Title: THE AFFECT THAT EXPECTED SOCIAL AND TECHNOLOGICAL CHANGES WILL HAVE ON ESTABLISHED OCCUPATIONS WITH IMPLICATIONS FOR CURRICULUM DEVELOPMENT

Abstract approved: Dr. Joseph Hlebichuk

Although the rate of social and technological change seems to be growing ever faster, and such changes are reflected in new directions for vocational education, the process of developing vocational programs in keeping with probable future contingencies remains unformalized. The purpose of this study was to examine the practicality of sequential interrogation—the Delphi technique—in predicting changes which will occur in the broad competencies necessary for the successful future performance of a job.

A test application of the Delphi process was made on a specific set of occupations—the middle management occupations in regulated motor freight transportation in the Portland, Oregon, metropolitan area. The areas of likely change, derived from a search of the trade
literature of recent years, were:

(1) An increasing use of computer technology in the processing of data, the making of management decisions and possible other applications.

(2) Changes in the posture of federal, state and local governmental agencies regarding their regulatory roles.

(3) A demand for ever-increasing levels of sophistication in the justification of rate changes.

(4) The continuing development of new equipment and technologies in materials handling.

(5) Increasing interaction among the various transportation modes.

(6) Changes in the social and environmental priorities of the nation as they affect the industry.

(7) An increasing demand for efficiency and effectiveness in the utilization of the resources of a firm.

The changes thus identified were translated into statements of broad skill or information needs and presented to the panel through four rounds of questioning and information feedback.

The process of questioning resulted in establishing (for each of the seven areas of anticipated change):

(1) The rate at which change is taken place,

(2) The degree to which middle managers are currently
competent in their work,

(3) The point in future time when current levels of knowledge will become obsolete.

In addition, the panel of experts examined each area of change in order to identify the specific skills which could be expected to alter as the result of expected change, and to suggest ways in which the industry might cope with the effect of change on its middle-managers.

The results thus obtained were submitted to four community college vocational administrators to obtain their views regarding the value of such information for curriculum development. Their response then became an additional basis for conclusions and recommendations.

Conclusions were reached regarding (1) the changes which are occurring in the occupational needs of middle managers in motor freight transportation, (2) the use of the Delphi Technique, and (3) the value of the technique to curriculum planners and vocational administrators.

The study data led to recommendations for (1) industry-education action in meeting the changing occupational needs of middle managers in motor freight transportation, and for (2) the application of futures research to vocational education.
The Affect that Expected Social and Technological Changes Will Have on Established Occupations With Implications for Curriculum Development

by

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A THESIS

submitted to

Oregon State University

in partial fulfillment of the requirements for the degree of

Doctor of Education

June 1976
ACKNOWLEDGMENTS

Many people have helped me conduct this study; to them I express my sincere appreciation. They include the members of my Delphi panel most particularly, but also the many individuals who helped in the original conceptualization of the project, the industry leaders who helped with both the selection of the questions and the appointment of still others who reviewed the progress of my efforts, community college administrators who offered penetrating criticism, and my professional associates whose forebearance made it possible for me to take upon myself the details of this effort when I might have been employed at the work of my office.

There were also, of course, the members of my doctoral committee and my major adviser--surely their efforts exceeded whatever I had a right to expect from them in supervising such a project. I hope they know how much I appreciated the many helpful comments, the hours of encouragement and guidance, the insistence that only my best efforts would suffice.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Overview</td>
<td>1</td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td>3</td>
</tr>
<tr>
<td>Purpose of the Study</td>
<td>4</td>
</tr>
<tr>
<td>Scope of the Study</td>
<td>5</td>
</tr>
<tr>
<td>Assumptions</td>
<td>6</td>
</tr>
<tr>
<td>Limitations</td>
<td>7</td>
</tr>
<tr>
<td>Definition of Terms</td>
<td>8</td>
</tr>
<tr>
<td>II. REVIEW OF RELATED STUDIES</td>
<td>10</td>
</tr>
<tr>
<td>Traditional Methods of Occupational Analysis</td>
<td>11</td>
</tr>
<tr>
<td>Job Analysis</td>
<td>11</td>
</tr>
<tr>
<td>Skills Survey</td>
<td>14</td>
</tr>
<tr>
<td>The Occupational Outlook Handbook</td>
<td>16</td>
</tr>
<tr>
<td>Local Studies of Employment Needs</td>
<td>18</td>
</tr>
<tr>
<td>Opinion Surveys</td>
<td>21</td>
</tr>
<tr>
<td>Using Trade Literature to Identify Change</td>
<td>23</td>
</tr>
<tr>
<td>The Delphi Technique of Predicting Future Events</td>
<td>25</td>
</tr>
<tr>
<td>Changes Anticipated in the Trade Literature</td>
<td>28</td>
</tr>
<tr>
<td>III. DESIGN OF THE STUDY</td>
<td>42</td>
</tr>
<tr>
<td>Selection and Use of the Delphi Panel</td>
<td>43</td>
</tr>
<tr>
<td>Determining the Changes Expected to Occur in the Industry</td>
<td>48</td>
</tr>
<tr>
<td>Ordering the Sequence of Projected Change</td>
<td>49</td>
</tr>
<tr>
<td>Establishing the Present Level of Competence</td>
<td>53</td>
</tr>
<tr>
<td>Determining when Present Knowledge will be Inadequate for Future Need</td>
<td>55</td>
</tr>
<tr>
<td>Determining the Specific Future Skill Requirements of Middle Managers</td>
<td>60</td>
</tr>
<tr>
<td>Determining the Most Suitable Methods for Reducing the Discrepancy Between Current Competencies and Future Skill Needs</td>
<td>62</td>
</tr>
<tr>
<td>Assessing the Value of the Study for Curriculum Development</td>
<td>63</td>
</tr>
<tr>
<td>IV. RESULTS OF THE STUDY</td>
<td>64</td>
</tr>
<tr>
<td>The Rate of Future Change</td>
<td>64</td>
</tr>
<tr>
<td>The Present Level of Competence of Middle Managers</td>
<td>69</td>
</tr>
<tr>
<td>The Obsolescing of Present Knowledge</td>
<td>70</td>
</tr>
<tr>
<td>Specific Skills Required of Middle Managers</td>
<td>72</td>
</tr>
<tr>
<td>Chapter</td>
<td>Page</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Reducing the Discrepancy Between Current Level and</td>
<td>78</td>
</tr>
<tr>
<td>Anticipated Requirements in Designated Competencies</td>
<td></td>
</tr>
<tr>
<td>Results of Interviews with Vocational Administrators</td>
<td>87</td>
</tr>
<tr>
<td>V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS</td>
<td>92</td>
</tr>
<tr>
<td>Summary of the Study</td>
<td>92</td>
</tr>
<tr>
<td>The Problem</td>
<td>92</td>
</tr>
<tr>
<td>Purpose of the Study</td>
<td>92</td>
</tr>
<tr>
<td>Significance of the Literature</td>
<td>93</td>
</tr>
<tr>
<td>Summary of Findings</td>
<td>94</td>
</tr>
<tr>
<td>Conclusions</td>
<td>96</td>
</tr>
<tr>
<td>Conclusions Regarding the Changes which are occurring in the</td>
<td>96</td>
</tr>
<tr>
<td>Occupational Needs of Middle Managers in Motor Freight Transportation</td>
<td></td>
</tr>
<tr>
<td>Conclusions Regarding the Use of the Delphi Technique</td>
<td>98</td>
</tr>
<tr>
<td>Conclusions Regarding the Value of the Delphi Technique to Curriculum</td>
<td>100</td>
</tr>
<tr>
<td>Planners and Vocational Administrators</td>
<td></td>
</tr>
<tr>
<td>Recommendations</td>
<td>101</td>
</tr>
<tr>
<td>Recommendations for Industry-Education Action in Meeting the</td>
<td>102</td>
</tr>
<tr>
<td>Changing Occupational Needs of Middle Managers in Motor Freight</td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td></td>
</tr>
<tr>
<td>Recommendations for Applying Futures Research to Vocational</td>
<td>108</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>Recommendations for the Application of the Delphi Technique to the</td>
<td>110</td>
</tr>
<tr>
<td>Design and Modification of Vocational Curriculums</td>
<td></td>
</tr>
<tr>
<td>BIBLIOGRAPHY</td>
<td>116</td>
</tr>
<tr>
<td>APPENDICES</td>
<td>122</td>
</tr>
<tr>
<td>Appendix A: Materials Submitted to the Delphi Panel</td>
<td>122</td>
</tr>
<tr>
<td>Appendix B: Summary of Responses to Interview Questions Asked of Four</td>
<td></td>
</tr>
<tr>
<td>Area Community College Vocational Deans</td>
<td></td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ranks assigned to seven items by 15 panel experts.</td>
<td>51</td>
</tr>
<tr>
<td>2. Changes in the median and mid-range of responses on a two-step Delphi question regarding the middle manager's current knowledge as a percent of the total that he ought to know.</td>
<td>54</td>
</tr>
<tr>
<td>3. Median and mid-range of Delphi panel responses to the question, &quot;In what year will the motor freight middle manager’s knowledge of computer technology and automated data processing become obsolete?&quot;</td>
<td>57</td>
</tr>
<tr>
<td>4. Median and mid-range of Delphi panel responses to the question, &quot;In what year will the motor freight middle manager’s knowledge of the work of governmental regulatory agencies become obsolete?&quot;</td>
<td>57</td>
</tr>
<tr>
<td>5. Median and mid-range of Delphi panel responses to the question, &quot;In what year will the motor freight middle manager’s ability to justify rate changes become obsolete?&quot;</td>
<td>58</td>
</tr>
<tr>
<td>6. Median and mid-range of Delphi panel responses to the question, &quot;In what year will the motor freight middle manager’s knowledge of methods of handling materials become obsolete?&quot;</td>
<td>58</td>
</tr>
<tr>
<td>7. Median and mid-range of Delphi panel responses to the question, &quot;In what year will the motor freight middle manager’s knowledge of alternative modes of transportation become obsolete?&quot;</td>
<td>59</td>
</tr>
<tr>
<td>8. Median and mid-range of Delphi panel responses to the question, &quot;In what year will the motor freight middle manager’s ability to relate his company’s activities to the total social environment become obsolete?&quot;</td>
<td>59</td>
</tr>
<tr>
<td>9. Median and mid-range of Delphi panel responses to the question, &quot;In what year will the motor freight middle manager’s ability to achieve economy and effectiveness in the area of his responsibility become obsolete?&quot;</td>
<td>60</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>10.</td>
<td>Areas of future change, ranked in declining order of their rates of change.</td>
</tr>
<tr>
<td>11.</td>
<td>Current competency of middle managers in seven designated areas, rank order of median responses.</td>
</tr>
<tr>
<td>12.</td>
<td>Consensus of Delphi panel on year of obsolescence for seven designated competencies.</td>
</tr>
<tr>
<td>13.</td>
<td>Summary of positive and negative remarks concerning various sub-skills in the general area of computer technology and automated data processing.</td>
</tr>
<tr>
<td>14.</td>
<td>Summary of positive and negative remarks concerning various sub-skills in the area of governmental regulatory agency activities.</td>
</tr>
<tr>
<td>15.</td>
<td>Summary of positive and negative remarks concerning various sub-skills in the area of justifying rate changes.</td>
</tr>
<tr>
<td>16.</td>
<td>Summary of positive and negative remarks concerning various sub-skills in the area of materials handling.</td>
</tr>
<tr>
<td>17.</td>
<td>Summary of positive and negative remarks concerning various sub-skills in the area of motor freight transportation's relationship to other transport modes.</td>
</tr>
<tr>
<td>18.</td>
<td>Summary of positive and negative remarks concerning various sub-skills in the area of social and environmental priorities.</td>
</tr>
<tr>
<td>19.</td>
<td>Summary of positive and negative remarks concerning various sub-skills in the area of economy and effectiveness.</td>
</tr>
<tr>
<td>20.</td>
<td>Percent of panel members indicating various methods for overcoming current or anticipated lack of knowledge of automated data processing.</td>
</tr>
<tr>
<td>21.</td>
<td>Percent of panel members indicating various methods for overcoming current or anticipated lack of knowledge of the work of governmental regulatory agencies.</td>
</tr>
<tr>
<td>Table</td>
<td>Page</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
</tr>
<tr>
<td>22. Percent of panel members indicating various methods for overcoming current or anticipated lack of ability to justify rate changes.</td>
<td>83</td>
</tr>
<tr>
<td>23. Percent of panel members indicating various methods for overcoming current or anticipated lack of knowledge of the methods of handling materials.</td>
<td>84</td>
</tr>
<tr>
<td>24. Percent of panel members indicating various methods for overcoming current or anticipated lack of knowledge of alternative modes of transportation.</td>
<td>84</td>
</tr>
<tr>
<td>25. Percent of panel members indicating various methods for overcoming current or anticipated lack of ability to relate the company's activities to the total social environment.</td>
<td>85</td>
</tr>
<tr>
<td>26. Percent of panel members indicating various methods for overcoming current or anticipated lack of ability to achieve economy and effectiveness.</td>
<td>85</td>
</tr>
<tr>
<td>27. Responses to questions asked during personal interviews of four vocational administrators.</td>
<td>90</td>
</tr>
</tbody>
</table>
THE AFFECT THAT EXPECTED SOCIAL AND TECHNOLOGICAL CHANGES WILL HAVE ON ESTABLISHED OCCUPATIONS WITH IMPLICATIONS FOR CURRICULUM DEVELOPMENT

I. INTRODUCTION

Overview

The increasing complexity of a society dominated by technological change challenges all the social institutions of our nation. Public education in particular is seen as the agency which must meet this challenge by preparing a citizenry able to cope with constant change. Venn (68, p. 1) underscored this need in a few words:

All levels of education, and particularly post-secondary education, must quickly move to assume greater responsibilities for preparing men and women for entry into the changed and changing world of technological work.

Alvin Toffler, in his current best seller, "Future Shock," addresses the question of change in education as follows (64, p. 403):

It is no longer sufficient for Johnny to understand the past. It is not even enough for him to understand the present, for the here and now environment will soon vanish. Johnny must learn to anticipate the directions and rate of change. He must, to put it technically, learn to make repeated, probabilistic, increasingly long-range assumptions about the future. And so must Johnny's teachers.

Vocational educators are not immune to the effect of innovation and change on their training programs. On the contrary, changes
which take place in the skills or knowledge required on the job, must be reflected and, if possible, anticipated, in the training curriculum if vocational graduates are to meet the requirements of employment and satisfactorily perform their tasks.

Current Federal legislation for vocational education and manpower training require that the expenditure of Federal funds be justified on the basis of actual and projected needs of the labor market. On December 4, 1970, the Oregon State Department of Education iterated a similar position by passing Board Policy No. 2321, Manpower Program Development (47). This policy requires the community colleges and career education division to develop an annual report of skill demands "...as indicated by available data." The policy states in part "...there shall be a continued reliance by the Oregon Board upon the State Department of Employment as the primary source of needed employment information." Further on the policy reads, "The State's long-range plan for vocational education will identify present and projected manpower needs based on the data derived from the statewide skill survey..." and again,

It shall be the policy of the Oregon Board of Education that local education agencies will not pursue the development of any training program until it has been determined that there is a reasonable prospect of employment for persons training in the proposed occupational areas.

The policy statement continues,
All local education agencies must submit evidence through application that the vocational programs they plan to operate will meet current and projected manpower needs and employment opportunities to be eligible to receive Federal funds. The state-wide skills survey will serve as a primary source of information...

Policy No. 2321 does not discourage the use of local surveys and other data in determining the occupational areas for which training is needed. However, the mandate is clear: Local education agencies, if they are to receive Federal funds, will plan their programs and justify their requests on the basis of available job data from the Oregon Employment Division.

**Statement of the Problem**

The recent growth of technology and the shifting of social priorities have brought us to an age of unusually rapid change. Education is affected, and vocational education perhaps most of all.

Within this milieu of constant change, community college vocational educators make decisions daily. Their decisions affect program development, equipment purchase, space allocation, curriculum development and all operations necessary to maintain an establishment charged with preparing people for employment.

The vocational administrator needs a wide range of information to support his decisions if the programs which he develops—or influences—are to reflect both the current and the future needs of
those who are to be served. The traditional tools for information gathering and decision making such as census reports, skills surveys and job analyses, are designed primarily to reflect a current condition rather than to predict future change.

Many of the decisions made by a vocational administrator today will affect a future condition; the building of shops and buying of equipment represents a long-term investment; the training of people provides them with knowledge and skills which they expect to find saleable at some future date. There is a need for predictive tools which vocational administrators can use to help assess the nature of change.

**Purpose of the Study**

It was the purpose of this study to examine the practicality of one method which might be used to inject the element of future change into the curriculum development process. This method—the Delphi technique—is usually associated with forecasting the point in time at which a specific event (such as the end of a war) will occur, but was used here to predict changes which will occur in the broad competencies necessary to the successful future performance of a job. This was done by making a test application of the method to a specific set of occupations—the middle management occupations in the regulated motor freight transportation industry in the Portland metropolitan area.
The changes thus predicted were examined by instructional deans in community colleges serving the Portland area in order to determine the acceptance that such data would receive from occupational advisory committees in the development of vocational curriculums.

**Scope of the Study**

The Portland metropolitan area was selected as the geographic center for the study. It is an area of considerable business and industrial diversification, 24th in size among the nation's standard metropolitan statistical areas. The Portland Standard Metropolitan Statistical Area consists of Clackamas, Multnomah and Washington counties in Oregon, and Clark County in Washington. The area is not significantly unlike other middle-sized cities throughout the country, although its lack of heavy industry has helped it to avoid much of the social unrest, environmental decay and labor disputes usually associated with such industry.

The motor freight transportation industry was selected for this study because it is subject to the pressures of change and is often the target of environmentalists, critics of governmental regulation and minority groups who charge it with discrimination. It is among the most ubiquitous of all industries, and one of the largest. It is an industry which both affects and is affected by social and technological
developments. The national concern with pollution, the use of computer technology, the recurring talk of deregulation—these changes give every assurance that coming decades will be anything but static for the industry.

Assumptions

The following assumptions were made:

1. That related literature and information available to the author will be sufficiently broad to provide an initial insight into the changing job skills of middle managers in motor freight transportation;

2. That selected authorities will provide additional insights into other necessary future skills on the survey instruments provided for this purpose;

3. That authorities in the Portland Metropolitan area will represent a broad cross-section of advanced thinking in the field of motor transportation;

4. That the Delphi process of review, reaction and authentication of initial statements will serve to continually refine and extend such statements to the point of general concurrence regarding the future skill requirements of middle managers in motor transport, and;
5. That the consensus of experts, once achieved, will represent a true and valid picture of the future competencies of middle managers.

6. That the directors of vocational education in the four community colleges serving the area can assess the relevancy of the study findings to curriculum development, judge the degree of acceptance which such results might receive at the hands of a curriculum advisory committee, and, from their own experience and judgement, state the general feasibility of applying such results to curriculum areas other than transportation or middle management.

**Limitations**

The study is limited by the following factors:

1. The number of authorities available to participate in the process of reviewing, refining and adding statements;

2. The great range and diversity of literature in the field of transportation, which increases the possibility of oversight, a possibility heightened by the general lack of occupational annotation in standard source books, and;

3. The necessarily subjective nature of a Delphi approach in predicting future events.
Definition of Terms

Community College -- A two-year institution which usually provides a variety of post-high school courses and programs including lower division collegiate (transfer), vocational-technical, adult continuing or basic education, and terminal general education courses, as well as guidance, counseling and placement services.

Skills -- The competencies necessary for performance of a given task. For the purpose of this study, the term includes manipulative, social, judgmental, and communicative skills, as well as basic, general or specific knowledge necessary for occupational competency.

Distributive Occupations -- Those occupations followed by persons engaged primarily in the marketing or merchandising of goods and services at both management and non-management levels.

Distributive Education -- A program of instruction for people who are, or wish to be, employed in the field of marketing and distribution.

Middle Management -- A level of employment which encompasses those individuals who do not have responsibility for policy decisions but have responsibility for developing and carrying out procedures necessary to the implementation of policy decision.
Within the personnel organization, such individuals may be placed close to first line employees or toward the upper end of the organization.

**Middle Manpower** -- For the purpose of this study, the terms middle manpower and middle management will be considered synonymous.

**Oregon Employment Division** -- The State's official agency for employment security, it is sometimes referred to as the Department of Employment, which was its official designation prior to July 1, 1968. The State Employment Service is the branch of the Division which supervises its manpower training activities.

**Tri-County Area** -- Clackamas, Multnomah and Washington Counties. The Oregon side of the Portland SMSA.

**State Department of Education--Oregon Board of Education** -- Two names for the same State agency. Current popularity favors the former, but in the early stages of this study the latter name was in dominant use.
II. REVIEW OF RELATED STUDIES

Vocational educators, industrial trainers and others concerned with job preparation have traditionally been concerned primarily with establishing current occupational content rather than with the problem of predicting skill changes which might be expected to occur at some future time. Through the years, they have developed and refined many techniques for the purpose of establishing the specific practices following by workers in the performance of their jobs at a given point in time.

