**Tables 1 and 2**), and although the low Knowledge ranking increased the Educational Need ranking, they still ranked low as an Educational Need, 33 out of 36 (**Table 4**). Neither appeared in the top 20 Educational Needs for any size company (**Table 5**). With the current, and rapidly rising, cost of energy, we wonder if the same questionnaire was sent today, biomass/bio-fuels would rank higher in Importance, and with the low Knowledge ranking become a more important Educational Need.

Although biomass and bio-fuels did not rank in the top 20 Educational Needs for any size company, the other new topic areas, Customer Relationship Management and Lean Manufacturing, did. Customer Relationship Management ranked as a top 20 Educational Need for all of the companies except those categorized as 100+ employees. Lean Manufacturing ranked as a top 20 Educational Need for companies with 20 to 100 employees (ranked #2) and for those companies with 100+ employees (**Table 5**).

Raw material types and availability, social issues, and economic issues continually change. Therefore, it is important that periodic needs assessments, those collecting similar information in addition to new information, are completed to help education providers assess the changing educational needs of the forest products industry.

Table 5. — Rank of the top 20 educational needs by company size based on number of employees.

0 to 9 employees (128[a])	10 to 19 employees (25)	20 to 100 employees (76)	101+ employees (59)
Identifying new markets	Identifying new markets	Competitive positioning	EPA DEQ regulations
Product pricing	Competitive positioning	Lean manufacturing	Safety regulations
Product promotion	Motivating employees	Strategic market planning	Identifying new markets
Plant management and finance	CAD – CAM – CNC	Identifying new markets	Strategic market planning
Strategic market planning	Strategic market planning	Motivating employees	New product development
Salesmanship	Inventory control/production scheduling	Customer relationship management	Plant maintenance
Finding market information	Quality and process control	Plant management and finance	Product pricing
Total quality management	Salesmanship	Product pricing	Competitive positioning
Competitive positioning	New product development	Finding market information	Dealing with changing raw materials
Public relations	Product promotion	Plant maintenance	Plant management and finance
Developing business plans	Plant management and finance	CAD – CAM – CNC	Inventory control/production scheduling
New product development	Safety regulations	Total quality management	Quality and process control
Sawing/cutting technology	Dealing with changing raw materials	Salesmanship	Motivating employees
Quality and process control	Product pricing	Quality and process control	Lean manufacturing
Inventory control/production scheduling	Finding market information	Dealing with changing raw materials	Machine vision technology
Motivating employees	Total quality management	Safety regulations	Salesmanship
Customer relationship management	Developing business plans	Inventory control/production	Wood–water relationships (including drying)
Wood–water relationships (including drying)	Customer relationship management	EPA DEQ regulations	CAD – CAM – CNC
Dealing with changing raw materials	Product distribution	Sawing–cutting technology	Product promotion
Basic problem solving skills	Lumber grading	New product development	Finding market information

[a] Number of responses.

Limitations and future research

The discrepancy method used in this study assumes that firms recognize their knowledge in certain subject matters. This may or may not be true. A further study to examine the knowledge level in subject areas of importance, but also in subject areas of reported high knowledge, such as Quality and Process Control, would be interesting and could provide more detailed information about the educational needs of Oregon's forest products industry.

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