EXPERIMENT 1

Experiment 1 had three goals. The first was to find out the pattern in the Motivation x Ability effect on judgment by managers. The second was to compare the obtained pattern with the pattern shown by college teachers. The final was to check on diagnostic power of the manipulation of information reliability (Surber, 1981a; Singh, in press) as tool of model diagnosis versus presence of two initial opinions in judges (Singh & Bhargava, 1984a, 1984b).

Method

In the experiment, a group of 22 senior managers predicted the performance of supervisors. To bring out the effect of role on choice of integration rule, a comparable group of college teachers also participated in the experiment. As already noted, the manipulation of information reliability was done to find out the presence of two initial opinions in judges. This manipulation was done to further check whether managers and teachers differ in information integration or information processing.
Stimuli and Design.

The stimulus persons were described as technical supervisors. To make the task meaningful to college teachers, the stimulus persons were described as technical supervisors in different laboratories of the college.

Descriptions of stimulus persons were typed on index cards. Each card carried information about motivation, source of motivation information, ability, and source of ability information. These descriptions were prepared from a $3 \times 3 \times 3 \times 3$ factorial design.

Motivation was defined as willingness to do well in the supervisory job. Motivation information had seven verbal levels: Extremely low, very much below average, below average, average, above average, very much above average, and extremely high. Ability was defined as capability (intelligence) of supervisors. It had the same levels as the motivation information. The three levels of both motivation and ability used in design were: Very much below average (VBA), average (AV), and very much above average (VAA).

The motivation information about the stimulus supervisors came from their immediate boss. The
length of contact between the boss and supervisor was expected to affect the reliability of motivation information. The length of contact had five levels: 1 Hour, 1 Day, 3 Months, 3 Years, and 4 Years. Of these, the middle three levels were used in the design.

The ability information came from the tests conducted at the time of selecting the supervisors. Reliability of ability information was manipulated by varying the duration of the tests conducted for different supervisors. This had five levels: 15 Minutes, 1 Hour, 1 Day (5 Hours), 2 Days (10 Hours), and 3 Days (15 Hours). The middle three levels were used in the design.

The design produced 81 stimulus supervisors. In addition, 9 end anchor profiles based on extreme values of motivation, ability, and information reliability were prepared. This made the number of profiles 90. The 9 end anchor profiles and 6 from the main profiles formed a set of 15 practice examples.

Procedure

Each subject was run individually. During the period of experiment, no external interference was allowed.
Written sheets of instructions introduced the task to the subject. The instruction urged the subject to predict job performance of supervisors on basis of information about their motivation and ability. It was emphasized that information about motivation and ability were not always highly credible. Information has been obtained through different sources (contact, tests) which varied in their accuracy and reliability. It is important, therefore, to consider not only the value of the information but also the dependability of the source.

After the subject finished reading the instruction sheet, the task was described to him with the help of the blackboard. The seven levels of ability and motivation information and the five levels of motivation reliability and ability reliability were written on the blackboard. The response scale for prediction of performance was a 21-step ladder. A sketch of this ladder was also put on the blackboard.

The subject first rated the 15 practice examples. After the end of practice, subject was asked to remove any doubt about his task and his role. After the subject understood the task, he rated the main set of 90 cards two times in different shuffled orders. On
both occasions, the subject wrote the code number of the stimulus supervisors and his judgment of their job performance on the response sheet. The experiment lasted for 1 hour 30 minutes. Data from both the replications were analyzed.

After the subject finished the ratings, he was broadly informed about the purpose of the research. He was also thanked for his cooperation.

Subjects

Twenty-two managers attending the advanced program in personnel management and industrial relations at the Indian Institute of Management, Ahmedabad constituted the managerial group of the experiment. Twenty-two professors from the Lalbhai Dhanpatbhai College of Engineering, Ahmedabad constituted the group of professors. Subjects volunteered to participate in the experiment in response to an appeal by the program coordinator or the college principal.

Both groups of subjects consisted of mature persons. The mean age of managers and teachers were 41 years and 11 months and 41 years respectively. The difference between the two age means was not significant, \( t(42) = 0.48 \). The experience of two groups in
their respective vocations were also quite close. Managers had an experience of 15 years 10 months on the average; teachers had an experience of 16 years 9 months. The difference was not significant, $t(42) = 0.50$.