It would be inaccurate, however, to imply that vocational educators are unconcerned with changing skill requirements. Many popular techniques give some indication of future needs, especially when successive uses of the method indicate the occurrence of change. The use of advisory committees, now mandatory for the receipt of Federal funds, is most certainly an attempt to identify trends as well as establish current practices. Nonetheless, projections of future skill requirements are hardly ever conducted on a formalized basis despite the near universal concern with changing technology and obsolescing skills.
Traditional Methods of Occupational Analysis

Job Analysis

Job analysis is the process of studying the duties, responsibilities and conditions of a job (48, p. 53). It is the basis for developing the job description (a written report delineating the job) and the job specification (a list of the skills, responsibilities and working conditions attendant to the job). These instruments are then used for the purpose of employee selection, as a guide to transfers, and promotions, as a basis for training programs and at least on occasion, as a guide to merit rating.

According to Patton and Littlefield (48, p. 51) "The securing of adequate job facts entails three closely related processes: the analysis of jobs, the writing of job descriptions, and the preparation of job specifications." Lawshe and Balma (42) point out that job analysis is essentially subjective in that it depends on the judgment of the analyst as the primary factor. A number of check list systems have been developed to make the process more objective, but they never completely eliminate the inherent subjectivity of the process.

Campbell et al (13) point out the particular difficulty in describing the managerial job. Although they were addressing themselves to the upper management level, it would seem reasonable to presume much of the same difficulty would apply to middle
management positions. Such jobs are subject to time-determined change, that is, the things a manager does at one time of the year are different from what he does at another time of the year. Managers are given broad administrative assignments, and consequently, the things that managers do in meeting their objectives differ even though the objectives are similar. Also, managerial jobs vary according to the situation, that is, from company to company, from region to region, from level to level.

Job analyses are made periodically for the purpose of identifying changes which may have taken place since the previous analysis, seldom for the purpose of projecting future changes. This static nature of job analysis is well recognized. In a study conducted by the American Management Association (58) only 45% of executives surveyed believed that job descriptions would remain in their present form for at least five years; 55% of the participants foresaw changes which would necessitate a different description in fewer than five years. The job description, and of course the total job analysis, reflects a current situation and is written after changes occur in the job—it is intended to reflect, not predict, change.

In recent years a new concept has appeared in job analysis which Fine (30, p. 1-23) has called systems analysis. This newer process of job analysis involves the careful examination of the tasks performed by all individuals within an organization or subset of an
organization for the purpose of reordering the jobs into career ladders. Specific tasks are reassigned, hindrances to upward mobility are removed, and the employer in various ways commits himself to the full utilization of the talents of each individual on the ladder.

The concept of upward mobility certainly implies the passage of time; time on each specific job while the processes of familiarization, performance and preparation for the next job on the ladder take place. If the ladder is found in an occupational area where rapid change might occur, and this could be expected in many occupational areas today, then one would expect such changes to be taken into account in the formula for job restructuring. However, the process of job restructuring gives scant attention, if any, to predicting the changes which might occur in the ultimate job during the process of ascending the ladder leading to it.

The concept of job analysis, whether in the early days of Scientific Management or in the most recent application of job restructuring and job enlargement, appears not to include the element of change. It is essentially a process of task examination at a given point of time, and although essential as a basis for curriculum development, it provides no insight into the skill requirements of a future date.
Skills Surveys

The United States Employment Service, in attempting to fulfill its mandate to match jobs and workers and to improve employability of long term unemployed and disadvantaged, has produced numerous manpower and operations research studies. Although these studies, both national and local, take many forms, it is the area skill surveys which have been used most frequently by vocational educators. Some 200 area skill surveys have been completed throughout the nation, about 20 of them in Oregon. All but one of the skill surveys developed in Oregon are referred to as "Area Manpower Resources."

The Manpower Resource of the Portland Metropolitan Area (59) is designed to provide comprehensive information of current employment and future labor requirements in the State's major labor area. This study relates community manpower resources to anticipate long-term occupational requirements both two and five years ahead. Replacement and expansion needs are projected from 1968 data to the year 1972 for more than 500 selected occupations.

In addition to published data, the Employment Division can provide special runs of data, xerox copies of raw data and computer printouts of special sections to local schools. Requests for such data are made through the Oregon Board of Education and are, of course, subject to disclosure limitations.
The Employment Division has for many years gathered employment data by industry, categorized by county. Vocational educators, however, require data by occupation, and it is only since 1965 that the Employment Division has been able to provide such information. As the Division's research capability grows, more complete and refined data will undoubtedly become available.

The most recent state-wide skills survey was made by the Division in 1969. The data is sorted into the 12 areas designated by the governor for manpower planning purposes. (Area 2 includes the three counties on the Oregon side of the Portland Metropolitan Area.) Occupations are designated by nine-digit code numbers taken from the Dictionary of Occupational Titles and listed by industry according to major group categories found in the Bureau of the Budget's Standard Industrial Classification Manual.

The break-out of data, for each occupation in each industry, gives number employed in 1969 with forecast employment for 1971 and 1975. The difference between the 1969 count and the forecast for 1971 and 1975 is attributable to replacement needs (based on estimates of death and retirement) and to growth needs (based on a number of judgmental factors). As pointed out in the previous chapter, no provision is made for upward mobility in the occupation as the result of advancement from low-level to higher-level jobs. Since most new job openings result from this process of advancement, the total projected
growth and replacement need is not a true indicator of the job openings which will become available in entry-level occupations.

For most occupations, the Employment Division's skill survey provides at least some additional data. In some cases the number of females employed in the occupation is given; in most cases a breakdown by six age groups is also given. For selected occupations there is given the median entry and median maximum wage or salary, the minimum hiring requirements and the extent of employer sponsored training.

The efforts of the Employment Division in gathering occupational data are hardly short of heroic, even though much is still lacking. However, from the point of view of the curriculum planner in vocational education, the two kinds of information most necessary--job content and changes anticipated within the occupation--are not to be found in a "skills survey." The term itself is a misnomer: it is an occupational survey, or job count, with demographic break-downs and extensions. It deals with human skills not at all.

The Occupational Outlook Handbook

Beginning in 1948, the U.S. Department of Labor initiated a series of Handbooks (67) for the purpose of providing counselors and others with reference information about the employment outlook, earnings and training requirements for major occupations. The first
Occupational Outlook Handbook listed 300 occupations. The size of the OOH has grown through the years, and now contains more than 700 occupations. Few however, relate specifically to middle-management occupations in transportation, and none to motor transport.

The Occupational Outlook Handbook occasionally makes reference to changing qualifications in certain occupations, but these are generally given in terms of high school diploma or college degree requirements, and reflect the continuing trend toward "upgrading" occupations by raising the educational requirements for entry.

The Handbook represents the expert opinion of Labor Department staff members, based upon their judgment of current trends and anticipated occurrences. Data from the Bureau of Labor Statistics and from the Bureau of the Census, as well as other agencies both in and out of government are used in formulating the views expressed in the Handbook.

The OOH is used widely by school counselors as well as employment counselors in local employment offices, vocational rehabilitation counselors, armed forces counselors and others. Medvin (43, p. 1-14) suggests an interesting extension of the use of the OOH in conjunction with local employment office lists of hard-to-fill vacancies. He points out that, where the number and percent of hard-to-fill is large, and has been for some time, and where the OOH
indicates national expansion, that it is entirely reasonable to presume that expansion will occur in the area. This approach, called the "unfilled job openings--OOH method" is suggested as an alternative to the area skills survey, a far more expensive, time consuming process.

Very rarely does the OOH make any direct references to changing skills or different knowledge which might in the future be a requirement for occupational competence. The 1948 edition (67, p. 151), in reference to traffic agents and clerks in air transportation suggested that experience in connection with freight or express traffic in other branches of transportation will be increasingly valuable in the future. This is the sole reference that the OOH makes to changes occurring in transportation.

Although the Occupational Outlook Handbook is a valuable tool for vocational counseling, the nature of its projections, which are limited to gross statements of future numbers needed, makes it of only cursory value to vocational educators in assessing the knowledge and skills which will be required of future workers.

Local Studies of Employment Needs

Vocational educators have long believed that training programs which prepare people for the widening spectrum of occupations should be organized and conducted with the advice and counsel of
representative committees. Riendeau (52, p. 26) points out that the pace of change today is outstripping the capacity of the schools to respond unless there is adequate two-way communication between educators and others in society who are actively engaged in program planning. Occupational advisory committees are probably the major vehicle by which vocational educators keep abreast of changes occurring in the occupations for which they provide training.

Improving and extending the use of local advisory committees seems to be one of the major objectives of State vocational education staffs. State occupational specialists generally are available to help local school districts in the formation of advisory committees and most states publish a handbook containing suggestions and recommendations for the conduct of advisory committee meetings, how to make appointments to the committee, what records should be kept, and so forth. The major professional associations also publish materials which are designed to help their members make effective use of such committees, and officially designated teacher education institutions invariably include the subject in their programs for training vocational instructors.

Thompson (63, p. 377) reports on the use of an advisory committee in the development of a transportation curriculum in Foothill Junior College, California. When the need for trained personnel in the general area of transportation was called to the
attention of the institution by the State Department of Education's Bureau of Business Education, college officials asked whether the state trends applied to the geographical area served by the school. In order to determine this, the Bureau called a meeting of representatives of various groups involved locally in transportation. The representatives present at the meeting supported the Bureau's position that trained personnel were in demand and also identified the occupational areas where the need was greatest. The group went further, suggesting that certain specific courses already offered by the college be included in the curriculum. Foothill College administrators then appointed an advisory committee of 16 representatives from local business firms who assisted in the development of a curriculum. A sub-committee of six members who were especially interested, and who were willing to devote their time to the project, met on a number of occasions to guide the development of the program.

The preceding account of the events leading up to the inauguration of a transportation curriculum is typical of what takes place prior to the establishment of an instructional program in a community college. Although the process is simple, it apparently is reasonably effective--its adherents are found in every institution. The process makes good utilization of local resources and insures that the program will be geared to local needs.
The typical occupational advisory committee probably includes selected members from the community who are familiar with trends taking place within the occupation, and who have opinions regarding the effect that social and technological change will have on that occupation. However, an advisory committee is not specifically called together for such a purpose, and even if it were, the direct confrontation of members with their peers would tend to inhibit the free expression of tentative viewpoints. Face-to-face confrontation in a meeting also tends to make an individual harden his position while he publicly defends it.

Opinion Surveys

Opinion surveys are also frequently used as a method of obtaining an insight into future training needs. Such surveys, usually conducted by mail, often consist of a questionnaire listing courses or study topics. The respondent is given an opportunity to check, on a Likert or similar scale, those topics which he considers most relevant. The value of such an opinion survey depends largely upon the nature of the check list as well as the initial selection of respondents. Generally, no provision is made for further refinement of the data and the reader must assess the importance of, say, a 90% concensus on one item as against a 75% concensus on another item.
An opinion survey undertaken by Dubin, Alderman and Marlow (19) had as one of its objectives the determination of the educational and training needs of managerial personnel in business and industry in Pennsylvania. In the study, three levels of management were identified as top, middle, and first-line supervision. The results of the survey, which involved a total of 3,620 respondents, were presented separately for each of the levels of management, and were further identified by different industries in subsequent publications (20, 21). The survey instrument used in the study offered respondents an extensive list of subject titles, arranged so that their opinions regarding the relative need for each subject could be given on a rating scale. Such an arrangement does not specifically request a projection of future need, but no doubt many respondents would take current trends and anticipated future needs into account in responding to the items. The authors found (19, p. 107) that, across all industry lines, the subjects ranked highest in need were found in three areas, General Management, Behavior Science, and Communications.

In a further analysis of their data, Dubin, Alderman and Marlow found (21, p. 2) that the 26 middle managers from 11 transportation companies (not including railroads) expressed their greatest interest in 17 courses falling in the areas of General Management, Communications, Behavioral Science, and Quantitative Methods.
Rating scales attempt to ascertain the intensity of a variable, and as such are superior to simple ordinal or interval scales. They seem to be the preferred scaling method where a consensus of several views is desired. The usual method of using the mean as an indicator of consensus, however, is subject to some question since consensus is found even in a case of maximum disagreement. If, for example, 100 judges are asked to rank Abraham Lincoln on a scale from one to five, and if 50 judges give him a score of "1" and 50 judges score him "5" (a case of maximum disagreement) the mean of "3" would be construed as consensus.

A more usual difficulty in rating scales stems from the fact that numerical symbols and generalized terms, such as "greatly agree," "agree," "disagree," etc., do not carry the same measurement meaning to all people. It is possible, of course, to devise more specific terms to give a rater a clearer standard for judgment, but precise descriptions are seldom given in opinion surveys.

Using Trade Literature to Identify Change

Undoubtedly most professional vocational educators keep abreast of changing occupational needs by a regular review of trade journals, text books and other printed material in the fields of their particular responsibility. The same magazines and books will frequently indicate trends and predict future changes.
The size and importance of transportation in America, and most particularly of road transportation, creates a huge volume of professional and trade literature. Metcalf (44) lists 102 associations which are specifically interested in road transport and 65 others which are more generally involved in the over-all field of transportation. He lists 39 major transportation library collections which specialize in road transportation, most of them concerned with automotive engineering or highway construction. Other libraries put major emphasis upon highway safety, history, automobiliana, or motor vehicle legislation. There are many other transportation library collections maintained by universities, professional associations and state highway departments. Government and industry reports, published studies, summary reviews of various transportation meetings and symposia may be found in such libraries, and may provide the reader with an insight into changes and trends as they develop.

It is difficult to assess the value of trade literature as a means of anticipating change. Trade journals are published in order to be sold, and no doubt their content reflects, at least to some degree, a consumer acceptability constraint. On the other hand, such journals should have available to them the best expertise of the industry and this, too, must be reflected in their content. Granting that some sources are better than others, the individual who consistently follows the journals in his occupational area probably develops valuable
insights into the trends affecting the industry.

The Delphi Technique of Predicting Future Events

The Delphi technique is a method for the "systematic solicitation and collation of expert opinions" (34, p. 1). Since it is a process by which informed judgment can be solicited, it could conceivably be applied to some extent to almost any decision making process. In actuality, however, it is most generally used in predicting future events or in planning changes and innovations which would probably not be introduced for some time.

The traditional approach to achieving a consensus is through open discussion. The Delphi technique, however, seeks to eliminate committee activity completely, thereby reducing the influence of specious persuasion and making it easier for respondents to abandon a publicly expressed opinion. Direct debate is replaced by sequential interrogation conducted by questionnaires which provide opinion feedback derived from previous questionnaires.

Helmer (34, p. 2-4) tells of the use of the Delphi Technique in the course of an inquiry into the future of automation. One question addressed to each member of a panel of experts was to estimate the year when a machine would become available that could comprehend standard I.Q. tests and score above 150. The responses consisted of a set of estimates spread over a time interval from 1975 to 2100.
In a follow-up questionnaire a summary of the distribution of responses previously obtained was fed back to the respondents by stating the median and the interquartile range. Each respondent was then asked to reconsider his previous answer, revise it if he wanted to and if his new response remained outside the interquartile range, to state briefly why he thought the answer should be that much lower or that much higher than the majority opinion. The responsibility for justifying relatively extreme responses was placed on the respondents, causing those without strong convictions to move their estimates closer to the median, while those who felt they had a good argument for an extreme opinion tended to retain their original estimate and defend it.

In the third round, the respondents were given a summary of reasons presented to support extreme positions. They were then asked to revise their second round responses, taking the summary of previous reasons into consideration and giving them whatever weight they felt was justified. A respondent whose answer still remained outside the new interquartile range was then required to state why he was unconvinced by the opposing arguments. In the fourth round, criticisms of the reasons previously offered were re-submitted to the respondents and they had one last chance to revise their estimate in view of the counter arguments. The median of the final responses was taken to represent group consensus. In the case of the high I. Q.
machine the median turned out to be the year 1990 with a final
interquartile range from 1985 to 2000. Helmer points out that this
convergence of opinions has been observed in a majority of cases
where the Delphi approach has been used.

Helmer and Rescher (35, p. 33) in further discussing the Delphi
technique, point out that

Both the inquiry into the reasons, and subsequent
feedback of the reasons adduced by others may serve
to stimulate the experts into taking into due account
considerations they might through inadvertence have
neglected, and to give due weight to factors they were
inclined to dismiss as unimportant on first thought.

Dunham (22, p. 79-82) using a modification of the Delphi
Technique consisting of only two rounds of questioning, conducted a
study of critical issues in community college teacher preparation.

In this study, he used two panels, one made up of national experts,
and the other of experts drawn from within the state of Oregon. The
same questions were asked of the members of both panels and the
results were nearly parallel. Dunham does not elaborate on the pos-
sible reasons for close agreement between national and local groups
of experts, nor does he conjecture on why the two groups disagree on
a few of the issues under consideration.

Hopkins, et al (39) used the Delphi technique through three
rounds of questioning to provide data for the planning process in
vocational and technical education in Oklahoma. They used more than
100 individuals on their panel, and concluded (p. 49) that the Delphi technique is "a method for planners of vocational and technical education to use in assisting them in the planning process." In actuality, the process provided the State of Oklahoma (sponsors of the project) with a wide range of agreed upon statements which could be used to determine the direction that occupational education would take in the years ahead. It was, then, a means for obtaining a consensus of public viewpoints, or attitudes regarding vocational education and the role the public expected schools to take in meeting the occupational needs of the State's citizens.

The Delphi technique, and various modifications of it, are specifically designed to predict future events. Its use in education, however, has been limited, often directed to purposes other than the forecasting of future events, and its possible application to the prediction of changing skill requirements has gone almost unnoticed.

Changes Anticipated in the Trade Literature

Seven major trends within the industry were identified by reviewing current and recent literature from the field. For the purpose of this study, the trends were considered to be non-probabilistic statements, subject to neither disagreement nor the application of any confidence level. As such, they are properly called "predictions." In correspondence, personal visits and interviews with Delphi panel
members and others who assisted with the study, no attempt was made to distinguish between a "prediction" and an "anticipation," although the latter term might be considered the diametric opposite since it implies the existence of a confidence level, although yet to be determined. The terms were freely intermingled, in oral and written discussion. No confusion developed from the mixing of these terms and responses were enhanced by offering judges the opportunity to infer whatever meaning they might.

On the other hand, the term "forecast" was never used, since it is definitely a probabilistic statement. To even the lay person, the term's association with weather forecasting might give it a degree of precision which was not intended.

The areas of predicted change, obtained by reviewing the literature available in the field and used as the basis for identifying future skill changes in motor transport middle management, appear below:

(1) An increasing use of computer technology in the processing of data, the making of management decisions and possible other applications.

(2) Changes in the posture of Federal, State and local governmental agencies regarding their regulatory roles.

(3) A demand for ever-increasing levels of sophistication in the justification of rate changes.
The continuing development of new equipment and technologies in materials handling.

Increasing interaction among the various transportation modes.

Changes in the social and environmental priorities of the nation as they affect the industry.

An increasing demand for efficiency and effectiveness in the utilization of the resources of a firm.

References in the literature to the above trends are far too numerous to chronicle. A few statements follow only for the purpose of indicating the expressions and viewpoints which resulted in the final selection of the list.

The first area of anticipated change, relating to automated data processing and computer technology, was prompted by various references to the growth of the data processing industry, by the almost universal inclusion of this subject in college management curriculums and by the recent development of a new generation of computers with the attendant decrease in the cost of second and third generation computers. The National Research Council (15, p. 7) has suggested that the most promising long-range approach to improving decision making and operation in transportation will be in substituting efficient analysis and experimentation for random experience. Butler (11, p. 43) reports that at least one motor freight company has developed a
comprehensive management system and is making its software available to smaller carriers for use in their own computers. Elder (26, p. 19) suggests that the high cost of communication in motor transportation has hindered the industry in making full utilization of computer technology. This high cost is partly caused by the motor carriers' reliance on Telpak, AT & T's bulk communication system. The Federal Communications Commission in March, 1971, authorized the first cooperative micro-wave relay network for use in motor transport. The general extension of such an authorization could conceivably pave the way for more rapid utilization of data processing techniques.

A January, 1970, article in a popular trade journal (24, p. 16) suggests that next to containerization, the biggest change for motor transportation in the 1970's will be in automation. At the heart of automation is the computer, which has the capability of keeping track of parcels in a unitized shipment, doing routine inventory control and invoicing, scheduling and routing vehicles, rate retrieval and possibly even rate making, as well as the actual operational control, in some instances, of materials handling equipment.

Hofer (38, p. 17) in a study of the effects of electronic data processing on formal structure in two manufacturing organizations, found the greatest effect at the operational level, less on the top functional level, least at the general management level. He reports
that the effects were greater on the organizational processes and on
the delegation of authority than upon the formal structure of the
organization itself. Shaul (56, p. 10) interviewed 53 middle managers
in eight companies which had converted parts of their systems to
electronic data processing at least two years previously. Of the group
interviewed, 60% said they spent more time on planning and less on
routine details. This Shaul (56, p. 11) attributes to the increased
volume and reliability of information, a general speed-up in the flow
of information, and the increasing demands of top management for
more detailed analysis from the system. In a company making exten-
sive use of electronic data processing technology, the middle manager
spends less time controlling, much more times planning, staffing and
directing. His job becomes more, not less complex. However, no
basic change takes place in the nature of the middle management
function.

Another area of anticipated change in motor transportation
relates to the work of governmental regulatory agencies. The entire
field of transportation is marked by a high degree of federal involve-
ment in the establishing of rates, routes, territorial boundaries and
service requirements. The motor freight transport segment of the
industry, in addition, is subject to further regulations because of its
dependence upon Federal and State highway networks. The federal
and state governments presume an interest in all road transport
because of the affect that such activities have upon highway safety and roadbed maintenance. The profit potential of any firm engaged in road transport is necessarily affected by height, weight and wheel base restrictions. Any change in the nature of government regulations can therefore be expected to influence the activities of management, both at the top and middle levels.

Assistant Attorney-General Richard W. McLaren, in a speech given January 28, 1971 before the New York State Bar Association, and reported in an industry trade journal (53, p. 20), proposes a general deregulation of transportation. Leaders in the motor transport industry, however, seem to be in marked disagreement regarding the advisability of such a move. The president of the American Trucking Associations, Incorporated, takes issue with the Attorney-General, contending that regulation is as necessary today as it was in 1935 when the Interstate Commerce Commission first began the regulation of intercity trucks (10, p. 19). The president of Consolidated Freightways, the nation's largest motor carrier, supports the continuance of regulation as being in the public interest (70, p. 7). On the other hand, the trustees of the Penn Central railroad have been reported seeking a relaxation of rate regulation (49, p. 22). Baker (7, p. 1) as early as 1962 supported the general discontinuance of regulation, proposing instead that mergers and consolidations be facilitated. Even earlier, the National Academy of Sciences--National Research Council
(15, p. 47) addressed itself to the problem of distortions caused by unbalanced regulatory activities.

The basic nature of motor transportation today is one of competition and close regulation. Any change in the posture of the Federal government regarding its regulatory role could conceivably bring about significant changes in the work of middle managers in the motor transportation mode.

Another area in which significant change is apparently expected will be found in the methods and processes for handling materials. Freight handling is an integral function of physical distribution, and increasing labor costs have spurred the development of more mechanized methods of moving goods. Automated electronic weighing systems are already in existence in a few railway yards, including the Southern Pacific yard in Eugene, Oregon, and similar systems may have future application to trucking lines. Semi-automated warehouses have been referred to in a previous paragraph, and a trade journal in March, 1971, (61, p. 93) reported the first exclusive automated break-bulk terminal in the motor freight industry, although such terminals have been in use by air carriers for some time. The heart of such a terminal is in its radio communications center, which maintains constant control over all freight movements. A 1968 industry report (2, p. 12) concluded that more economical ways must be found to handle freight movements. The report recommended the
development of automated terminals, more efficient freight handling techniques, better vehicles and higher size and weight limits. A recent issue of a national trade journal (65) devoted entirely to the subject of materials handling makes reference to a walking truck already under development by General Electric (p. 23), air pallets and stratocarriers, (p. 37), entire shipments superintended by computers (p. 41), and new conveyor methods (p. 27).

Still another area of anticipated change in motor transport is signaled by the increased need for cooperation among the various transportation modes in the movement of goods from one point to another. A 1967 industry report (1, p. 1-16), projected the development of inter-modal containers for land-air shipments and pointed out that any such cooperation is almost exclusively one of air-truck coordination. In anticipating the advent of increasing cooperation among the various transport modes, the National Academy of Sciences --National Research Council (15, p. 77) called for "individuals who can think and act in the broader perspective of a transportation complex rather than only within the view of an individual component or mode of transportation."

As previously mentioned, containerization is seen by some as the greatest transportation change in the 1970's, and one result of such a development will be the necessary cooperation of air, water, rail and road transport firms in moving standardized container loads from point of departure to final destination.
Another area of anticipated change relates to the growing national concern over the quality of the environment—pollution, the decay of the inner-city, and ever-higher noise levels. A report growing out of a director's workshop on transportation and the environment contained the following remark by Governor Reagan of California (12, p. 1).

A booming economy and the good life will be no good at all if our air is too dirty to breathe, our water too polluted to use, our surroundings too noise and our land too cluttered and littered to allow us to live decently.

The motor transport industry in particular is singled out for its contribution to the general decay of our environment. The National Academy of Sciences--National Research Council (15, p. 34) states that transportation is as significant in shaping urban development as it is in serving it and points out (p. 56) the need for further data to assess the relationship of transport to the environment. Early in 1971, an Oregon association of industry leaders began a program designed to reduce air and noise pollution on the part of truck operators (23, p. 17). An examination of motor transport trade journal articles indicates the concern of the industry with environmental decay. Transport Topics, a weekly trade journal, carried an article on January 18, 1971, entitled, "Growing U.S. Role Predicted in Trucking Noise Abatement," (27, p. 1). The same journal on February 1, 1971, carried an article "ATA Pledges Effective Ecology
Measures" (6, p. 1), on February 8, 1971, an article entitled "Cost Versus Advantage Measure is Urged in Ecology Work" (16, p. 1) and on February 15, 1971, an article entitled, "Nixon to Seek New Laws on Noise, Emission" (28, p. 1). Fleet Owner, for January, 1971 (71, p. 54), related the results of tests on tire and other noise factors conducted by the Department of Transportation's Office of Noise Abatement. Haskell (32, p. 22) points out that the diesel powered truck comes under more criticism from the public than other, worse offenders. Although admitting that the diesel produces clouds of smoke and sulphur dioxide, he points out that the emissions are not so injurious to health as the family automobile, even when compared on a one-to-one ratio.

The literature also indicates that the middle manager of the future will be more involved in the social concerns of his community than he is at the present or has been in the past. Fenn (29, p. 4) points out that poor communication between managers and community groups undercuts the usefulness of businessmen. A study he conducted indicates there is increased corporate approval of the use of executive time in community affairs. He reports that 75% of the volunteer organizations he interviewed indicated that business interest and participation is on the upturn. Some of his respondents, however, indicated a growing difficulty in working with the newer activist groups in the community. He recommends that companies encourage younger
(presumably middle management level) executives to participate in community affairs. Rockefeller (54, p. 131) suggests that business executives must find ways to make corporate goals more relevant to society's needs and concerns. He suggests that the voices of dissent are really signals of society's change, and that this represents opportunity for the businessman to serve. "Industry needs to address itself," he says, "to the larger environment, both physical and societal," and concludes, "Time is running out for those who choose to conduct business by past formulas" (54, p. 138).

Cohn (14, p. 69) conducted a survey of 247 major urban-based companies in an attempt to determine the effectiveness of corporate efforts in solving urban problems. The first such efforts followed in the wake of the 1967 riots, but three years later, according to Cohn, few companies were satisfied with the results of their programs. He points out that, to most companies, the urban crisis refers to the problems of the black ghettos, that is, to the growth and expansion of poverty centers, rising unemployment among the black poor, increasing racial tensions, and the constant threat of racial violence. Other problems, such as air and water pollution, deficient housing, inadequate transportation and education, public safety, undoubtedly contribute to the urban crisis but there are relatively few corporate programs specifically designed to meet these issues.
Rich (50, p. 1-4) suggests that the challenge of change in the 60's was economic, whereas in the 70's, it is social. Two of the major problems which present themselves in this decade are the decay of the inner-city and the degrading of our environment. He points out that current unrest and what he calls a "revolution in expectations" (50, p. 1) will press business and government for rapid solutions to these and other problems.

Then Secretary of Transportation John A. Volpe (69), in a speech read February 3, 1971, at the Transportation Associations of America's annual meeting in Chicago, predicted a major role for transportation in affecting needed change. He said, "Transportation can become the cutting edge of social and environmental progress in this country" (69, p. E1321).

The National Academy of Sciences--National Research Council (15, p. 77) points out that of particular importance is the "need for manpower to better relate the transportation system to the overall environment."

A final area of anticipated change in motor transportation relates to growing competition in the industry. On May 29, 1971, Transport Topics, an industry trade journal, reported that 1970 net income in the trucking industry was down 15% from 1969 despite rate increases granted by the I.C.C. Robeson (53, p. 77) cites higher labor and capital costs as the major factors contributing to a possibly lower
share of total freight tonnage moved by motor carriers. He points out that the Federal freeze on allowable sizes and weights limits the ability of the industry to hold costs down by increases in productivity. A 1968 industry report (3, p. 1-16) points out that the smaller carriers are being squeezed between rising costs on one hand and the increasing sophistication of the industry on the other. Wages paid to full time employees of for-hire carriers rose more than 50% in the ten years from 1958 to 1968. The cost of more equipment in the same period grew variously from 26% to as much as 60%. The report further suggests that mergers will grow in the future, and that the increasing size of trucking companies through mergers tends to increase rather than decrease competition. It should be pointed out that most mergers in the industry are of the end-to-end type, designed to extend the territory of a firm. This trend, the report continues, undoubtedly is the result of the I. C. C.'s policy of granting few new rights, relying as it does on the criterion of public need. Carriers wanting to grow have little alternative to the merger route.

The National Academy of Sciences--National Research Council (15) in summarizing the need for new or improved competencies in transportation, states that the nature of the emerging problems calls for individuals "whose specialized competence can accelerate the drive towards greater economy in all areas and at all levels of the transportation system" (p. 77).
These, then, were the seven major trends identified in the review of literature. It might be pointed out that they were found early in the search; additional time spent in the review of literature added nothing more to the list. This fact seemed to reinforce the view that the list was complete—as complete as any search could make it. It must be pointed out that the Delphi method of submitting and re-submitting such a list to a panel of experts offers the researcher an opportunity to ask for any addition to the list, and any oversight should, therefore, be corrected as part of the process of sequential interrogation. Since the panel made no suggestions for additional trends, the list thus obtained by reviewing the literature was considered complete.
III. DESIGN OF THE STUDY

It was the purpose of the study to explore the possible use of sequential interrogation in predicting occupational changes and to determine whether such information would be helpful to curriculum planners in establishing content in vocational training programs. The investigation was applied specifically to middle management occupations in the regulated motor freight transportation industry in the Portland metropolitan area.

The technique employed in the study followed a progressive approach. Such an approach contains the inherent limitations of subjectivity; it therefore proceeded from as broad a base of information as could be established by reviewing current and recent related literature. It was an assumption of the study that such a review would provide a broad enough base from which important changes could be extracted. The changes thus identified were translated into statements of broad skill or information needs, and presented to a panel of experts through a series of questionnaires in the manner of the Delphi technique.

After the panel has reached consensus on the questions presented to it, and the data had been tabulated, the results were presented to four vocational deans, or directors, representing the area's four community colleges. This was done by personal interview. The
responses were summarized, becoming an additional basis for the conclusions and recommendations.

Selection and Use of the Delphi Panel

Panel members were selected on the basis of suggestions and recommendations made by a number of individuals, the nature of whose work or position would indicate a familiarity with local leadership in the industry. Since the study had as its geographic base the Oregon counties within the Portland Standard Metropolitan Statistical Area, the individuals interviewed for recommendations were also all from the same area. The people contacted for this purpose included business reporters for the area's newspapers, paid officials with various trade and professional associations and professors of business administration at Portland State University.

Twenty experts were finally selected for the panel, 16 of whom agreed to serve. All 16 completed all four rounds of questioning. The panel of experts included nine who were employed at middle or upper management levels in regulated "for-hire" motor freight transportation firms, two attorneys who specialized in serving the industry, two consultants, two shippers and one equipment lessor.

Following the identification of critical trends, initial statements and a survey instrument were developed. Subsequent instruments were
developed only after an analysis had been made of the previous responses.

The traditional Delphi process follows four rounds of questioning conducted entirely by mail. In the first round the panel members are given an initial statement, the process is explained, and a simple answer is requested for the question, or questions, under consideration. At this point the respondent may suggest changes in the wording of the question, or ask for clarification. In round two, the same questions are submitted again, together with whatever changes were made in order to clarify the questions. The second questionnaire includes the median and the interquartile range obtained from round one responses. Each respondent is asked to reconsider his previous answer, possibly revise it, and if his new response lies outside the interquartile range, to state briefly why he thinks his answer should vary that much from the majority opinion. In round three, the respondent is again provided with the median and interquartile range taken from the second round responses. In addition, he is provided with a concise summary of reasons given for extreme positions. He is then asked to revise his second round response, giving whatever weight he thinks justified to the arguments for extreme opinions. At this point in the process, the respondent whose answer still lies outside the mid-range is asked to state why he is unconvinced by opposing arguments. In round four, the counter arguments are
mailed out, and each respondent is asked to give his final answer. The median of the final response is taken as group consensus.

In this application of the Delphi Technique, certain important changes were made in the traditional process. The round two responses were found to differ only slightly from round one responses (see Tables 3 through 9). Therefore, in round three, the same questions were asked, but in a totally different form, and requiring an entirely different response. The form of the question in rounds one and two were as follows:

In what year will the motor transport middle manager's currently acceptable level of knowledge of ____________ be insufficient for the satisfactory performance of his job?

In round three the question appeared in the following form. The comments from round two were included, but the median and mid-range were not given, since the form of the question had changed.

The middle manager's current knowledge of ____________ represents what percentage of the total that he ought to know?

The questions from round one and two were re-submitted to the panel in round four, together with the median and mid-range from round two. The respondent's previous response was purposely not given, however, in the hope that he might be more amenable to shifting his viewpoint if he were unaware of his earlier response. The form of the question was altered somewhat:
In what year will the motor freight middle manager's knowledge of _____________ become obsolete?

Tables 3 to 9 show a marked change in round four. The reason for this is unclear, but three possibilities can be suggested: some event may have occurred during the considerable time span between rounds two and four, the new question submitted in round three may have triggered a latent or subliminal response, or the minor change in wording which was intended for clarification may have had a different and unintentional impact.

At this point it is only possible to conjecture on the actual cause for the shift in the panel's position. The study made no attempt to monitor social or other changes which might have taken place during the approximately two-months' time lag between rounds two and four, a procedure which could have been built into the process without great difficulty. Assuming, however, that no such change occurred during that time span sufficient to account for what happened, and assuming further that the minor change in wording of the question (a common ploy in the Delphi technique) had no unintentional impact, then it seems likely that the experts were somehow jolted into a new position by the entirely new form in which the question was submitted in round three.

The round three question was also re-submitted in round four, together with the median and mid-range from the round three
responses. The respondent's previous answer was also provided, making this a two step Delphi process. It is possible that the introduction of a new question (or a radical re-phrasing of the same question) at an early point in the Delphi process can crystallize a hidden viewpoint in the manner of a gestalt phenomenon. Additional research might provide a better understanding of what takes place during the Delphi questioning and help establish a firm theoretical foundation for operational changes with predictable results.

Since round four was the final opportunity to obtain information from the panel, three additional questions were asked, each attempting to add something which would be helpful to the curriculum determination process. In one question, the panel was asked for their view regarding the best ways in which middle managers could be kept abreast of changes taking place in the industry. A second question, in seven parts, was an attempt to define more specifically the skills or knowledge necessary in each of the broad areas which had been the concern of the panel. The third question was yet another attempt to shed light on the impact of change, in this case by asking the respondents to rank each of the seven areas of change according to the rate at which change is expected. Chapter IV gives the results obtained from this additional questioning.

Another point should be made regarding the use of the Delphi panel in this study. When the results from round one were tabulated
it was found that several respondents had indicated that certain competencies were needed immediately, rather than in some future time. A note was therefore enclosed with the round two materials (see Appendix A) which encouraged respondents to examine the question in relation to future need. This note may have prejudiced the study in ways that would be difficult to assess.

Throughout the study, the same seven areas of expected change were addressed, and the same 16 panel members were used. All of the materials sent to the panel will be found in Appendix A.

**Determining the Changes Expected to Occur in the Industry**

In reviewing transportation literature for the purpose of this study, the main collections used were those of the Oregon State Library, the libraries of Oregon State University and the University of Oregon, the transportation library of the Oregon Department of Transportation, and to a lesser degree, the library of the Richmond Field Station, a unit of the University of California at Berkeley. The review was limited to materials published since 1960.

Through the process of constant sorting it gradually became possible to categorize the findings under the heading of various skill or knowledge areas. Eventually, seven broad areas of occupational competency emerged, as follows:

1) an increasing demand for efficiency and effectiveness in the utilization of the resources of the firm,
2) changes in the posture of governmental agencies regarding their regulatory roles,

3) a demand for ever increasing sophistication in rate making,

4) an increasing use of computer technology in data processing and other applications,

5) the continuing development of new technologies in materials handling,

6) increasing interaction among the various transport, and

7) changes in social and environmental priorities as they affect the industry.

Ordering the Sequence of Projected Change

In addition to establishing the major trends occurring in the motor transport industry, it was considered desirable to establish the sequence in which changes would occur. The views of the Delphi panel members were therefore solicited by putting a question to them on Round 4. By this time the panel experts were presumably familiar with the seven areas of change and the competencies related to each. They had (again presumably) spent some time in reflecting on the ramifications of change and its effect upon middle management competencies. There had been previous feedback from earlier questions, and the various remarks of other panel members had been provided. The question was therefore put in the following manner:
The panel has established that changes are taking place in the following seven areas. However, it seems unreasonable to presume that the rate of change will be equal in all areas. Will you take a few moments to rank them in the order in which change is likely to take place? Write the numeral "1" after that area in which you see the most rapid change occurring, "2" after that area in which you see the next most rapid change occurring, etc. Make sure you rank all items.

The seven areas of change were then listed, with space on which to record an answer.

The actual rate of change is not established by this process, of course. But the question did provide a basis for ranking the changes in the order in which they are likely to occur.

Table 1 gives the ranks of the 15 panel experts to the seven items. In order to establish the degree of agreement among the 15 sets of seven ranks, Kendall's Coefficient of Concordance $W$ was measured. $W$ was found to be .201. Since $m$ was of small value, a continuity correction was applied, making the value of $W_c$ .199. The probability of a Type I error was set at .05 and tested for significance in accordance with the probabilities given by the F distribution. The results were found to be significant at the .05 level, and the null hypothesis (that observed agreement is a matter of chance) was rejected in favor of the alternative (that the observed agreement is not a matter of chance): this method of analysis is discussed by Edwards (25, p. 402-412).
Table 1. Ranks assigned to seven items by 15 panel experts.

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<td>5476</td>
<td>6889</td>
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Table 1. Continued.

\[ \frac{\sum_{i=1}^{n} \left( \sum_{j=1}^{m} x_{ij} \right)^2}{mn} - \frac{mn(n+1)^2}{4} = 84.5 \]

\[ \frac{m(n^3 - n)}{12} = 420 \]

\[ W = \frac{84.5}{420} = 0.201 \]

\[ W_c = \frac{84.5 - (1/15)}{420 + (2/15)} = 0.199 \]

\[ F = \frac{(14)W}{1 - W_c} = 3.478 \]

\( df_1 = 6 \)

\( df_2 = 82 \)

\( F_t \sim 2.2 \) at 5% level of significance

Null hypothesis: that the observed agreement is a matter of chance

Alternative hypothesis: that the observed agreement is not a matter of chance

3.478 > 2.2, reject null hypothesis
The sums of the columns in Table 1 were used to rank the items (that is, the seven areas of predicted change) in the order in which they are likely to occur, the columns with the lowest sum being the area of change predicted to occur first.

Establishing the Present Level of Competence

As part of the overall purpose of predicting the future skill requirements of middle managers, it was considered desirable to determine the current level of competency, or more exactly, to rank the seven designated skill areas according to the level of present competency exhibited by middle managers. To do this, the question was put to the panel on Round 3, asking the experts to give their judgment of the current adequacy of middle managers in the seven skills (or areas of knowledge) that were previously identified. The general form of the question was as follows:

The middle manager's current knowledge of ... represents what percentage of the total that he ought to know? ______%  

the question being repeated with appropriate changes for each of the seven designated skill areas.

Since the question asked for an intuitive response drawn from each individual's substantive knowledge of the industry and its personnel, the question was re-submitted in the following and final round, together with feed-back in the form of the median and mid-range of
responses from the previous round. A two-step Delphi process was thus followed.

As is usual in this type of successive questioning (with feedback) the mid-range of responses tended to shorten the second time the question was asked, although the median shifted only in a single instance. This was considered to be trivial since it was accounted for by one response. These effects are shown in Table 2.