Results

Judgments made by managers and teachers were subjected to analyses of variance together as well as separately. The results of these analyses are given in Appendices A-1 and A-2. This section presents the main findings directly relevant for the purpose.

Pattern in Motivation x Ability Effect

The first point of interest in the data analysis was the pattern in the Motivation x Ability effect in judgments by managers and teachers. Figure 1 presents mean judgment of job performance as function of motivation (curve parameter) and ability (on horizontal axis) of the stimulus supervisors. The graph on the left displays a systematic divergence toward right, whereas the graph on the right displays a nice pattern of parallelism. Thus, it can be said that managers and teachers predicted job performance according to different algebraic rules.
Figure 1. Mean job performance as a function of motivation and ability of stimulus subordinates. The abbreviations VBA, AV, and VAA refer to Very much below average, Average, and Very much above average levels, respectively. Data from Experiment 1.
The divergence in the left and parallelism in the right graphs were also supported statistically. The first graph had significant Motivation x Ability effect, $F(4, 84) = 9.13, \; \hat{p} < .01$ and the entire interaction effect resided in just the Linear x Linear trend, $F(1, 21) = 13.43, \; \hat{p} < .01$. This confirms the linear fan interpretation of the left graph at the quantitative level. The right graph had nonsignificant Motivation x Ability effect, $F(4, 84) = 1.29$, which supported the parallelism interpretation mentioned above.

In the overall analysis, Group x Motivation x Ability was also significant, $F(4, 168) = 5.28, \; \hat{p} < .01$. This means that the two graphs indeed differ in their patterns, and that managers predict performance in a manner different than teachers.

**Multiplying versus Averaging**

Figure 2 presents profiles of Reliability of motivation information x Motivation, Reliability of ability information x Ability, Reliability of ability information x Motivation and Reliability of motivation information x Ability effects for managers (upper part) and for teachers (lower part). According
Figure 2. Factorial plots of Motivation Reliability x Motivation, Ability Reliability x Ability, Motivation Reliability x Ability, and Ability Reliability x Motivation effects from Experiment 1. The abbreviations HI, MOD, and LO refer to High, Moderate, and Low levels, respectively.
to both the averaging and multiplying rules, reliability and value of an information should multiply each other. In other words, the two left most graphs should have the linear fan pattern. An examination of the four graphs, two for managers and two for teachers, clearly show this trend.

Results presented in Table 1 are F ratio for overall interaction as well as for the four trend components of each interaction. It is clear that the pattern is as expected. This means that reliability manipulation affected weight of the information.

In overall analysis of variance, both groups of subjects had similar trend. Group x Motivation Reliability x Motivation, F (4,168) = 0.686 and Group x Ability Reliability x Ability, F (4,168) = 0.619 were both non-significant. It may be said, therefore, that both groups of subjects reacted to information reliability in a similar manner.

The critical distinction between averaging and multiplying rule of integration of information about motivation and ability comes from the pattern in the two right most graphs. According to the multiplying rule, the third graph should be similar to the first
<table>
<thead>
<tr>
<th>Interaction Effects</th>
<th>Overall F</th>
<th>L x L</th>
<th>L x Q</th>
<th>Q x L</th>
<th>Q x Q</th>
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<tr>
<td></td>
<td>(4,84)</td>
<td>(1,21)</td>
<td>(1,21)</td>
<td>(1,21)</td>
<td>(1,21)</td>
</tr>
<tr>
<td><strong>Managers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivation</td>
<td>18.55**</td>
<td>20.03**</td>
<td>0.52</td>
<td>0.73</td>
<td>0.04</td>
</tr>
<tr>
<td>Reliability x Motivation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ability</td>
<td>13.18**</td>
<td>12.41**</td>
<td>2.66</td>
<td>0.28</td>
<td>3.96</td>
</tr>
<tr>
<td>Reliability x Ability</td>
<td></td>
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<tr>
<td><strong>Teachers</strong></td>
<td></td>
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</tr>
<tr>
<td>Motivation</td>
<td>23.00**</td>
<td>23.34**</td>
<td>0.01</td>
<td>2.95</td>
<td>0.01</td>
</tr>
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<td>Reliability x Motivation</td>
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<td></td>
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<tr>
<td>Ability</td>
<td>12.53**</td>
<td>15.48**</td>
<td>0.16</td>
<td>5.32*</td>
<td>4.24</td>
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<td>Reliability x Ability</td>
<td></td>
<td></td>
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</tbody>
</table>

**Note.** Letters L and Q refer to Linear and Quadratic components, respectively. The dfs of F-Ratios are indicated in brackets.