Table 2. Changes in the median and mid-range of responses on a two-step Delphi question regarding the middle manager's current knowledge as a percent of the total that he ought to know. (% sign omitted)

<table>
<thead>
<tr>
<th>Item</th>
<th>Shift of the Median</th>
<th>Reduction of the Mid-Range</th>
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All 16 members of the Delphi panel responded to the question, although some declined to answer a particular sub-part, a privilege granted in the instructions. Of the 99 answers to the seven items, 24 were changed on the second round, 15 serving to lower the original estimate, nine raising the estimate. The second round of questioning narrowed the mid-range on five of the seven items, but shifted the median on only one.
It is hardly possible that percentage estimates on a question of this type would reflect in any more than a very general way the "real" amount that people know—if such is even possible to ascertain. However, the percentages so expressed discriminate among the items being tested, and make it possible to rank them in an order system. That was the purpose of the questions. The median did not shift appreciably, although the mid-range decreased considerably. It can be presumed that further rounds of the same question would not alter the rank order of the various items.

**Determining when Present Knowledge will be Inadequate for Future Need**

In order to establish the date when current knowledge in each of the seven designated skill areas will become obsolete, the question was put to the panel three times, on Rounds 1, 2 and 4. The forms used for this purpose, together with letters and feed-back information submitted to the panel will be found in Appendix A.

The questions were altered slightly in successive rounds as the result of comments made by various respondents. The first time the question was submitted to the panel it was preceded by an explanation of the references in the literature which had prompted inclusion of that particular skill area for analysis. An explanation of the process of sequential interrogation was also enclosed with the first round of questions.
In the second round of questioning each panel member was provided with feedback in the form of the mid-range and the median from the previous round. The individual's previous answer was also given to him and space was provided for a new response. Each panel member was then requested, if his new answer lay outside the mid-range given, to explain why his viewpoint differed from the majority opinion.

In the fourth round of questioning panel members were provided with the mid-ranges and medians from the second round, together with a summary of comments and arguments from other panel members. They were then asked for their final answers. The median established by the fourth round responses was accepted as the consensus of the group, and became the date established by the panel for the obsolescence of present knowledge in each of the broad areas of competency.

The results of this process of questioning generally followed the usual effect of the Delphi technique; the mid-range of responses tended to shrink, and the median tended to shift. However, the individual experts selected for the panel were in all cases unfamiliar with the Delphi technique, and consequently many unusable responses were received, especially in the early rounds. In the first round, for example, the number of usable responses was insufficient to establish either mid-range or median on five of the seven items. By round
two, responses had improved to where a median could be established for all seven items, and a mid-range for six items.

The effect of sequential questioning on the mid-range and median is shown in Tables 3 through 9.

Table 3. Median (.) and mid-range (—) of Delphi panel responses to the question, "In what year will the motor freight middle manager's knowledge of computer technology and automated data processing become obsolete?"

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Table 4. Median (.) and mid-range (—) of Delphi panel responses to the question, "In what year will the motor freight middle manager's knowledge of the work of governmental regulatory agencies become obsolete?"

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(Mid-range and median not established in Round 1. The mid-range was reduced to a single year by Round 4.)
Table 5. Median (.) and mid-range (___) of Delphi panel responses to the question, "In what year will the motor freight middle manager's ability to justify rate changes become obsolete?"

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(Mid-range and median not established in Round 1. Mid-range not established in Round 2.)

Table 6. Median (.) and mid-range (___) of Delphi panel responses to the question, "In what year will the motor freight middle manager's knowledge of methods of handling materials become obsolete?"

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(Mid-range and median not established in Round 1.)
Table 7. Median (.) and mid-range (___) of Delphi panel responses to the question, "In what year will the motor freight middle manager's knowledge of alternative modes of transportation become obsolete?"

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Table 8. Median (.) and mid-range (___) of Delphi panel responses to the question, "In what year will the motor freight middle manager's ability to relate his company's activities to the total social environment become obsolete?"

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</tbody>
</table>

(Mid-range and median not established in Round 1.)
Table 9. Median (.) and mid-range (____) of Delphi panel responses to the question, "In what year will the motor freight middle manager's ability to achieve economy and effectiveness in the area of his responsibility become obsolete?"

<table>
<thead>
<tr>
<th>Year</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1971</td>
<td></td>
<td></td>
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<tr>
<td>1972</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1973</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1974</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1976</td>
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<td></td>
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<tr>
<td>1977</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>1978</td>
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<tr>
<td>1979</td>
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<td></td>
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<tr>
<td>1980</td>
<td></td>
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</tr>
</tbody>
</table>

Round 1
Round 2
Round 4

(Mid-range and median not established on Round 1.)

Determining the Specific Future Skill Requirements of Middle Managers

This study was concerned with the investigation of broad areas of change occurring, or due to occur, in the motor freight industry, and with the broad competencies which are, or will be required of middle managers as a result of the predicted changes. However, it became immediately apparent that some effort should be made to interpret in a more specific manner just what skills would be included in each broad area of competency. Question No. 2 on Round 4, was designed to elicit from the panel experts a more nearly exact definition of each of the seven broad skill areas.

The instrument used in this part of the study was somewhat structured, in the sense that a number of suggestions were offered under each major heading. Although panel members were encouraged to add additional comments, few did. Fifteen panelists responded to
the question. Wherever possible, answers were tabulated as either a
definite "yes" or a definite "no" regarding each of the sub-skills under
the major headings. For the purpose of curriculum recommendations,
any sub-item, or specific skill, which had at least ten "yes"
responses and no more than two "no" responses was considered to
represent panel consensus, and that item was then listed as a neces-
sary future skill requirements of middle managers in the motor
freight industry. Items which failed to meet this criterion were con-
sidered still subject to further examination. For example, a knowl-
dge of procedures before agencies and rules of evidence in hearings
is considered a part of the general knowledge of governmental regula-
tory agencies which the middle managers must have, since 11
respondents gave a definite "yes" to this item, and only two gave a
definite "no."
On the other hand, a general knowledge of law is con-
sidered still subject to final determination, since only eight respond-
ents gave a definite "yes," and two gave a definite no." The
rationale here is that the five who failed to respond at all to the item,
or who qualified their response in some manner, would have to be
questioned further before any panel consensus could be presumed.
Determining the Most Suitable Methods for Reducing the Discrepancy Between Current Competencies and Future Skill Needs

It was desirable to obtain from the panel members their suggestions concerning just how the industry might best correct the current or predicted skill inadequacies of middle managers in each of the seven previously identified areas. An instrument was designed (Question No. 1 on Round 4, in Appendix B) which listed nine alternative methods, or approaches, which might be taken to prepare middle managers for the changes which are taking place.

The alternatives included 1) changes in hiring policy, 2) discharge of individuals, 3) job restructuring, 4) using outside consultants, 5) using professional organizations, 6) company training, 7) extensive college "degree" training, 8) short courses and 9) specialized training programs. The nine alternatives were defined more fully on the instrument, and respondents were asked to select from the list the one, two, or three approaches which they thought would be most suitable to each broad area of competency. Answers were tabulated and the raw data converted to percentage figures.

Since there were only 15 respondents, only large differences in percentage have any meaning. Caution was exercised in drawing inferences from the data wherever the responses indicated a wide divergence of opinion. In most cases, however there was general
agreement among the respondents concerning the most suitable methods for preparing middle managers for the changes which lie ahead.

Assessing the Value of the Study for Curriculum Development

The vocational deans, or directors, of the four community colleges serving the Portland Metropolitan area were interviewed in order to determine what value the study findings might have for curriculum development. The directors were all interviewed in person, and each was asked the same set of seven questions. The names of those interviewed, the questions asked, and the answers given are found in Appendix B.

The personal interview was used to elicit responses, rather than the written questionnaire, since the highly flexible nature of the interview lends itself to the rephrasing of questions in order to obtain clear, unambiguous and complete answers. Also, the interview method virtually assures that tables of data presented by the interviewer will be examined completely and in detail.

The interviewer and the interviewees all represented the same profession and had roughly similar educational backgrounds. This enhances the credibility of the responses by assuring the existence of a common vocabulary, a friendly atmosphere conducive to honest responses, and sufficient uninterrupted time for complete answers. Such advantages in communication were judged to outweigh the danger that the common backgrounds of interviewer and interviewees might merely perpetuate the blind acceptance of professional shibboleths.
IV. RESULTS OF THE STUDY

The seven anticipated changes, identified by reviewing the literature, were analyzed by a panel of experts in order to establish (1) the rate at which change is taking place, (2) the degree to which middle managers are currently competent in their work, and (3) at what point in future time the current levels of knowledge will become obsolete. In addition, the panel of experts examined each area of change with a view to (4) identifying the specific skills which could be expected to alter as the result of such change, and (5) suggest ways in which the industry might cope with the effect of change upon its middle managers. The results thus obtained were submitted to four community college vocational administrators to obtain their views regarding the possible value of such information for curriculum development.

The Rate of Future Change

Although the areas of future change could be established by reviewing the literature, there were no clues to the rate at which such changes might occur. The question was therefore put to the panel of experts as part of the fourth and final series of questioning. (The selection of the panel is discussed in Chapter III). Of the 16 answers received, 15 were usable.
It should be pointed out again that the same panel of experts was used throughout the study. In the successive rounds of questioning, the panel members became more familiar with the terminology used, and particularly with the seven areas of anticipated change which were under continuous consideration. The process of sequential interrogation with various forms of feed-back from previous responses tends to minimize individual differences among the panel experts, resulting in a closer agreement, or near consensus, of opinion on the topics under study. For this reason, the panel members were treated as a single group, with no attempt to uncover distinctions within any sub-groups of the panel. At this point in the process, however, individual responses were analyzed according to whether the respondent is employed by a motor freight transport firm, or by a firm outside the industry but serving, or served by, the transport industry.

Of the 15 usable responses to the question concerned with the rate of future change, eight are employed by the industry (designated Ind.) and seven are employed by firms with a close connection with, but not actually engaged in, freight transportation (designated Non-ind.).

The item appeared as Question No. 3, in the fourth round, and was stated as follows:

The panel has established that changes are taking place in the following seven areas. However, it seems unreasonable
to presume that the rate of change will be equal in all areas.

Will you take a few moments to rank them in the order in which change is likely to take place? Write the numeral "1" after that area in which you see the most rapid change occurring, "2" after that area in which you see the next most rapid change occurring, etc.

Make sure you rank all items.

There followed the seven areas of change previously identified, in the same order in which they appear at the beginning of this chapter, with a blank space on which a rank number could be placed.

The ranking of the items in the Table below became part of the rationale for sequencing the recommendations in the following chapter. If the expected changes are to follow a certain order, then this order should be reflected in the steps taken by the industry and by educational agencies in providing the necessary skills for the future.

According to the panel, the most rapid rate of change is expected in the demand for efficiency and effectiveness in the utilization of the resources of the firm. Of the 15 respondents, seven ranked this area as changing more rapidly than any other.

The next most rapid rate of change is expected to be in the altering posture of Federal, State and local governments regarding the regulation of the motor freight industry. Five of the 15 respondents
ranked this item in the first order of change; two, however, were in complete disagreement, ranking it as having the lowest rate of future change.

Table 10. Areas of future change, ranked in declining order of their rates of change.

<table>
<thead>
<tr>
<th>Area of Change</th>
<th>Rank Order, Rates of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All (15)</td>
</tr>
<tr>
<td>An increasing demand for efficiency and effectiveness in the utilization of the resources of the firm</td>
<td>1st</td>
</tr>
<tr>
<td>Changes in the posture of governmental agencies regarding their regulatory roles</td>
<td>2nd</td>
</tr>
<tr>
<td>A demand for ever increasing sophistication in rate making</td>
<td>3rd</td>
</tr>
<tr>
<td>An increasing use of computer technology in data processing and other applications</td>
<td>4th</td>
</tr>
<tr>
<td>The continuing development of new technologies in materials handling</td>
<td>5th</td>
</tr>
<tr>
<td>Increasing interaction among the various transport modes</td>
<td>6th</td>
</tr>
<tr>
<td>Changes in social and environmental priorities as the affect the industry</td>
<td>7th</td>
</tr>
</tbody>
</table>

* Indicates tie.

The third most rapid rate of change is expected in the demand for ever increasing levels of sophistication in the justification of rate
changes. Eight of the 15 panel members responding to this question placed it in the 1st, 2nd or 3rd rank of the seven designated areas.

The fourth, or mid-rank position was given to the area of computer technology. None of the respondents ranked this area of change in the 1st order, but seven ranked it in either 2nd or 3rd place.

The fifth rank was assigned to the area of new equipment and technologies for handling materials. However, a close examination of the panel members' replies shows a considerable divergence of opinion, those members directly employed by motor freight firms indicating a faster rate of change than panel members employed outside the industry.

The sixth ranking of the future change rate was in the area of inter-modal cooperation, again with some disagreement among the panel members. Those employed within the industry ranked this item in seventh, or last place, while experts employed outside the industry ranked it in 5th place.

The slowest rate of change, according to the panel of experts, will be in the nation's social and environmental priorities. Although one of the respondents ranked this in 1st place, there were eight who predicted the lowest rate of change for this area.

Data obtained from the panel does not, of course, indicate the actual rate of change, only the order of the rate of change expected in
the seven designated areas. In summary, the panel of experts (with notable exceptions) agreed that the demand for efficiency and effectiveness in operation, the government's position regarding regulation, and the need for better ways to justify rate changes will have the greatest rate of change, while materials handling technology, intermodal cooperation, and social and environmental priorities will be slower to change. The change in data processing and computer technology was ascribed a mid-point position in the rank order of change for the seven designated areas.

The Present Level of Competence of Middle Managers

In order to gain some insight into the current level of knowledge, or ability, of middle managers in each of the seven areas of predicted change, the panel experts were asked to answer the following question:

The middle manager's current knowledge of... represents what percentage of the total that he ought to know?

The question was presented for each of the seven areas of change, the blank space being filled in with the general competency relating to each.

The questions were asked on both rounds three and four, with only slight change occurring in the rank order of median responses. Table 11 gives the designated areas of competency as they were
ranked by the Delphi Panel.

Table 11. Current competency of middle managers in seven designated areas, rank order of median responses.

<table>
<thead>
<tr>
<th>Lowest level of competency</th>
<th>Knowledge of automated data processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Next to the lowest level of competency</td>
<td>Ability to relate the company's activities to the total social environment, and Ability to justify rate changes</td>
</tr>
<tr>
<td>Mid-level of competency</td>
<td>Knowledge of the work of governmental regulatory agencies, and Knowledge of alternative modes of transportation</td>
</tr>
<tr>
<td>Next to the highest level of competency</td>
<td>Competence in achieving economy and effectiveness in the area of his responsibility</td>
</tr>
<tr>
<td>Highest level of competency</td>
<td>Knowledge of the methods of handling materials</td>
</tr>
</tbody>
</table>

The Obsolescing of Present Knowledge

It was a specific objective of the study to determine just when the current level of competency of middle managers in motor freight transport would become inadequate for the satisfactory performance of their jobs. The question was put to the panel three times, in keeping with the typical Delphi Technique. The median of responses on the final reply was taken as consensus.
A more thorough explanation of the process used to determine dates of obsolescence appears in Chapter III, and the instruments used for obtaining the data will be found in Appendix A.

The consensus of the Delphi panel regarding the year in which each competency will become obsolete is given in Table 12.

Table 12. Consensus of Delphi panel on year of obsolescence for seven designated competencies.

<table>
<thead>
<tr>
<th>Year of Obsolescence</th>
<th>Current Competency</th>
</tr>
</thead>
</table>
| 1973                 | Ability to justify rate changes  
                        | Knowledge of the work of governmental regulatory agencies |
| 1974                 | Knowledge of alternative modes of transportation  
                        | Knowledge of computer technology |
| 1975                 | Ability to achieve economy and effectiveness within the area of his responsibility  
                        | Ability to relate his company's activities to the total social environment |
| 1976                 | Knowledge of methods of handling materials |

As usually happens with sequential interrogation and feedback, the mid-range shrunk in successive rounds of questioning, and the median shifted appreciably. In one competency area (concerning knowledge of the work of governmental agencies) the mid-range shrunk to a single year, the median. In another area, (concerning the ability to achieve economy and effectiveness in operation) the mid-range still
extended over a time period of four years after the final round of questioning.

**Specific Skills Required of Middle Managers**

In order to define more specifically the competencies which are, or which will be required of middle managers, the panel experts were asked to indicate the special abilities or skills that the manager needs for competency in each of the seven designated areas of predicted change. The instrument designed for this purpose was somewhat structured, in as much as it provided several suggestions under each major heading. However, panel members were encouraged to comment freely, adding any suggestions which they felt would be appropriate.

Although some remarks were made, most panel members simply indicated "yes" or "no" to each of the suggestions given on the instrument. The question was asked only on Round 4 of the series. Sixteen usable replies were received.

In the general area of computer technology and automated data processing, responses indicated a general need for an understanding of the potential uses of A.D.P., its costs and benefits, a knowledge of applicable terminology, and the ability to collect, assimilate and analyze relevant information. There was less agreement regarding the need for a knowledge of systems and procedures and the ability to
apply computer techniques. A knowledge of computer languages was considered unimportant by 60% of those who responded specifically to that item.

General comments regarding automated data processing were varied. One respondent pointed out that many firms have wasted a great deal of money on data processing; another pointed out that the middle manager needs a working knowledge of the subject so he can answer the questions of top management.

A compilation of the positive and negative responses appears in Table 13.

Table 13. Summary of positive and negative remarks concerning various sub-skills in the general area of computer technology and automated data processing.

<table>
<thead>
<tr>
<th>Potential uses of ADP</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collection, assimilation and analysis of relevant information</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>Costs and benefits of ADP</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Communication of ADP terminology</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Systems and procedures</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Application of computer techniques</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Computer languages</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

Concerning a knowledge of governmental regulatory agencies, the panel members were almost universally agreed on the importance
of the five specifics provided to them under this heading. However, several of the respondents did suggest that a general knowledge of law would be sufficient, and that attorneys are available who know the procedures. A summary of positive and negative responses appears in Table 14.

Table 14. Summary of positive and negative remarks concerning various sub-skills in the area of governmental regulatory agency activities.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current changes and changes in prospect</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>Compliance procedures</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>Knowledge of operating authority</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>Procedures before agencies, rules of evidence in hearings</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Knowledge of law</td>
<td>8</td>
<td>2</td>
</tr>
</tbody>
</table>

In the area of justifying rate changes, panel members were in general agreement that middle managers in motor freight transportation need to know the economics of transport costs, economic conditions, cost accounting, rate making procedures and how to analyze statistical data. There was less agreement on the need to know how to prepare exhibits, some viewing this as the responsibility of top management or tariff bureaus and attorneys. Only two respondents stated that middle managers need to know the rules of evidence.
Positive and negative responses are summarized in Table 15.

Table 15. Summary of positive and negative remarks concerning various sub-skills in the area of justifying rate changes.

<table>
<thead>
<tr>
<th>Sub-skill</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economics of transportation costs</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>Economic conditions</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Rate making procedures</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>Cost accounting</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Analysis of statistical data</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Preparation of exhibits</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Demand analysis</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Rules of evidence</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

In the field of materials handling, respondents were in general agreement that middle managers must know material handling equipment, alternative methods of handling materials, vehicles, terminal layout, and the organization of facilities. Only one expressed the view that accounting methods were necessary as applied to materials handling.

Few general comments were made regarding the area of materials handling, other than that this is an especially important part of the middle manager’s responsibility. The summary of positive and negative responses appears in Table 16.
Table 16. Summary of positive and negative remarks concerning various sub-skills in the area of materials handling.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material handling equipment</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>Alternative methods of handling materials</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Vehicles and trailers</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Warehouse and terminal layout</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Organization of facilities</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Time and motion studies</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Capital budgeting</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Accounting methods</td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>

In the area of motor freight transportation's relationship to other transport modes, the panel members were in almost total agreement that all sub-topics were necessary to the competency of the middle manager, although two of the respondents indicated that it was unnecessary for the middle manager to know very much about regulatory policies of State government. A breakdown of the data is in Table 17.

In the broad area designated as relating the company's activities to the total social environment, panel members were in agreement regarding the importance of all sub-topics, except for the impact of the motor carrier industry upon environmental decay. It is also worth noting that some of the sub-topics under this question elicited only a few responses. Only seven of the 16 respondents made any definite
comment regarding the need for sensitivity to, or awareness of, cultural differences and human needs. The summary of all definite responses is given in Table 18.

Table 17. Summary of positive and negative remarks concerning various sub-skills in the area of motor freight transportation's relationship to other transport modes.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competitive positions</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Motor transport technology</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Regulatory policies of Federal gov't.</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>Transport economies and comparative advantages</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Other transport technology</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Impact of total cost of distribution</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Regulatory policies of State gov't.</td>
<td>13</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 18. Summary of positive and negative remarks concerning various sub-skills in the area of social and environmental priorities.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social issues in general</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Public speaking, public relations</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Sensitivity to, or awareness of, cultural differences and human needs</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Impact of the motor carrier industry on:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>urban congestion</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>environmental decay</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>minority hiring</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>skilled employment market</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>safety practices</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>support for community betterment</td>
<td>10</td>
<td>0</td>
</tr>
</tbody>
</table>
The area relating to middle management's ability to achieve economy and effectiveness resulted in a greater response and closer agreement than any other. The summary of responses in Table 19 shows clearly the high level of agreement.

Table 19. Summary of positive and negative remarks concerning various sub-skills in the area of economy and effectiveness.

<table>
<thead>
<tr>
<th>Sub-skill</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization and planning</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Employee supervision, in-plant training, evaluation</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Maintenance planning and control</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>Management education</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Methods analysis and work simplification</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Equipment replacement policy</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>Management practice</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Management and labor relations</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Budgeting and control</td>
<td>11</td>
<td>1</td>
</tr>
</tbody>
</table>

Reducing the Discrepancy Between Current Level and Anticipated Requirements in Designated Competencies

Seven broad areas of anticipated change were identified early in the study, changes which could reasonably be expected to alter the future skill requirements for middle managers in the motor freight transportation industry. These seven areas of change are re-stated below, each with its associated set of skills, or competency:
An increasing use of computer technology in the processing of data, the making of management decisions, and possible other applications.

Changes in the posture of Federal, State and local governmental agencies regarding their regulatory roles.

A demand for ever-increasing levels of sophistication in the justification of rate changes.

The continuing development of new equipment and technologies in the handling of materials.

Increasing interaction among the various transportation modes.

Changes in the social and environmental priorities of the nation as they affect the industry.
An increasing demand for efficiency and effectiveness in the utilization of the resources of the firm

Ability to achieve economy and effectiveness

Discrepancies which exist between current levels of competency and projected future requirements might conceivably be corrected—or reduced—by a number of different, alternative methods. As the study progressed, different panel members suggested various ways in which the problem of inadequate skill levels might be resolved. Some of the suggestions involved an educational approach to the problem, others related to changes which administrative management might make in order to alleviate the difficulty. For the purpose of this study, the following nine possible methods, or courses of action, were considered. They include all of the suggestions made from time to time by the various panel members.

...Adoption of hiring policies which would tend to bring more highly qualified recruits into the entry level jobs of the firm, or into the executive training programs.

...Discharge of individuals with particularly low levels of competency, replacing them with others whose skills are more highly developed.

...Job restructuring, so that the requirements of each position will more nearly correspond to the talents of the middle manager
holding that position.

...More extensive use of expertise from outside the company, such as consulting firms, business service organizations, professional associations, government offices, universities, etc.

...Establishing new, or strengthening existing professional membership organizations or associations which could then provide the specialized expertise necessary.

...Company training programs.

...Making more extensive use of associate, baccalaureate, graduate or other "degree" programs offered by educational institutions as a means of upgrading new entrants to the field.

...Institutes, seminars or other short courses, dealing with general or specific problems, and offered frequently for the purpose of bringing the latest information and concepts to the attention of middle managers.

...Specialized training programs, more extensive than institutes but less extensive than degree programs, conducted by public or private educational institutions and offered at times convenient for middle managers to attend.

The panel of experts was used as a representative group of leaders in the industry, and was polled to determine which of the corrective actions listed above would be the most suitable means of building the related competencies among middle managers. The item
appeared as Question No. 1, in round four of the Delphi process, with 15 of the 16 members providing usable answers.

The polled responses of the panel experts indicates that different approaches will be necessary in order to reduce the current, or projected skill deficiencies. Also, the experts favored short, intensive, and specific training over long-term educational programs. Moreover, there seemed to be a general reluctance to suggest the discharge of "low-competence" people, although it could be that the respondents feel that such an alternative would apply to only a very few.

The results of the poll appear below. Because some respondents indicated more than one method, totals will exceed 100%.

<table>
<thead>
<tr>
<th>Method</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialized college training programs</td>
<td>67%</td>
</tr>
<tr>
<td>Institutes, seminars, short courses</td>
<td>33%</td>
</tr>
<tr>
<td>A change in hiring practices</td>
<td>27%</td>
</tr>
<tr>
<td>Use of outside consultants</td>
<td>27%</td>
</tr>
<tr>
<td>Company training programs</td>
<td>13%</td>
</tr>
<tr>
<td>Job restructuring</td>
<td>7%</td>
</tr>
<tr>
<td>Discharge of incompetent individuals</td>
<td>--</td>
</tr>
<tr>
<td>Use of professional organizations</td>
<td>--</td>
</tr>
<tr>
<td>College degree programs</td>
<td>--</td>
</tr>
</tbody>
</table>
### Table 21. Percent of panel members indicating various methods for overcoming current or anticipated lack of knowledge of the work of governmental regulatory agencies.

<table>
<thead>
<tr>
<th>Method</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutes, seminars, short courses</td>
<td>47%</td>
</tr>
<tr>
<td>A change in hiring policies</td>
<td>27%</td>
</tr>
<tr>
<td>Use of outside consultants</td>
<td>27%</td>
</tr>
<tr>
<td>Specialized college training programs</td>
<td>20%</td>
</tr>
<tr>
<td>Use of professional organizations</td>
<td>13%</td>
</tr>
<tr>
<td>Company training programs</td>
<td>13%</td>
</tr>
<tr>
<td>Job restructuring</td>
<td>7%</td>
</tr>
<tr>
<td>Discharge of incompetent individuals</td>
<td>--</td>
</tr>
<tr>
<td>College degree programs</td>
<td>--</td>
</tr>
</tbody>
</table>

### Table 22. Percent of panel members indicating various methods for overcoming current or anticipated lack of ability to justify rate changes.

<table>
<thead>
<tr>
<th>Method</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of outside consultants</td>
<td>53%</td>
</tr>
<tr>
<td>Institutes, seminars, short courses</td>
<td>33%</td>
</tr>
<tr>
<td>Company training programs</td>
<td>20%</td>
</tr>
<tr>
<td>Specialized college training programs</td>
<td>20%</td>
</tr>
<tr>
<td>Discharge of incompetent individuals</td>
<td>7%</td>
</tr>
<tr>
<td>Job restructuring</td>
<td>7%</td>
</tr>
<tr>
<td>A change in hiring policies</td>
<td>--</td>
</tr>
<tr>
<td>Use of professional organizations</td>
<td>--</td>
</tr>
<tr>
<td>College degree programs</td>
<td>--</td>
</tr>
</tbody>
</table>
Table 23. Percent of panel members indicating various methods for overcoming current or anticipated lack of knowledge of the methods of handling materials.

<table>
<thead>
<tr>
<th>Method</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company training programs</td>
<td>47%</td>
</tr>
<tr>
<td>Institutes, seminars, short courses</td>
<td>40%</td>
</tr>
<tr>
<td>A change in hiring policies</td>
<td>13%</td>
</tr>
<tr>
<td>Job restructuring</td>
<td>13%</td>
</tr>
<tr>
<td>Specialized college training programs</td>
<td>13%</td>
</tr>
<tr>
<td>Use of outside consultants</td>
<td>7%</td>
</tr>
<tr>
<td>Discharge of incompetent individuals</td>
<td>--</td>
</tr>
<tr>
<td>Use of professional organizations</td>
<td>--</td>
</tr>
<tr>
<td>College degree programs</td>
<td>--</td>
</tr>
</tbody>
</table>

Table 24. Percent of panel members indicating various methods for overcoming current or anticipated lack of knowledge of alternative modes of transportation.

<table>
<thead>
<tr>
<th>Method</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutes, seminars, short courses</td>
<td>47%</td>
</tr>
<tr>
<td>A change in hiring policies</td>
<td>27%</td>
</tr>
<tr>
<td>College degree programs</td>
<td>27%</td>
</tr>
<tr>
<td>Specialized college training programs</td>
<td>20%</td>
</tr>
<tr>
<td>Use of outside consultants</td>
<td>13%</td>
</tr>
<tr>
<td>Discharge of incompetent individuals</td>
<td>7%</td>
</tr>
<tr>
<td>Use of professional organizations</td>
<td>7%</td>
</tr>
<tr>
<td>Company training programs</td>
<td>7%</td>
</tr>
<tr>
<td>Job restructuring</td>
<td>--</td>
</tr>
</tbody>
</table>
Table 25. Percent of panel members indicating various methods for overcoming current or anticipated lack of ability to relate the company's activities to the total social environment.

<table>
<thead>
<tr>
<th>Method</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A change in hiring policies</td>
<td>27%</td>
</tr>
<tr>
<td>Company training programs</td>
<td>27%</td>
</tr>
<tr>
<td>Institutes, seminars, short courses</td>
<td>20%</td>
</tr>
<tr>
<td>Use of outside consultants</td>
<td>13%</td>
</tr>
<tr>
<td>Use of professional organizations</td>
<td>13%</td>
</tr>
<tr>
<td>College degree programs</td>
<td>13%</td>
</tr>
<tr>
<td>Specialized college training programs</td>
<td>7%</td>
</tr>
<tr>
<td>Discharge of incompetent individuals</td>
<td>--</td>
</tr>
<tr>
<td>Job restructuring</td>
<td>--</td>
</tr>
</tbody>
</table>

Table 26. Percent of panel members indicating various methods for overcoming current or anticipated lack of ability to achieve economy and effectiveness.

<table>
<thead>
<tr>
<th>Method</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job restructuring</td>
<td>40%</td>
</tr>
<tr>
<td>Company training programs</td>
<td>40%</td>
</tr>
<tr>
<td>Discharge of incompetent individuals</td>
<td>20%</td>
</tr>
<tr>
<td>Specialized training programs</td>
<td>20%</td>
</tr>
<tr>
<td>A change in hiring policies</td>
<td>13%</td>
</tr>
<tr>
<td>Institutes, seminars, short courses</td>
<td>13%</td>
</tr>
<tr>
<td>Use of outside consultants</td>
<td>7%</td>
</tr>
<tr>
<td>College degree programs</td>
<td>7%</td>
</tr>
<tr>
<td>Use of professional organizations</td>
<td>--</td>
</tr>
</tbody>
</table>
Results of Interviews with Vocational Administrators

It was a purpose of the study to determine the possible use and practicality of applying Delphi panel results to the community college curriculum development process. In order to assess the value of the study results for such a purpose, several Portland area leaders in vocational education were interviewed, with the summarization of their views taken as the determinant of Delphi utility in a curriculum setting.

Four interviewees were selected, one from each of the public community colleges serving the Portland metropolitan area. Each individual had at least ten years of experience in curriculum planning, in establishing and working with advisory committees, and in industry-community college interrelationships. Each, in addition, held a position of administrative responsibility in the occupational education division of his school. The names of the individuals interviewed, as well as the questions asked and the responses given, will be found in Appendix B.

The first question related to the value of a simple list of anticipated changes. The list of seven changes which was shown to the interviewees was generated by reviewing the trade literature, and all four respondents stated that such a list would be of definite interest to a curriculum advisory committee. Two of the respondents believed
that such a list would be rejected if the advisory committee members did not hold similar views of probable future events. One pointed to the need to interpret the information, another stated that the information would provide the committee with a point of departure in their discussions of curriculum development.

The four respondents were divided on the value of having the rate of change for each of the areas under consideration. Two doubted the value, one seemed to think that the value would be primarily in considering the development of part-time courses, while another stated definitely that having the rate of change would help curriculum developers concentrate on areas of greatest and most immediate importance.

All four community college administrators believed that it would be very helpful to know the current level of competency among workers for whom a training program was being prepared. One administrator felt, however, that the advisory committee could arrive at the competency level of workers in the occupation with which they were familiar without recourse to the information from a panel of experts.

All administrators agreed that it would be most helpful to know the year in which current competency would no longer be adequate for the future demands of a job. One added that it might be of even greater value in scheduling the start of short-term courses than in
developing curriculum for a preparatory program. Another pointed out the possible application of this information to the whole question of job shifting or job enlargement. One respondent expressed the view that such information would be of even greater value to administrators than to curriculum committees.

All four agreed that it would be essential to have a breakdown of any broad occupational competency, so that curriculum planners could apply the information to the specific questions that must be faced when developing a curriculum. At least three of the four believed that there could be very little application of the study data to curriculum planning if the broad areas of knowledge were not interpreted in terms of specific job skills.

The college administrators were generally agreed that there would be some value in reporting the opinion of a Delphi panel on the alternative ways in which to resolve the problem of keeping workers abreast of occupational change. One, however, believed that administrators would find such information of value in selling the school's program, and in helping advisory committee members see the possible alternatives to schooling as a method for resolving industry's manpower needs.

Generally, the information gathered by the study was considered by vocational administrators to be usable in the curriculum process, either by adding to the information pool available to planners, in
substantiating the viewpoints already held by advisory committee members, in helping to verify the findings of a local study group, or in providing a more unified view of probable change in the near future and the possible impact of that change upon occupational requirements.
Table 27. Responses to questions asked during personal interviews of four vocational administrators.

<table>
<thead>
<tr>
<th>Question</th>
<th>#1</th>
<th>#2</th>
<th>#3</th>
<th>#4</th>
<th>Consensus</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1. In the field of motor freight transportation, seven anticipated changes were identified. Would it be useful to an advisory committee, in developing curriculum in this field, to have such a list for consideration?</td>
<td>great value</td>
<td>some value</td>
<td>some value</td>
<td>some value</td>
<td>some value</td>
</tr>
<tr>
<td>#2. Although the process of reviewing relevant literature will generate a list of expected changes, it seems reasonable to presume that the rate of change in the various areas would be different. Would it be of value to a committee to have the areas of future change ranked in order of their rates of change?</td>
<td>little value</td>
<td>little value</td>
<td>some value</td>
<td>some value</td>
<td>little value</td>
</tr>
<tr>
<td>#3. Would it be of value to a curriculum advisory committee, to have before it a list of the current competencies of middle managers, ranked in order from lowest to highest?</td>
<td>some value</td>
<td>great value</td>
<td>great value</td>
<td>great value</td>
<td>great value</td>
</tr>
<tr>
<td>#4. The panel has determined in which future year the current level of competency of middle managers would be inadequate for the satisfactory performance of their jobs. Would this information be helpful to an advisory committee?</td>
<td>great value</td>
<td>great value</td>
<td>great value</td>
<td>great value</td>
<td>great value</td>
</tr>
<tr>
<td>Question</td>
<td>#1</td>
<td>#2</td>
<td>#3</td>
<td>#4</td>
<td>Consensus</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>#5. Would it be helpful to an advisory committee to have broad competencies defined in more specific terms?</td>
<td>great</td>
<td>great</td>
<td>great</td>
<td>great</td>
<td>great value</td>
</tr>
<tr>
<td>#6. Would it be helpful to a curriculum committee to have the consensus of a Delphi panel regarding alternative ways in which to reduce the discrepancy between actual and needed competencies?</td>
<td>little</td>
<td>some</td>
<td>little</td>
<td>great</td>
<td>some value</td>
</tr>
</tbody>
</table>
Summary of the Study

The Problem

In a time of fast moving change there exists a constant danger that vocational training programs will reflect the past demands of changing occupations, rather than the current and future skills which will be required. The typical inputs to curriculum determination -- job analysis, skills surveys, trade committees -- are concerned with on-going requirements, not future needs. If change continues as a fact of life (one of the few predictions on which all seem agreed) then vocational program planners need predictive tools which will help them identify occupational changes in advance of their actual occurrence.

Purpose of the Study

It was the purpose of the study to explore the possible use of sequential interrogation in predicting changes which might occur in the broad competencies necessary for the successful future performance of a job, and to assess the possible usefulness to curriculum planners of information obtained by such a process. The investigation was applied specifically to middle management occupations in
regulated motor freight transportation in the Portland, Oregon, metropolitan area.

Significance of the Literature

A review of the traditional methods of examining occupations showed little capability of fortelling future events, and for that matter, little concern with the prediction of future change built into the techniques and methods most common to curriculum determination. A review of the Delphi technique of sequential questioning with feedback, however, indicated that it is designed for the purpose of anticipating the occurrence of an unlikely event.

A review of recent trade literature identified seven areas of change affecting the regulated segment of the motor freight transportation industry. They appear below, without any significance to the order in which they are presented:

(1) An increasing use of computer technology in the processing of data, the making of management decisions and possible other applications.

(2) Changes in the posture of Federal, State and local governmental agencies regarding their regulatory roles.

(3) A demand for ever-increasing levels of sophistication in the justification of rate changes.
(4) The continuing development of new equipment and technologies in materials handling

(5) Increasing interaction among the various transportation modes.

(6) Changes in the social and environmental priorities of the nation as they affect the industry.

(7) An increasing demand for efficiency and effectiveness in the utilization of the resources of the firm.

Summary of Findings

As a result of the study it was possible to discriminate among the seven areas of change according to the rate at which change can be expected. According to the panel, the greatest rate of change is occurring in the demand for efficiency and effectiveness in the utilization of the resources of the firm, and in the changing posture of governmental agencies regarding their regulatory roles. The rate of change was expected to be lowest both in the increasing interaction among the different transportation modes, and in changing social and environmental priorities.

According to the panel, the current competency of middle managers is greatest in the area of materials handling, and secondly in their ability to achieve economy and effectiveness within the areas of their responsibility. The lowest level of competency of middle
managers is found in the area of data processing; their ability to relate their firm's activities to the total social environment and their ability to justify rate changes are considered their next lowest level of competence.

It was the consensus of the panel that the various competencies of middle managers would be obsolete in from one to four years. The panel concluded (in 1972) that the year 1973 would see the obsolescence of their ability to justify rate changes and their knowledge of the work of governmental regulatory agencies. The middle manager's knowledge of alternative modes of transportation and of computer technology would be obsolete by 1974; his ability to achieve economy and effectiveness and his ability to relate his company's activities to the total social environment will become obsolete in 1975; his knowledge of materials handling will be obsolete in 1976.

Respondents were able to define more specifically the competencies which relate to each of the broad areas of expected change. There was, however, a good deal of disagreement on some of the sub-skills, particularly in the areas of computer technology, the justifying of rate changes and the knowledge required for materials handling.

A polling of panel members indicated that different approaches will be necessary in order to reduce any current or projected deficiency in the skill levels of middle managers. The experts
favored short, intensive, and specific training over long-term educational programs. In addition, there was a general reluctance to suggest the discharge of 'low competence' individuals as a means of raising the average level of middle management skill.

Four of the area's leading vocational educators--each representing one of the metropolitan area's public community colleges--reviewed the findings of the study from the point of view of its possible value to a curriculum advisory committee. All were agreed on the value to an administrator of a simple list of expected changes, and all expressed the view that indicating change in terms of the year in which current competency would become obsolescent would be of particular interest and value to a curriculum committee. There was universal agreement that any list of broad areas of knowledge would have to be further identified in specific terms if curriculum planning is to be influenced.

Conclusions

Conclusions Regarding the Changes which are Occurring in the Occupational Needs of Middle Managers in Motor Freight Transportation

(1) Social and technological changes occurring in our society are increasing the sophistication of the middle management function in motor freight transport. An increasing reliance upon the computer
for automated data processing, plus changes which soon will take place in the way all levels of government approach their regulatory functions, will require managers to have a view of transportation as a single economic function and a more specific capability in the area of records control.

(2) Middle managers are currently most competent in the specific tasks which take up the largest share of their working time—those tasks which relate to handling materials and the movement of goods. They are less competent in those areas which call for social skills and broader knowledge.

(3) The knowledge of middle managers in motor freight transportation decays over a four-year time span; that is, in four years' time the middle manager's skills and knowledge, if they are not augmented in any way, will become out-dated to the point where he will be unable to satisfactorily perform his job.

(4) In order to correct a discrepancy between current levels of competency and projected future requirements, it will be necessary for the industry to employ a wide range of alternative methods, including changes in hiring and firing policies, job restructuring, the extensive use of outside consultants, company training programs, and the full array of available post-secondary vocational education programs.
Conclusions Regarding the Use of the Delphi Technique

(1) Most experts will require a considerable amount of orientation to the process of sequential questioning if their replies are to be received in usable form.

(2) Unless the panel of experts is familiar with the use of the Delphi technique, it may be necessary to alter the usual process, making modifications in the traditional four round method in order to elicit the depth and extent of response needed for decision making. Such modifications may cloud the answers, making the results correspondingly suspect, but the technique, consisting as it does of successive rounds of questioning, lends itself to periodic adjustment. Changes in the process should be made only when responses fail to yield successively refined answers.

(3) The process followed in this study gives no guarantee that every area of major change will be uncovered. A review of the literature failed to find enough reference to a pending energy crisis to warrant listing such a change on the questionnaires submitted to the panel of experts. Furthermore, the experts failed to make any mention of such an important occurrence, although the Delphi technique supposedly assures that such oversights on the part of an investigator will be 'caught' by the panel.
(4) A panel of selected experts will follow through with the process of sequential questioning through the necessary several rounds, giving usable replies to specific questions, submitting written arguments in the defense of positions which they feel strongly, and providing sequential refinement of their answers.