* p < .05

** p < .01
and the fourth similar to the second. There is no evidence for such a similarity. On this basis, it can be said that motivation and ability were not multiplied.

According to averaging rule, the third graph should have a pattern exactly opposite of the first graph, and the fourth graph opposite of the second graph. There is no evidence of this prescription either. The averaging interpretation of the data is thus not possible either.

Considered together, it can be said that reliability affects weight of an information. It cannot be, however, be expected to distinguish between alternative rules as Singh and Bhargava (1984a, 1984b) also noted.

Evidence for Two Initial Opinions

The parallelism pattern in the third and fourth graphs of Figure 2 suggest that reliability of an information affects its initial opinion at the first stage of integration (Singh & Bhargava, 1984a, 1984b). If this is true, then managers followed two-stage averaging-multiplying rule,

\[
\text{Performance} = \left[ \frac{w_0 \frac{M_0 + w M}{w_0 + w}}{w_0 + w} \right] + \left[ \frac{u_0 \frac{A_0 + u A}{u_0 + u}}{u_0 + u} \right].
\] (15)
According to this model, reliability of an information affects the effectiveness of that information alone, and is neutral with respect to the effectiveness of the other information (Singh & Bhargava, 1984a).

Appropriateness of this model can be seen by the nine sets of graphs of Figure 3. Each graph is a factorial plot of Motivation x Ability effect under reliability of two types of information. The role of initial opinion in judgment can be seen by considering the first panel from left at the bottom and the first panel from right at the top in Figure 3. In both the cases, the two information are of equal reliability. However, the separation of curves and their slope are far greater in the latter than in the former case. It follows that information reliability operates on the initial opinion of the judges and that the role played by the initial opinion is inversely related to the level of information reliability.

To see that there are two separate initial opinions, consider the top left and the bottom right panels in Figure 3. In the top left panel, motivation information has low reliability and ability information has high reliability. For the bottom left
Figure 3. Mean job performance as a function of motivation and ability information of stimulus subordinates under nine conditions of information reliability. Data from managers of Experiment 1.
panel, the reverse is true. Comparing the two panels, the slope of curves is steeper in the former than in the latter case. In contrast, the vertical spread of curves is more in the bottom right panel. Also, at a given level of motivation reliability, all motivation curves show constant spread. Similarly, at the fixed levels of ability reliability, ability curves have constant slope. This establishes presence of two initial opinions in judgment reasonably well.

A further implication of Equation 15 is that the plot of Motivation x Ability will give linear fan. This is because of the multiplication of motivation and ability information at the second stage. Evidence for this fan pattern has already been seen.

A look at the nine graphs of Figure 4 shows that all the observations made about the presence of two initial opinions in managers earlier also hold good for teachers. However, their integration rule is additive. Judgment by teachers can thus be represented by

\[
\text{Performance} = \left[ \frac{w_o m_o + w_m}{w_o + w} \right] + \left[ \frac{u_o a_o + u_a}{u_o + u} \right]. \tag{6}
\]

Comparison of Equation 6 with 15 shows that managers and teachers process information in a similar manner. However, they use different rule in integration of
Figure 4. Mean job performance as a function of motivation and ability information of stimulus subordinates under nine conditions of information reliability. Data from teachers of Experiment 1.
information about motivation and ability while predicting job performance. This indicates that managers have their own way of information integration. This confirms the hypothesis of role as a determinant of information integration.

Discussion

There are four main findings of Experiment 1. First, managers seem to follow a multiplying rule in prediction of job performance of subordinates. Second, teachers seem to follow an additive rule. Third, while the integration rule of managers sharply differ from that of teachers, the information processing of two groups is the same. Both have two initial opinions, and they process information in two stages. Finally, the utility of manipulation of information reliabilities for differentiating rules is rather limited. Such a manipulation appears to be good at diagnosis of information processing.

While the evidence for a multiplying-type rule for managers is consistent with the proposals of Heider (1958) and Vroom (1964), the obtained evidence is only suggestive. To show that the fan pattern were indeed caused by multiplying, a different experiment will be required.