(5) Panel members drawn from areas closely associated with an industry can be expected to give responses very similar to those given by experts employed within that industry, while at the same time contributing a slightly different viewpoint to open ended questions.

(6) Panel members cannot be expected to add comments or suggestions to semi-structured questions, even after four rounds of questioning, as evidenced by responses to the Round 4 question on the specific skills required of middle managers. On that instrument, panel members were encouraged to add remarks of their own, but few elected to do so.

(7) Although the process followed in this study will usually result in a shrinking of the mid-range and a shifting of the median, the process will not affect all questions equally. When the median is taken as consensus, the extent of the mid-range will influence the confidence with which we view the consensus. In establishing the year of obsolescence for the various competencies designated in the study, the mid-range shrunk to a single year in one case, while in another case the mid-range extended over a period of four years.
(8) It is possible to gain general consensus on a broad statement without any assurance that all experts are in agreement on the meaning of the term, or what specifics are included within the term. The Round 4 question concerning the various sub-skills in each broad skill area indicates considerable difference of opinion among the experts.

(9) The process of sequential interrogation is time consuming, requiring as it does that all responses be received from one round before the second round can begin. Also, the process does not permit the setting of a definite cut-off data since it may take three, four, or more rounds to obtain the necessary consensus.

(10) The results of the study indicate that the Delphi process is not as good a predictor of broad changes as it is an indicator of specific future change—which is how it is most generally used.

Conclusions Regarding the Value of the Delphi Technique to Curriculum Planners and Vocational Administrators

(1) Use of the Delphi process can contribute to decision making in curriculum development by providing the consensus of industry experts regarding future change and future needs. Corollary to this statement, however, it must be pointed out that nothing in the study warrants the conclusion that all areas of change and all future needs can be identified with a Delphi panel.
(2) Vocational administrators will find both interesting and valuable, for curriculum and for other purposes, a list of changes taking place within society, and which bear in particular ways upon present or future occupational needs.

(3) Information about future change will be accepted by vocational administrators and curriculum committees if presented in terms of the year in which a present level of knowledge or skill will no longer be sufficient for the satisfactory performance of a job.

(4) If occupational competencies are expressed in broad terms, it will be necessary to provide curriculum planners with definitions which are sufficiently specific to be used in recommending skills and knowledge needed in a course of study.

(5) Curriculum planners and vocational administrators will find it helpful to their purpose if they are provided with an indication of the current, or present, level of competency of workers in a given occupation. The information should show the importance of the competency to the occupation as well as those competencies in which workers are most and least capable.

Recommendations

Following are the major recommendations which derive from the findings of the study. They appear in three sets. The first set of recommendations relate to actions which are necessary to meet the
changing needs of middle managers in motor transportation. The second set deals with the application of future research to vocational education. The third set of recommendations relate to the potential application of the Delphi technique to curriculum development.

Recommendations for Industry-Education Action in Meeting the Changing Occupational Needs of Middle Managers in Motor Freight Transportation

The following recommendations appear as suggestions for reducing the discrepancy between the future demands upon the motor freight transport industry's middle management on the one hand, and on the other, the ability of middle managers to meet those demands. The recommendations are given in the order of their immediacy; those which appear first deal with needs which are currently most critical, those which appear toward the end of the list deal with needs which are not quite so immediate in their import.

The relative importance of each recommendation was established by comparing the rate at which change is occurring in that area, the present level of middle management competence in that area, and the date at which current knowledge in that area will become obsolete, with the change rates, competence levels and obsolescence dates for each of the other areas of knowledge.

Recommendation number 1. Since the demand for sophistication in rate making is increasing, the rate of change in this field is rapid,
the competence of middle managers in this area is relatively low, and knowledge in this field becomes obsolete rapidly, it is recommended that motor transport firms plan immediately for more extensive use of available expertise from outside the company. It is further recommended that consulting firms in the metropolitan area, as well as business service organizations, begin immediately to expand their service capability so that they may begin to take over an ever larger share of the responsibility for justifying rate changes. It would also seem prudent for professional associations serving the industry in the metropolitan area to examine possible ways in which they might expand their roles to include assistance in rate change justification to their members. Public and private colleges and universities in the area, particularly Portland State University, should review their mandates to serve the area's business community and provide whatever additional service that their staff and budget limitations will permit.

Recommendation number 2. Although automated data processing and the computer have already begun to influence the industry, the competency of middle managers in this area is lowest of all skill areas considered in the study, and knowledge in this area becomes obsolete very rapidly, it is recommended that colleges and universities in the area provide a specialized training program to acquaint middle managers with the potential uses of automated data processing, the collection, assimilation and analysis of relevant information, the
costs and benefits of electronic data processing, and the general terminology common to the field. The program might consist of the equivalent of two or three undergraduate courses bolstered as necessary by short term institutes, seminars, or lecture series. In the initial stages of the planning such a program, it would seem that Portland Community College and Portland State University should meet to confer on their separate responsibilities, and to cooperate in providing for the needs of the industry.

Recommendation number 3. Since Federal, State and local governmental agencies are presently reviewing their regulatory roles, and since knowledge in this area is due for early obsolescence, it is recommended that institutes, seminars and short courses be established without delay in order to help keep middle managers informed of current trends and changes in prospect for the industry. Such institutes should deal particularly with compliance procedures, operating authority, rules of evidence, and procedures before agencies. Middle managers are currently more competent in this area than in most others, but this knowledge apparently becomes obsolescent yearly, putting a great burden upon the middle manager to keep abreast of change. A continuing institute is therefore recommended. The Division of Continuing Education, a unit of the State System of Higher Education, through its Institute and Conference Planning section, would seem a likely agency to prepare a set of alternative
suggestions for consideration by leading motor transport firms in the area.

Recommendation number 4  Since there is an increasing demand for efficiency and effectiveness in utilizing the resources of the individual motor transport firm, and since the rate of change in this area is growing rapidly, it is recommended that firms examine the possibility of restructuring their middle management jobs so that the requirements of each position will more nearly correspond to the talents of the managers holding those positions. In addition, company training programs should be expended whenever possible to provide a broader coverage of the management function, including organization and planning, employee supervision, in-plant training and evaluation, maintenance planning and equipment replacement, budgeting, labor relations, methods analysis and work simplification. Although middle managers are highly competent in this area at the present time, their knowledge will be obsolete very soon unless strenuous efforts are made to keep building their competencies, probably month by month.

Recommendation number 5. Because of the increasing interaction taking place among the various transport modes, it is recommended that Portland State University (or some other institution in the area) plan a one- or two-day institute to be held twice yearly to keep motor transport middle managers informed of the relative
competitive positions of the various transport modes, their different technologies, the governmental regulation of the other modes, and to help develop a generalized concept of the total cost of distribution as a determiner of which form of transportation is selected by a shipper. Although the rate of change occurring in this area is not as fast as in some other areas, and middle managers are considered highly competent in so far as current requirements go, knowledge is expected to obsolesce early. The special institute should, therefore, begin as soon as possible.

Recommendation number 6. Since changes in social and environmental priorities affect the motor carrier industry, and since such change will affect the work of middle managers, it is recommended that firms encourage their managers to keep in touch with major issues such as the impact of the industry on urban congestion, minority hiring, safety, the skilled labor market, and community betterment. Managers need to improve their public relations skills, including the ability to speak persuasively in public, so that they may respond to community criticism and present the position of the industry on social issues in an effective manner. No agreement was reached in this study regarding the best method of achieving this goal, but one suggestion is that firms encourage individual managers to attend lectures, involve themselves in civic affairs, and study in depth the relationship of motor transportation to the major social
movements of our time. Since the rate of change in this area is expected to be slow, and since current levels of competency are not expected to obsolesce until the year 1975, the industry would appear to have time to react to this need. However, the competency of middle managers in this area is judged to be low, and it may take a considerable period of time to bring about any significant improvement in their general capability. Therefore, it is recommended that no undue delay be taken in implementing a suitable course of action.

Recommendation number 7. Since new technologies in materials handling is a continuing development, and since the effectiveness of a motor freight firm will largely depend upon its ability to handle materials efficiently, it is recommended that individual firms continue, and where possible expand their company training programs to keep their managers acquainted with the latest developments in facilities, equipment, warehouse and terminal layout, and motor vehicles. Companies should consider the possibility of cooperating to sponsor an annual materials handling institute through one of their professional associations or one of the area's community colleges. Since the rate of change is slow in this area, and since the current competency of middle managers is especially high as regards materials handling, and since current knowledge is not projected to be obsolete until 1976, this recommendation has the lowest priority. However, it should be part of any overall planning for improving the
general level of ability of middle managers.

Recommendations for Applying Futures Research to Vocational Education

Recommendation number 1. The Community College and Career Education unit of the State Department of Education, in cooperation with the vocational teacher education staff of Oregon State University should carry on a continuing review of social change and its effect upon occupational training needs. The process should be sufficiently formalized that responsibilities could be assigned, progress reports would be written, and some means of communication with field staff devised.

Recommendation number 2. The State Department of Education should add weight to the importance of futures research by requiring community colleges, at the time that they request approval for new curriculums, to indicate how they have accounted for probable changes in future occupational requirements, or give the basis they have for presuming that no significant change will occur.

Recommendation number 3. The State designated vocational teacher education institutions should immediately explore possible ways of incorporating futures research in their preparatory training programs. In addition, arrangements should be made for in-service teacher training primarily to acquaint vocational teachers with the
nature of change, ways in which social change affects occupations, and to develop a sensitivity to the need for futures planning in any instructional program.

Recommendation number 4. Oregon State University should sponsor continuing research into the nature and extent of social change, examining the many possible techniques now emerging for this purpose, with a view to selecting those methods which hold greatest promise for predicting occupational change.

Recommendation number 5. Additional efforts should be made in applying the Delphi technique to the problem of predicting future change in occupational requirements. Specific questions relating to curriculum emphasis, employment patterns, and equipment changes—in all occupational areas—should be selected in cooperation with vocational educators and then submitted to experts in the Delphi manner. Further efforts should also explore the possible use of sequential interrogation in assessing the impact upon jobs of broad social, political, and economic changes currently taking place.

Recommendation number 6. When used for curriculum purposes, the Delphi technique can be considered an extension of the local advisory committee. There is a need to document the difference between using an advisory committee and a Delphi panel. An effort should be made to assess the added information that a Delphi panel can given and to determine how much more accurate its results would
be than merely asking similar questions of an advisory committee.

**Recommendations for the Application of the Delphi Technique to the Design and Modification of Vocational Curriculums**

The development of vocational curriculums will remain—at least in the foreseeable future—an inexact science. By adding predictive tools to the formalized process of curriculum development vocational programs can be improved, making them more closely oriented to future needs and less subject to daily forecasts based on personal viewpoints.

The results of this study indicate that the main weakness, or drawbacks to the extensive use of the Delphi technique are its specificity and its structural rigidity. In its transitional form, without modification, Delphi may have only limited potential, since it lends itself most effectively to answering a specific, clearly defined question, re-submitted with feedback over four rounds of interrogation.

Applying Delphi to broad statements of competency poses a number of special difficulties. The study indicated that penal members become easily confused over inexact terminology; it was necessary to make minor changes in the wording of the questions on the second round. It was also apparent that panel members had difficulty in conceptualizing a specific date when a general event would occur,
and this necessitated additional instructions mid-way through the process. Additionally, the application of Delphi to broad statements raises the obvious problem of validating the results of generalized questioning.

Granting the above difficulties, the alternative (asking specific questions which relate to specific and determinable events) presents even more difficult problems. Almost all vocational curriculums consist of a number of courses, and each course contains a number of informational bits—to ask a specific question relating to each of these bits would be quite impossible, if the time consuming Delphi process were to be followed.

It seems, therefore, that if the Delphi technique is to be used as an aid to curriculum planning, it must necessarily be applied to broad statements of needs or competencies. It will remain the responsibility of the local vocational administration to evaluate the import of Delphi results, and make whatever curriculum changes seem reasonable in light of the panel's predictions.

Perhaps the major recommendation to come out of this study is that Delphi should be looked at as a conceptual process designed to secure insights, viewpoints and opinions which might otherwise not surface, rather than as a rigid technique whose purpose is to predict the date of occurrence of some specific future event. Conceived in this manner, Delphi lends itself to a broad range of variations,
alterations, changes and distortions. The limit of such distortion, the extent to which Delphi can be altered and still be Delphi, was not established in this study.

At this point, the study presumes that the basic character of the Delphi technique is one of feedback in a non-threatening situation. So long as this character remains, Delphi is intact. It is this interpretation of Delphi that leads to the following recommendations.

Recommendation number 1. The basic nature of the Delphi technique must be retained. Without feedback obtained through a series of questions, and without the anonymity of statements submitted in the absence of peer pressure, the essential nature of Delphi simply does not exist. In order to obtain sufficient feedback, it would seem that a minimum of three rounds of questioning would be necessary, although some experimentation with a two-step process might identify specific cases in which the third step would be unnecessary. Freedom from confrontation must also be maintained if divergent viewpoints are to be nurtured, developed, and presented by panel members.

Recommendation number 2. Within the constraints of feedback and anonymity, vocational educators must feel free to modify Delphi in whatever ways are necessary to secure the information required for curriculum development. This may result in some studies with fewer, or more, than the usual four rounds.
It may be necessary to alter, at least in some slight way, the wording of questions in rounds subsequent to the first. Slight changes in the wording of a question are often made in even the most rigorous applications of the Delphi technique, but vocational educators may find it necessary to stretch the usual bounds of acceptability in order to secure the range of viewpoints desired for curriculum modification. This seems most likely to be necessary during the early stages of Delphi development, since experts selected to serve on a panel are unlikely to be familiar with the process of sequential questioning.

The present study demonstrated the need to inject new questions during the interrogation process. This will prove necessary whenever the responses to the questioning become static or polarized. At such a point, the investigator will need to inject a new line of questioning, or dramatically alter the previous line, in order to bring to the surface of the discussion those points which are relevant to the objective of the study.

Again, because of the naivete of panel experts in the use of the Delphi technique, it may be adviseable to give additional instructions during the progress of questioning. Such instructions should be made carefully and in full realization that they will most certainly prejudice the final results, probably to a degree that cannot be ascertained at a later date.
Vocational educators should use the final round of questioning as an opportunity to ask an additional set of different, but related, questions. Of course, no feedback is possible when presenting a new question in the final round. However, the previous rounds of questioning, with feedback and counter arguments, creates a panel which, by the final round, is too valuable, too knowledgeable of the study purposes, too dedicated and purposeful, to allow them to disband without making every effort to obtain their final viewpoints and suggestions.

All of the above modifications of the Delphi technique were employed in the present study, without any apparent deleterious affect. Additional directions were given after the questioning had begun; slight changes were made in the wording of the questions in round two and three in order to clarify the purpose; a number of additional questions were asked at the end of round four with additional significant information obtained.

Recommendation number 3. If the Delphi technique is to be used as a guide to curriculum planning, it must be applied to broad statements of competency, knowledge and purpose. Broad, generalized statements provide an excellent guide for curriculum developers while at the same time providing the maximum opportunity for the exercise of local judgement.

Delphi should not be used to replace any of the usual curriculum development devices. Rather, it should be used to add an additional
dimension to the usual survey instruments, employer questionnaires, local advisory committees, and school faculty. Delphi has the peculiar capacity of predicting future change. As such, it should become a valuable adjunct to the decision-making process in vocational education.
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July 12, 1971

Mr. Ernest H. Augustino
Oregon Washington Transfer
3322 NW 15th Avenue
Portland, Oregon

Dear Mr. Augustino:

I want to thank you for agreeing to help analyze the impact which certain social and technological events may have upon changing skill requirements in the motor freight industry. The Career Education Division has identified a need for post-high school education which will provide the training necessary for success in supervisory and middle management occupations. Your assistance will help make sure that community college curriculums will adequately prepare people for jobs which are in the process of change.

By reviewing recent literature in the field, I have identified several changes apparently taking place in the industry. There is a sheet attached which explains the process which will be used to verify these changes, and to order the time sequence in which they might occur.

Will you please give your initial response to the questions, and return the forms to me today? Subsequent rounds of the questionnaire will be mailed as rapidly as possible.

Again, thank you for your offer of assistance.

Sincerely,

David J. Mair
MDT Coordinator

DJM/clm
Enclosure
THE DELPHI TECHNIQUE OF PREDICTING FUTURE EVENTS

The co-called Delphi Technique is a method for the systematic solicitation and collation of expert opinions. Since it is a process by which informed judgment can be solicited, it could conceivably be applied to some extent to almost any decision making process. In actuality, however, it is most generally used in predicting future events or in planning changes and innovations which would probably not be introduced for some time.

The traditional approach for achieving a consensus is through open discussion. The Delphi Technique, however, seeks to eliminate committee activity completely, thereby reducing the influence of specious persuasion and making it easier for respondents to abandon a publicly expressed opinion. Direct debate is replaced by sequential interrogation conducted by questionnaires which provide opinion feedback derived from previous questionnaires. The process to be followed in the present study will be carried through four rounds of questioning as follows:

Round 1 - Following the first identification of critical trends, initial statements and a survey instrument will be developed. The initial set of questions will be mailed to panel members, together with directions and an explanation of the process. Each expert will be asked to provide an answer to each question, and also to suggest
any additional skill changes which may have been overlooked.

Round 2 - A follow-up questionnaire, containing any changes necessary for clarification as the result of suggestions received on the 1st round, will be mailed to the respondents. This second questionnaire will include a summary of the distribution of previous responses, stating the median and the interquartile range, i.e., the interval containing the middle 50 per cent of the responses. Each respondent will then be asked to reconsider his previous answer, possibly revise it, and, if his new response lies outside the interquartile range, to state briefly why he thinks the answer should vary that much from the majority opinion.

Round 3 - A third questionnaire will be mailed to each respondent, again with a summary showing the median and interquartile range of responses from the second round. In addition, the respondents will be provided with a concise summary of the reasons given in support of extreme positions. They will then be asked to revise their second round responses, giving whatever weight they consider proper to the arguments offered for extreme opinions. At this point in the process, a respondent whose answer still remains outside the new interquartile range will be asked to state why he is unconvinced by the opposing arguments.

Round 4 - A fourth questionnaire will be mailed to each respondent, containing the counter-arguments, and each will be given one
last chance to revise his answer. The median of the final responses will be taken as the closest thing possible to a group consensus. From this, certain recommendations will be made for the preparation of middle-managers in the motor transport industry and these recommendations will represent the major conclusion of the study.
The first question, relating to automated data processing and computer technology, is prompted by various references to the growth of the data processing industry, by the almost universal inclusion of this subject in college management curriculums, and by the recent development of a new generation of computers with the attendant decrease in the cost of second generation computers. It seems reasonable to presume that middle managers in the future will need a greater knowledge of data processing methods than is now required for the performance of their tasks. We would like your judgment of just when the currently acceptable level of expertise in this area will no longer be sufficient for satisfactory job performance.

Question No. 1

In what year will the motor transport middle manager's currently acceptable level of knowledge of automated data processing and computer technology be insufficient for the satisfactory performance of his job?

In the year . .

(If it is your opinion that no significant change will occur in the future requirements for this competency, please write the word "never" in the space provided).

Make any comments you care to in the space below. As the result of your remarks—and the remarks of others—the question may be altered in successive rounds.
The second question relates to anticipated changes which may occur as the result of a different position which might be taken by the Federal and State regulatory agencies. The entire field of transportation is marked by a high degree of governmental regulation in the establishing of rates, routes, territorial boundaries and service requirements. In addition, the trucking industry is subject to further regulations because of its dependence upon federal and state highway networks. Any change in the nature of governmental regulation can therefore be expected to influence the activities of management, both at the top and middle levels. If you feel that middle managers in the future will need to know more about the work of regulatory agencies than is necessary now, will you give us your judgment of just when this change will become critical?

Question No. 2

In what year will the motor transport middle managers' currently acceptable level of knowledge of the work of governmental regulatory agencies be insufficient for the satisfactory performance of his job?

In the year . . ____________

(If it is your opinion that no significant change will occur in the future requirements for this competency, please write the word "never" in the space provided).

Make any comments you care to in the space below. As the result of your remarks—and the remarks of others—the question may be altered in successive rounds.
DELPHI PANEL ON THE CHANGING SKILLS OF MIDDLE MANAGERS IN MOTOR TRANSPORTATION

The third question is also prompted by possible changes in the posture of government regarding its regulatory role. However, this question is more specifically related to rate making and the justification of rate changes. It seems possible that middle managers in the future will find it necessary to employ more sophisticated methods in establishing transportation costs, and go into greater depth in analyzing the full costs of performing their various customer services. If you feel that such a change will occur, that is, that middle managers will need to exhibit additional competency in rate changing in the future, will you give us your considered judgment of just when the need for this skill will become critical?

Question No. 3

In what year will the motor transport middle manager's currently acceptable level of expertise in justifying rate changes be insufficient for the satisfactory performance of his job?

In the year . . ____________

(If it is your opinion that no significant change will occur in the future requirements for this competency, please write the word "never" in the space provided).

Make any comments you care to in the space below. As the result of your remarks--and the remarks of others--the question may be altered in successive rounds.
DELPHI PANEL ON THE CHANGING SKILLS OF MIDDLE MANAGERS IN MOTOR TRANSPORTATION

The fourth question is prompted by significant changes apparently occurring in the methods and processes of handling materials. Freight handling is an integral part of physical distribution, and increasing labor costs have spurred the development of more mechanized methods of moving goods. Will middle managers in the future need to be more familiar with such processes? If you think so, will you please indicate when you feel such a need will be critical.

Question No. 4

In what year will the motor transport middle manager's currently acceptable level of knowledge of the methods of handling materials be insufficient for the satisfactory performance of his job?

In the year . . ______________

(If it is your opinion that no significant change will occur in the future requirements for this competency, please write the word "never" in the space provided).

Make any comments you care to in the space below. As the result of your remarks--and the remarks of others--the question may be altered in successive rounds.
Question number five is signaled by the increased need for cooperation among the various transportation modes in the movement of goods from one place to another. For example, the development of inter-modal containers for land-air shipments would require a significant degree of air-truck coordination. As early as 1960, the National Research Council called for "individuals who can think and act in the broader perspective of a transportation complex rather than within the view of an individual component or mode of transportation". If you agree that middle managers in the future will need to know more about the total transport system than is necessary now, will you please indicate just when this need will become of critical importance.

Question No. 5

In what year will the middle manager's currently acceptable knowledge of alternative modes of transportation (and the total complex of physical distribution) be insufficient for the satisfactory performance of his job?

In the year . . ________________

(If it is your opinion that no significant change will occur in the future requirements for this competency, please write the word "never" in the space provided).

Make any comments you care to in the space below. As the result of your remarks--and the remarks of others--the question may be altered in successive rounds.
Another area of anticipated change relates to the growing national concern with social problems. The continuing decay of our environment and the need for greater employment opportunity for minorities are examples of national concerns which might affect the future work of middle managers in motor transportation. Perhaps there are other examples. If you feel that middle managers in the future will need additional expertise in relating the firm's activities to social and community needs, will you indicate just when the need for this competency will be critical?

Question No. 6

In what year will the middle manager's currently acceptable level of ability to relate the company's activities to the total social environment be insufficient for the satisfactory performance of his job?

In the year . .

(If it is your opinion that no significant change will occur in the future requirements for this competency, please write the word "never" in the space provided).

Make any comments you care to in the space below. As the result of your remarks--and the remarks of others--the question may be altered in successive rounds.
The final question relates to growing competition in the industry. Higher labor and capital costs, the growing number of end-to-end mergers, and the desire of competing modes for a greater share of the transport dollar all point to a continuation of the trend toward more competition. Is it possible that middle managers in the future will require a specialized competence in obtaining ever greater economy in the area of their responsibility? If you think this is true, will you indicate just when you believe this need will be critical.

**Question No. 7**

In what year will the middle manager's currently acceptable level of competence in achieving the maximum degree of economy and effectiveness within the area of his responsibility be insufficient for the satisfactory performance of his job?

In the year . . ____________

(If it is your opinion that no significant change will occur in the future requirements for this competency, please write the word "never" in the space provided).

Make any comments you care to in the space below. As the result of your remarks—and the remarks of others—the question may be altered in successive rounds.
Materials Submitted to the Delphi Panel in

ROUND #2
August 17, 1971

Mr. Roy N. Gaussoin
Silver Eagle Company
5885 NW St. Helens Road
Portland, Oregon

Dear Mr. Gaussoin:

Thank you for your response to the first round questionnaire on the changing skills of middle managers in motor transportation.

Will you please read the attached note, then answer the second round? I think you will find the form self-explanatory.

Sincerely,

David J. Mair

DJM/clm
Enclosures
NOTE TO PANEL MEMBERS:

It is my assumption that middle managers currently employed are at least adequate to the tasks they perform. Several respondents have suggested that some of the competencies given in the questionnaire are already needed--that middle managers need such skills now, in 1971. In a sense, of course, this may be true. However, middle managers (by and large) still maintain their jobs--they are not being replaced or demoted. On this round of questioning, will you pin-point just when the lack of a particular competency will become critical--when firms will elect to take some action (whether re-training, replacement, demotion, job-restructuring, etc.) in order to secure the level of competency necessary.

A few respondents pointed out that the competencies required of middle managers vary greatly from firm to firm--and from job to job within a firm. It would be nice for educators if this were not so--and yet it undoubtedly is. However, people who seek middle-management positions seldom set their sights on a particular job in a particular firm. They must prepare themselves for a wide range of possible opportunities in a wide range of possible firms. Also, since most middle management jobs are not "entry level", the individual must be upwardly mobile--he must be prepared to accept an opportunity at a higher level in his own, or another firm. For the purpose of this study, will you consider "middle management" a generic term encompassing those individuals who do not have responsibility for policy decision, but are responsible for developing and carrying out procedures necessary to the implementation of policy decision. Such individuals may be placed close to first-line employees or toward the upper end of the organization.
Round 2

Respondent __________________

DELPHI PANEL ON THE CHANGING SKILLS OF MIDDLE MANAGERS IN MOTOR TRANSPORTATION

Question No. 1

In what year will the motor transport middle manager's current level of knowledge of automated data processing be insufficient for the performance of his job?

Median of previous responses _____

Mid-range of previous responses _____

Your previous response _____

Your new response _____

I have no views regarding this question, and decline to answer_____.

If your new response lies outside the mid-range given above, please explain why your view differs from the majority opinion.
Round 2

Question No. 2

In what year will the motor transport middle manager's current knowledge of the work of governmental regulatory agencies be insufficient for the performance of his job?

Median of previous responses

Mid-range of previous responses

Your previous response

Your new response

I have no views regarding this question, and decline to answer.
Round 2

Respondent ________________

DELPHI PANEL ON THE CHANGING SKILLS OF MIDDLE MANAGERS IN MOTOR TRANSPORTATION

Question No. 3

In what year will the motor transport middle manager's current ability to justify rate changes be insufficient for the performance of his job?

Median of previous responses ______

Mid-range of previous responses ______

Your previous response ______

Your new response ______

I have no views regarding this question, and decline to answer ______.
Question No. 4

In what year will the motor transport middle manager's current knowledge of the methods of handling materials be insufficient for the performance of his job?

Median of previous responses ______

Mid-range of previous responses ______

Your previous response ______

Your new response ______

I have no views regarding this question and decline to answer ______.

If your new response lies outside the mid-range given above, please explain why your view differs from the majority opinion.
Round 2

Respondent __________________

DELPHI PANEL ON THE CHANGING SKILLS OF MIDDLE MANAGERS IN MOTOR TRANSPORTATION

Question No. 5

In what year will the motor transport middle manager's current knowledge of alternative modes of transportation be insufficient for the performance of his job?

Median of previous responses _____

Mid-range of previous responses _____

Your previous response _____

Your new response _____

I have no views regarding this question, and decline to answer _____.

If your new response lies outside the mid-range given above, please explain why your view differs from the majority opinion.
Question No. 6

In what year will the motor transport middle manager's current ability to relate the company's activities to the total social environment be insufficient for the performance of his job?

Median of previous responses _____

Mid-range of previous responses _____

Your previous response _____

Your new response _____

I have no views regarding this question, and decline to answer _____.
DELPHI PANEL ON THE CHANGING SKILLS OF MIDDLE MANAGERS IN MOTOR TRANSPORTATION

Question No. 7

In what year will the motor transport middle manager's current competence in achieving economy and effectiveness within the area of his responsibility be insufficient for the performance of his job?

Median of previous responses _____

Mid-range of previous responses _____

Your previous response _____

Your new response _____

I have no views regarding his question, and decline to answer _____.
Materials Submitted to the Delphi Panel in

ROUND #3
October 9, 1971

Mr. G. Browning, Jr., President
Silver Wheel Freight Lines, Inc.
1321 SE Water Avenue
Portland, Oregon

Dear Mr. Browning:

Thank you very much for your reply to Round No. 2 of the panel questionnaire. Round No. 3 is enclosed. You will find the format different, but concerned with the same seven topics.

A summary of comments made by various panel members is also enclosed. Will you read the arguments, giving them whatever weight you feel they deserve, before answering the question?

In as much as I am approaching a deadline, I would appreciate an early return of the forms.

Sincerely,

David J. Mair

DJM/clm
Enclosures
DELPHI PANEL ON THE CHANGING SKILLS OF MIDDLE MANAGERS IN MOTOR TRANSPORTATION

Note: It is the purpose of this round of questioning to obtain your judgment of the current adequacy of middle managers in the seven skills (or areas of knowledge) that were identified previously. By way of example, if it is your opinion that middle managers should know a great deal about, let us say, finance—including whatever might come under that heading—and you also feel that middle managers, by and large, already know almost all that they need to know about such things, then you might fill out the sample question in the following manner:

Sample Question

The middle manager's current knowledge of Finance represents what percentage of the total that he ought to know? _____%

Question No. 1

The middle manager's current knowledge of automated data processing represents what percentage of the total that he ought to know? _____%

I have no views regarding this question and decline to answer _____.

Question No. 2

The middle manager's current knowledge of the work of governmental regulatory agencies represents what percentage of the total that he ought to know? _____%

I have no views regarding this question and decline to answer _____.

Question No. 3

The middle manager's current ability to justify rate changes represents what percentage of the total that he ought to know? _____%
Round 3

Question No. 3 (continued)

I have no views regarding this question and decline to answer _____.

Question No. 4

The middle manager's current knowledge of the methods of handling materials represents what percentage of the total that he ought to know? _____% 

I have no views regarding this question and decline to answer _____.

Question No. 5

The middle manager's current knowledge of alternative modes of transportation represents what percentage of the total that he ought to know? _____% 

I have no views regarding this question and decline to answer _____.

Question No. 6

The middle manager's current ability to relate the company's activities to the total social environment represents what percentage of the total that he ought to know? _____% 

I have no views regarding this question and decline to answer _____.

Question No. 7

The middle manager's current competence in achieving economy and effectiveness within the area of his responsibility represents what percentage of the total that he ought to know? _____% 

I have no views regarding this question and decline to answer _____.
DELPHI PANEL COMMENTS ON QUESTION NUMBER 1, 
CONCERNING THE CHANGING SKILLS 
IN AUTOMATED DATA PROCESSING

If middle management is not sufficiently aware of what to expect or demand of their data processing department they will receive what information the data processing manager feels they should have, which in many cases is not sufficient or is completely different that what they expected to receive.

Even at the top management level knowledge of data processing is now very limited.

The larger motor carriers are presently using computer and data processing programs. Middle managers are involved only on a limited basis now, but must have a greater knowledge of this field in the next decade. Small carriers will soon become equipped and utilize this technology as it becomes economically feasible.

The level of competency and the job requirements will vary from company to company. Among the more technologically advanced carriers, the need for increased information about EDP will occur very soon.

A greater knowledge of data processing and computer technology would be desirable now but with the progress being made in applying these processes to the Transportation Industry, middle management will have to have a more complete understanding of these matters by 1973.

Most middle managers today are able to keep up with current requirements by self-help and education. The rapid development of data processing and computer technology requirements may catch up and find sadly unprepared most middle managers, however, within a short time.
DELPHI PANEL COMMENTS ON QUESTION NUMBER 2, CONCERNING THE MIDDLE MANAGER'S LEVEL OF KNOWLEDGE OF GOVERNMENTAL REGULATORY AGENCIES

Middle managers can maintain a satisfactory level of competence by keeping up with legislative changes.

De-regulation is being mentioned on both the federal and state levels. In the past 10 years, there has been very little change in the regulations under which the transportation industry operates. However, any form of de-regulation could severely hinder the common carriers' ability to meet competition and still provide protection to the shipping public. Unless the middle manager is familiar with both current and proposed changes in regulation he will have a difficult time reaching a sound decision on long term programs.

Regulations are so complex now it is difficult to comprehend them completely.

The new DOT safety regulations require considerable learning in particular.

The knowledge of management in this area is at a present level of understanding that is impossible. This is one area that immediate attention is necessary.

The numerous changes in the regulatory policies of the ICC, FMC, DAB, DOT, etc., must be kept abreast of on a weekly or even daily basis if middle management is to perform satisfactorily. In other words, what the manager knows today may not be sufficient to cope with tomorrow's changes.

There is insufficient knowledge of regulatory agencies and governing regulations at present.

The current level of knowledge of the work of regulatory agencies will remain sufficient in the future, however, it is becoming rapidly more difficult to keep abreast of the regulations and to implement them in a satisfactory manner.
DELPHI PANEL COMMENTS ON QUESTION NUMBER 3, CONCERNING THE MIDDLE MANAGER'S LEVEL OF EXPERTISE IN JUSTIFYING RATE CHANGES

Middle management is competent to keep pace with additional requirements of data in justification of rate increases. If new approaches to rate making are required by regulatory bodies, then middle managers have the capability of meeting the challenge.

In the past the motor carrier industry has relied heavily upon tariff bureau personnel to develop studies to submit to the regulatory agencies to justify rate increases. The industry has been falling behind in obtaining only labor offset increases, often months after a contract increase. The bureaus now must request more sophisticated information requiring many man hours to develop. Most class I and some class II carriers have gone to computers to meet the deadlines for requested data and also have the capabilities to project and submit up-to-date data.

Very few if any middle managers really know how to construct their costs—they rely on Tariff Bureaus to accumulate data.

Bureau rate staffs are alert to changing requirements and adjust competently to them.

With each dat, the need for sophisticated rate making is evident. Unless the transportation industry is willing to deal with this problem immediately, the future holds major problems. The regulatory agencies are now requiring greater detail with each revenue case and the ability of the industry to provide this information is very doubtful.

Rate increases are inextricably interwoven with labor increases. The ICC and various PUC's have established certain operating cost criteria which must be submitted to the regulatory bodies as justification for requested general rate increases. Accordingly, the carriers must maintain a continuous cost analysis program. However, most of these programs are established by the tariff publishing bureaus, acting for all carriers involved. This leaves little or no policy-making in this field to most middle management of the individual firms.

There is an increasing demand upon managers in the area of rates and rate structures. In the face of rising costs and keep competition, only freight rates can compensate for these changes. Establishment and justification of rates is a very important phase of a manager's responsibility.
Middle managers must be aware of transportation costs and their influence on rates. However, top management is usually where rate decisions are made and where fully allocated costs are analyzed.

Most middle managers are not at an acceptable level of expertise, at the present time, in justifying rate changes. More recently the demands and requirements by regulatory agencies, have become increasingly burdensome and middle managers as a whole have neither appreciated the need for expertise in this field nor have they developed such talent.
DELPHI PANEL COMMENTS ON QUESTION NUMBER 4, CONCERNING THE MIDDLE MANAGER'S LEVEL OF KNOWLEDGE OF HANDLING MATERIALS

At the present time the industry is in trouble in the handling of LTL freight. Our present cost is approaching .13 per minute and the industry has faced strong opposition from the public to obtain an increase in size and weight of equipment. The Terminal Operators Council of the American Trucking Association, devotes most of its time to try and find better ways to move goods both over the road, and across the dock. Drag lines help to some extent but also add problems. Dock carts work for some companies and not for others. The present labor contract must be changed to eliminate restrictions that prevent many good ideas from being put into effect.

More labor saving devices are needed now!

Six more years of wage increases will require new methods.

Carrier management in general is well informed on operational technologies.

This is an area in which progress is being made by the industry and middle managers are equal to the task for at least 10 years.

There has been a relatively slow rate of growth in mechanical handling innovations during the past ten years. Also, the factor of organized labor's resistance to mechanical handling must be considered.

Our present level of knowledge could quite rapidly become insufficient unless we can invent, accept, and encourage change in freight handling methods.

Motor carriers as a whole are lagging in innovating better ways of handling freight. New ideas should be developed by middle management since these are the people who work most with freight handling on a daily basis. Some background in industrial engineering would be helpful for middle managers.

Middle managers, in comparison with top management, may not now be sufficiently informed or concerned with this need for vast improvements and break throughs in materials handling methods. Indeed, this may be a growing problem with top management which will show an effect upon the success or failure of many operations.
DELPHI PANEL COMMENTS ON QUESTION NUMBER 5, CONCERNING THE MIDDLE MANAGER'S LEVEL OF KNOWLEDGE OF ALTERNATIVE MODES OF TRANSPORTATION

There has been significant progress in the past five years in the movement of goods between different modes of transportation. The railroad piggy-back, inter-modal containers, interchange of equipment, have all helped speed up the movement of freight between different carriers. Even between countries there has been an improvement. The recent agreement between the U.S., Canada and Europe in use of the T.I.R. carnet to allow goods to move over borders without delay has been a big step. Middle management must stay aware of these continual changes and take advantage of the opportunities they afford.

The arena of intermodal competition, for a given manager, is relatively limited. A general knowledge is not now an operational necessity.

This problem must first be dealt with on a regulatory level before industry can deal with it. However, the knowledge of top and middle management of other modes of transportation is extremely insufficient. If and when all modes of transportation are put under one regulatory head, then industry can deal with the problem.

It is currently critical for the middle management of the medium and large size carrier to have a good working knowledge of physical distribution and inter-modal transportation, both from the operation and solicitation point of view. The small carrier management may never need to be proficient in this field.

Much delay is now experienced by shippers and consignees where multiple modes of transportation are necessary to get their goods to market. Much more needs to be done in the way of interchangeability of equipment communication between modes, customer information availability, simplifying of paperwork etc. Middle managers should help solve these problems and be conversant with the solutions that some carriers have advanced on individual problems.

Middle managers should now have some sophisticated understanding of all transport and distribution systems and particularly the possibilities available to his operation in fulfilling a smoother and more important function within total distribution. It seems that many middle managers within the field are both unconcerned and uninformed, thus blind, to the overall concepts and possibilities, as well as developing requirements in the distribution of goods - perhaps the best and most accurate word to use, in this context, is ignorance.
DELPHI PANEL COMMENTS ON QUESTION NUMBER 6, CONCERNING THE MIDDLE MANAGER'S ABILITY TO RELATE THE COMPANY'S ACTIVITIES TO THE TOTAL SOCIAL ENVIRONMENT

We recently went through a serious period with regard to minorities and their employment opportunities. Unless some major changes take place within the next two years, we will once again face a critical period. Managers will have to devote more time in the future to the society in which we live and learn to understand the people they deal with.

Rapidly changing total social environment will require broader knowledge by managers in the near future. Only by adapting new standards can transportation companies retain respect in the business community.

Most middle managers have the expertise to cope with environmental and social problems, however, a good many lack empathy for the problems. There is a need for more awareness and social conscience but the know-how (within current technological limits) is now available in middle managers.

Most middle managers should, like top management, become increasingly aware of social and community needs. If such individuals do not have such awareness, and would not relate their own company's activities to the total social environment at this time, such middle managers would currently not be at an acceptable level. However, it is expected that these personnel will never be insufficient on this measurement.
More competition with de-regulation would create more problems than it would solve. The additional route authorities in the airline industry shows on a smaller scale what could happen on the financial level. In the past our company has been able to find ways to economize but in the past few years our ideas have met head on with contract restrictions, initial cost to put the ideas to work, tight money problems, etc. We are now facing the need for new competence in this area.

It is most obvious that industry is now in trouble and that the need for economy and effectiveness within the area of responsibility of not only middle management but top management is insufficient.

The future of transportation as we know it lies in whatever changes may be made in our federal or state regulatory systems. Competition is lessening rather than growing due to the great power wielded by the various rate-making bureaus who, in turn, are controlled by the strongest carriers. A change in regulatory policy, for example, that would allow "free entry" into the trucking field would require all middle management to increase the efficiency of their operations immediately. No change would enable them to continue indefinitely "as is".

Apparently the lack of knowledge has already been insufficient in a growing number of cases. Unless managers start immediately to "manage" their operations the competence of their companies will deteriorate. The need for economy and effectiveness is critical now.

Many carriers are in financial trouble today due to middle managements inability to control costs and achieve greater production. The carriers that do survive and grow will do so based on their ability to achieve greater productivity and reduced costs without having to look to increased freight rates as the solution to financial woes. Greater expertise in the areas covered by questions 1, 4 and 5 will help control costs and make carriers more competitive. More awareness in the areas covered by questions 2 and 6 will help to achieve harmony between regulatory agencies dealing with environmental, social and economic problems.

There is considerable competition between carriers and between modes and, of greater significance keen competition between increasing costs and the possibilities of growing inefficiencies vs. the need for greater efficiency, economies, and improved operating methods and procedures. It is doubtful that middle managers are at this time up to a desirable degree of competence.
Materials Submitted to the Delphi Panel in
ROUND #4
November 24, 1971

Mr. Roy N. Gaussoin  
Silver Eagle Company  
5885 NW St. Helens Road  
Portland, Oregon

Dear Mr. Gaussoin:

The fourth and final round of questions relating to motor freight transportation is enclosed. I want to thank you very much for your viewpoints and opinions of changes taking place within the industry, and how these changes are likely to affect the future skill requirements of middle managers.

You will, of course, receive a summary of the study, including any recommendations based upon it, as soon as the process has been completed.

Sincerely,

David J. Mair  

DJM/clm  
Enclosures
Question 1

Within the motor freight transportation industry, seven broad areas of continuing change have been identified. Each of these areas of change can be associated with a set of skills or competencies which middle managers presumably will require if they are to perform their tasks in a satisfactory manner -- now and in the years ahead.

There are several different ways in which a general lack of knowledge, or deficiency of skill, might be corrected. On the following page I have listed a number of alternative approaches which the industry might possibly take in preparing middle management for the changes which are taking place. Please indicate the method(s) you believe would best apply to each of the competencies by placing the numbers corresponding to those method(s) in the space provided beside each competency.

If you choose to list more than one method for a given competency, please rank the methods in the order of their importance (most important to the left).
<table>
<thead>
<tr>
<th>Method</th>
<th>Competency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Adoption of hiring policies which would tend to bring more highly qualified recruits into the entry level jobs of the firm, or into the executive training programs.</td>
<td>Knowledge of automated data processing.</td>
</tr>
<tr>
<td>2. Discharge of individuals with particularly low levels of competency, replacing them with others whose skills are more highly developed.</td>
<td>Knowledge of the work of governmental regulatory agencies.</td>
</tr>
<tr>
<td>3. Job restructuring, so that the requirements of each position will more nearly correspond to the talents of the middle manager holding that position.</td>
<td>Ability to justify rate changes.</td>
</tr>
<tr>
<td>4. More extensive use of expertise from outside the company, such as consulting firms, business service organizations, professional associations, government offices, universities, etc.</td>
<td>Knowledge of the methods of handling materials.</td>
</tr>
<tr>
<td>5. Establishing new, or strengthening existing professional membership organizations or associations which could then provide the specialized expertise necessary.</td>
<td>Knowledge of alternative modes of transportation.</td>
</tr>
<tr>
<td>6. Company training programs.</td>
<td>Ability to relate the company’s activities to the total social environment.</td>
</tr>
<tr>
<td>7. Making more extensive use of associate, baccalaureate, graduate or other “degree” programs offered by educational institutions as a means of upgrading new entrants to the field.</td>
<td>Ability to achieve economy and effectiveness.</td>
</tr>
<tr>
<td>8. Institutes, seminars or other short courses, dealing with general, or specific problems, and offered frequently for the purpose of bringing the latest information and concepts to the attention of middle managers.</td>
<td></td>
</tr>
<tr>
<td>9. Specialized training programs, more extensive than institutes but less extensive than degree programs, conducted by public or private educational institutions and offered at times convenient for middle managers to attend.</td>
<td></td>
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</tbody>
</table>
Question No. 2

Will you help me define more specifically the skills or understandings which are, or will be, required of middle managers in the light of changes which you anticipate in the motor freight industry? The seven broad areas of change are listed on this and the following pages. Please indicate the special abilities or skills that the manager needs in order to be competent in each area.

Some suggestions are given. Make any comments regarding each or any of them (just a "yes" or "no" will help) and add any further suggestions which you feel are appropriate.

A. Automated Data Processing:

Application of computer techniques.

Collection, assimilation and analysis of relevant information.

Communication of A.D.P. terminology intelligibly.

Computer languages.

Potential uses of A.D.P.

Costs and benefits of A.D.P.

Systems and procedures.

B. Governmental Regulatory Agencies:

Knowledge of law.

Procedures before agencies, rule of evidence in hearings.
Current changes and changes in prospect.

Compliance procedures.

Knowledge of operating authority.

C. The Justification of Rate Changes:

Cost accounting.

Rules of evidence.

Economic conditions.

Preparation of exhibits.

Analysis of statistical data.

Economics of transportation costs.

Rate making procedures.

Demand analysis.

D. New Methods of Handling Materials:

Capital budgeting.

Warehouse and terminal layout.

Organization of facilities.
Accounting methods.

Time and motion studies.

Alternative methods.

Material handling equipment.

Vehicles and trailers.

E. The Relationship of Motor Freight Transportation to Other Methods of Transportation:

Competitive positions.

Transport economies and comparative advantages.

Regulatory policies of Federal government.

Regulatory policies of State government.

Motor transport technology.

Other transport technology.

Impact of total cost of distribution.

F. Relating the Company's Activities to the Total Social Environment:

Social issues in general.

Sensitivity to, or awareness of, cultural differences and human needs.
Impact of the motor carrier industry on---
urban congestion
environmental decay.
minority hiring.
skilled employment market.
safety practices.
support for community betterment.

Public speaking, public relations.

G. Achieving Economy and Effectiveness:

Management practice.

Organization and planning.

Budgeting and control.

Employee supervision, in-plant training, evaluation.

Management education.

Methods analysis and work simplification.

Maintenance planning and control.

Equipment replacement policy.

Management and labor relations.
Question No. 3

The panel has established that changes are taking place in the following seven areas. However, it seems unreasonable to presume that the rate of change will be equal in all areas. Will you take a few moments to rank them in the order in which change is likely to take place? Write the numeral "1" after that area in which you see the most rapid change occurring, "2" after that area in which you see the next most rapid change occurring, etc. Make sure you rank all items.

1. Increased use of computer technology in the processing of data, and the making of management decisions.
2. Changes in the posture of federal, state and local governments regarding regulation of the motor freight industry's activities.
3. The demand for ever increasing levels of sophistication in justifying rate changes.
4. The development of new equipment and technologies for handling materials.
5. Increasing involvement and interaction between motor freight transportation and the various other modes such as water, air and rail.
6. Changes in the social and environmental priorities of the nation as they affect the motor freight industry.
7. The increasing demand for efficiency and effectiveness in the utilization of the resources of a firm, the search for cost-cutting methods, reduction of waste and better application of managerial talent.
Question No. 4

An analysis of previous responses from the panel yields certain data concerning the future skill requirements of middle managers in the motor freight transport industry. In this fourth round of questioning, would you please give your final answers to the questions. You will notice that the wording has been altered slightly. After reflecting on the changes which you see occurring in the industry, now and in the future, will you give your final reply.

<table>
<thead>
<tr>
<th>Question</th>
<th>Previous responses from the Delphi panel</th>
<th>Your Final Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>In what year will the motor freight middle manager's knowledge of the work of governmental regulatory agencies become obsolete?</td>
<td>1973, 1972-73</td>
<td></td>
</tr>
<tr>
<td>In what year will the motor freight middle manager's ability to justify rate changes become obsolete?</td>
<td>1973</td>
<td></td>
</tr>
<tr>
<td>In what year will the motor freight middle manager's knowledge of alternative modes of transportation become obsolete?</td>
<td>1973, 1973-74</td>
<td></td>
</tr>
<tr>
<td>In what year will the motor freight middle manager's ability to achieve economy and effectiveness in the area of his responsibility become obsolete?</td>
<td>1974, 1973-75</td>
<td></td>
</tr>
<tr>
<td>In what year will the motor freight middle manager's knowledge of computer technology and automated data processing become obsolete?</td>
<td>1975, 1973-75</td>
<td></td>
</tr>
<tr>
<td>In what year will the motor freight middle manager's ability to relate his company's activities to the total social environment become obsolete?</td>
<td>1975, 1974-75</td>
<td></td>
</tr>
<tr>
<td>In what year will the motor freight middle manager's knowledge of methods of handling materials become obsolete?</td>
<td>1979, 1976-80</td>
<td></td>
</tr>
</tbody>
</table>
Question No. 5

This question is the same as round #3, except that you are now provided with "feed-back" in the form of the previous results. For each item, the median and the mid-range are given from round #3, together with your previous answer. Will you give whatever weight, or consideration you wish to the previous results, and then write your final answer in the space provided.

<table>
<thead>
<tr>
<th>Item</th>
<th>Median</th>
<th>Mid-range</th>
<th>Your Previous Answer</th>
<th>Your Final Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>The middle manager's current knowledge of automated data processing represents what percentage of the total that he ought to know?</td>
<td>33%</td>
<td>10% to 50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The middle manager's current knowledge of the work of governmental regulatory agencies represents what percentage of the total that he ought to know?</td>
<td>60%</td>
<td>50% to 75%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The middle manager's current ability to justify rate changes represents what percentage of the total that he ought to know?</td>
<td>50%</td>
<td>30% to 60%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The middle manager's current knowledge of the methods of handling materials represents what percentage of the total that he ought to know?</td>
<td>75%</td>
<td>50% to 80%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The middle manager's current knowledge of alternative modes of transportation represents what percentage of the total that he ought to know?</td>
<td>60%</td>
<td>40% to 75%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The middle manager's current ability to relate the company's activities to the total social environment represents what percentage of the total that he ought to know?</td>
<td>50%</td>
<td>50% to 70%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The middle manager's current competence in achieving economy and effectiveness within the area of his responsibility represents what percentage of the total he ought to know?</td>
<td>70%</td>
<td>50% to 75%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B
SUMMARY OF RESPONSES TO INTERVIEW QUESTIONS ASKED OF FOUR AREA COMMUNITY COLLEGE VOCATIONAL DEANS

Question #1 (Show table 10)
"In the field of motor freight transportation, seven anticipated changes were identified. Would it be useful to an advisory committee, in dealing with the development of a curriculum in this field, to have such a list before it for consideration?"

Answers:
R.K. "Yes, it would be of extreme value, in all occupational areas. For example, in the automotive curriculum it is not now clear just what power plant will be dominant a few years from now--piston, rotary, turbine or something entirely different. There seems to be no agreement at all among the so-called experts. Many thousands of dollars could be saved in equipment costs alone if we know which direction to take.

"I think the local advisory committee would tend to accept such a list, but not if the information diverged too much from the major opinion of the committee members."

L.D. "Such a list would be very interesting. However, I think it would have to roughly parallel the views of the committee if they were to accept it."

J.M. "A list like this would do a great deal to stimulate discussion. It would also help the committee to think in terms of future change, and that is needed. However, the items on the list would have to be interpreted. For example, our transportation and distribution program at Mt. Hood probably would not require public speaking, in order to meet future requirement. Our t. and d. students will not
be high enough in management for some time to be called upon to relate the concerns of their firms to the general public. By the time they reached that level, they would have had plenty of time to take such a course as part of their continuing education need."

E. C. "Our advisory committees are made up of representatives of different business firms, and very often they have slightly different viewpoints--a list like this might help a great deal in getting them off on a good start. It might help to get them to see things in a similar way. If nothing else, it might reduce the time wasted in considering widely divergent views, and in that way speed up the process of decision making and curriculum development."

Question #2 (show table 10 again)

"Although the process of reviewing relevant literature will generate a list of expected changes, it seems reasonable to presume that the rate of change in the various areas would be different. Table 10, which you have been looking at, ranks the areas of future change in declining order of their rates of change. Would it be of value to a committee to have the list of changes in such order?"

Answers:
R. K. "I really can't see that it would be of much help to have the rate of change."

L. D. "Not much."

J. M. "I think we would have to try it out on a committee before we could tell just what use could be made of it. It does seem that the rate of change would be helpful, that is, knowing which changes were the most imminent. But just how this knowledge could be used
in curriculum planning—well, I'm not sure. Maybe it would have more value in setting up part-time courses, and I've really been thinking in terms of preparatory programs in all of my previous remarks."

E. C. "Each projected change is going to have a slightly different effect on curriculum. Giving the rate of change would help curriculum people—an advisory committee or others—zero in on these areas of greatest and most immediate import."

Question #3 (Show table 11)
"In this table the current, or present, competency of middle managers is shown. You will note that the lowest level of competency relates to the manager's knowledge of automated data processing. This means that the panel of experts considered middle managers to be less knowledgeable, less capable in this field than in any other area under consideration. The other competencies follow, in rising order, until we reach the highest level of competency, which relates to the middle manager's current knowledge of the methods of handling materials.

"Do you think that such a list would be of value to a curriculum advisory committee?"

Answers:

R. K. "I think there might be some difficulty with the word "competency"—perhaps "knowledge" would be a term easier for a committee to deal with and understand.

"This would be very valueable information to have, but I think the local committee could arrive at this by themselves—that is, I think the committee is sufficiently familiar with the various "levels of competency" among workers in their local area so that they could
arrange a list of skills, or areas of knowledge, in the order of "competency level" without any help from a panel of experts. Actually, this is what they do, when they consider the needs of workers in their area."

L. D. "I should think it would be valuable, especially since it builds on the previous information gathered. This information gives a balance to everything, it provides a take-off point for the committee to consider curriculum needs. Of course, the local committee members probably already have a pretty good, pretty general idea of the capability of workers in the community. After all, we select the members of the committee on the basis of their familiarity with the business community."

J. M. "It goes without saying that we need to have the current level of competency of workers before we try to set up a training program, and if we had the data organized as it is in this table we would have a systematic basis for making our decisions. That is really what we need as much as anything--a more systematic basis for curriculum development. We also need additional inputs, more research, so we don't have just the opinion of a local advisory committee. This table of current competencies would provide something extra, it would make me feel more comfortable about committee recommendations, if local people were in general agreement with an outside panel of experts. We would still use a local committee, of course, and we would rely on what they had to say."

E. C. "This would definitely be of value. It would help initiate a discussion, and it would give the committee members a good starting point. I suspect a committee would have no difficulty accepting such data, if they did disagree, we would probably have to go along
with the committee. Of course, if the data were sufficiently well supported, then we might have to reassess that position, and perhaps alter the committee make-up so that it would reflect the view of a Delphi panel. I suppose it's all a matter of evaluating trade-offs, but our inclination would always be to go with the local committee, putting the onus on the experts to prove that they were right."

Question #4 (Show table 12)
"In this table the panel indicates the year in which the current level of competency of middle managers in motor freight transportation would be inadequate for the satisfactory performance of their jobs. Do you think it would be helpful to you, or to a local curriculum committee, to have this information for each competency or area of knowledge?"

Answers:
R. K. "It would be very valuable, if it could be done, and if the committee could be sure of the validity of the study. I know I wish I had this information for every occupational area that we cover in the whole school. It would help me a lot in the major decisions that I have to make, decisions that relate to program development—which occupational areas to offer instruction in, where to place the greatest emphasis, when to start up a new program—that sort of thing."

L. D. "Yes this is a new approach, and very intriguing. It would probably result in a lot of discussion among committee members, but it might not get much agreement. I suppose there is a difference in the competencies needed by individuals and the competencies that are needed, or desired, by the industries in which they work. This fact might result in some difference of opinion, but I still feel it would be very valuable to have the consensus of a panel."

J. M. "It would be very valuable to have the year of obsolescence of the most important skills, or knowledge, but I really feel that it would
be more important to the whole problem of job shifting, and to occupational upgrading, rather than the initial preparation of workers. I can see where it would be of extreme value to program planners in scheduling short-term courses, or in extending the expertise of the community college to local employers, and helping them with their training needs. I can see, also, how this information would have many implications for specialization; it would also help us in planning our future staffing needs. There is almost no end to the ways in which this kind of information would be useable. However, it would have to be more reliable as a predictor of the future than a mere guess. If an administrator were wrong very often when relying on this kind of data, then I'm afraid he would just quit using it."

E.C. "Knowing when the worker's capability will become obsolete would be of the greatest value in developing occupational supplementary courses. This sort of information would be much more valuable to administrators, I think, than to an advisory committee. That's partly because an advisory committee could judge this to some degree for themselves. It would be very helpful to a vocational director in showing where the market lies; of course, right now we are not in any financial position to expand into other areas, and I suppose other schools are in a similar position of financial difficulty, but in more normal times I would find this data very, very interesting. At first look, it might appear a bit 'iffy', since the data depends on presupposing certain things, but if this were shown to a local committee, and the local committee agreed that the data would apply to our local area, then I could use it as a major source of input data for decision making, for deciding which areas to move into, and in what order."

Question #5 (show tables 13-19)

"The following tables attempt to define more specifically the
competencies which have been under discussion. Would it be helpful to have broad competencies defined in more specific terms?"

Answers:
R. K. "Yes, it would be most helpful--perhaps even necessary--to have any broad area of knowledge defined in such a way that every committee member knew exactly what was meant. Otherwise a great deal of confusion might result and the value of a projection would be negated."
L. D. "If the committee is concerned with the specifics of a curriculum, then obviously it would be essential that each broad area be defined."
J. M. "It would be absolutely essential to have a breakdown of all the broad areas--very necessary to specify just what is meant, or included as part of each subject area. For example, data processing might be necessary, but not programming, and it would be critical that we know what the Delphi panel referred to when they spoke of automated data processing."
E. C. "This would be absolutely necessary, as I pointed out in some of my previous remarks. In fact, all the information you have shown would have much less specific value for curriculum purposes, if the local advisory committee was agreed on the broad areas, then fell to quarreling among themselves regarding the specifics that were implied."

Question #6 (Show tables on pages 20-26)
"Would it be helpful to a curriculum committee to have the consensus of a Delphi panel regarding alternative ways in which to reduce the discrepancy between actual and needed competencies?"

Answers:
R. K. "I can't see how this would be of much help. It's the job of the
committee, working with the curriculum director, to advise the school regarding just what help the industry expects from the school. A committee probably would not pay much attention to the opinion of a Delphi panel on this kind of question."

L. D. "A list like this would be good to show to the committee, to help them in their deliberations. The list would be helpful, but I don't think the committee would need, or want, the opinion of the Delphi panel. The committee might think that something was being thrust upon them and resent it, or they might be unduly influenced by it. At any rate, the views of the experts would not contribute very much, in my opinion."

J. M. "This sort of information might be highly desirable to top management in the industry. Certainly it would give them some initial direction to take, it would help square them away, in their planning. However, I don't think it would be helpful to a school, since the school is already committed to their approach—an educational approach—to solving the problem of changing skill requirements."

E. C. "I think this data would be most useful to administrators, and it would show committee members that other alternatives are available. As you probably know, advisory committees tend to put more reliance on schooling as a means of solving industry's problems than is at all warranted by our past success. Now, this information would show me where the competition is—it would also be helpful in making a sales pitch, in promoting our services to industry and the business community."
J. A. Bates, District Manager
Pacific Motor Trucking Company
1830 S. E. Schiller
Portland, Oregon

Larry Benedict, Safety Director
Widing Transfer
10145 N. Portland Road
Portland, Oregon

W. W. Brazelton, District Manager
Puget Sound Truck Lines, Inc.
10031 N. Vancouver
Portland, Oregon

G. Browning, Jr., President
Silver Wheel Freight Lines, Inc.
1321 S. E. Water Avenue
Portland, Oregon

Leonard Clark
Holman Transfer Company
1221 S. E. Water
Portland, Oregon

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Trans Western Express
5940 N. Basin
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Commonwealth Building
421 S. W. 6th
Portland, Oregon
Mr. James O. Nelson  
Rollins-TER  
525 S.W. Pine  
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Don Osbjornson  
Lamb-Weston, Inc.  
6600 S.W. Hampton  
Portland, Oregon

M.C. Risser, Consultant  
Paul Hoschelle Associates  
Terminal Sales Building  
Portland, Oregon

Jack Stewart, Consultant  
Willamette Tariff Bureau, Inc.  
1444 S.E. Hawthorne Boulevard  
Portland, Oregon

Norbert Trudeau, President  
Green Transfer and Storage Company  
2425 N.W. 23rd Place  
Portland, Oregon

Mr. Earl V. White, Attorney at Law  
Farley Building  
2400 S.W. 4th  
Portland, Oregon

Robert Wilhelm, Jr.  
Wilhelm Trucking Company  
3250 N.W. St. Helens Road  
Portland, Oregon
### Vocational Deans Interviewed

As part of the study

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<tr>
<th>#</th>
<th>Name</th>
<th>Position</th>
<th>Institution</th>
<th>Location</th>
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<tr>
<td># 1</td>
<td>Ron Kaiser</td>
<td>Dean of Occupational Education</td>
<td>Clackamas Community College</td>
<td>Oregon City, Oregon</td>
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<tr>
<td># 2</td>
<td>Lewis Douglas</td>
<td>Chairman, Department of Business Education</td>
<td>Portland Community College</td>
<td>Portland, Oregon</td>
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<tr>
<td># 3</td>
<td>Jack Miller</td>
<td>Dean of Vocational Education</td>
<td>Mt. Hood Community College</td>
<td>Gresham, Oregon</td>
</tr>
<tr>
<td># 4</td>
<td>Elton Chase</td>
<td>Associate Dean of Occupational Education</td>
<td>Clark College</td>
<td>Vancouver, Washington</td>
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