PLANNING SKILL DEVELOPMENT

FOR SYSTEMS ANALYSTS

Alarming results from a survey of skill priorities and promotion criteria for Systems Analysts

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November, 1979

CISR No. 51
Sloan WP No. 1094-79

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To motivate and retain their skilled Systems Analysts, DP management must reassess their skill priorities, skill development programs, and personnel evaluation systems.

"Grow-your-own and keep them"

Simply stated, the demand for skilled DP personnel is greater than the available supply; competition in hiring skilled people drives up salaries, and has left most DP departments without enough skilled personnel. Consequently, more and more DP departments are revitalizing their skill development programs and are reassessing their personnel evaluation procedures.

Unfortunately, our research results reveal a hidden crisis. Skill development programs omit major, relevant topics and do not reward systems analysts for developing top priority skills. Personnel evaluation systems are virtually driving systems analysts out of some firms with obsolete standards, and are not rewarding systems analysts for the skills the head of the DP department rates as most important.

Success requires a practical planning technique for the diagnosis and improvement of current problems. DP management must identify the relevant skills for an SA, modify the evaluation system to reward these skills, communicate these priorities effectively, and assure at least the existence of a skill development program in top priority skills.

These necessities for success may seem obvious, but, according to our research, they have not been practiced in even better companies. In order to examine these issues we, at the Center for Information Systems Research, surveyed systems analysts and heads of DP departments about skill priorities and evaluation standards for systems analysts.¹

* We wish to thank the anonymous managers and companies who participated in this research, Christine Bullen for her management of the data gathering process, and the Center for Information Systems Research for partial funding.

Prioritization of Skills

Our research began with identification of a list of relevant skills for a systems analyst (SA). We designed the list to be short but representative of the broad range of relevant skills. If a particular company wanted to develop a relevant list of skills and perform an internal diagnostic comparable to this research project, it could easily be done by customizing our procedures.

The sixteen skills used in our survey and throughout this article are listed in Table 1. They were randomly sequenced on a questionnaire, and respondents rated each on the seven-point scale shown, where 1 represents a completely irrelevant skill, 3 a necessary prerequisite, 5 very important, and 7 the single most important skill.

The Chief Information Officers (CIO) in companies V, W, X, Y, and Z rated the priority of each skill. The order in which the sixteen skills are numbered in Table 1 is the average value of each skill on the seven point scale of the CIOs' priority ratings.

We do not contend the CIOs surveyed are right in their priority assignments, and the proper priorities of the skills do, of course, vary by company. However, our data does show a basic agreement among these five CIOs on their priority assignments of systems analyst skills.

The bottom six priorities (rated not as irrelevant, but as necessary prerequisites) are dominated by the traditional technical skills, whereas the top six all relate to a strong user orientation. The CIOs' emphasis is on managerial and organizational issues at the front end of the systems development life cycle.

It seems likely that the current priorities of these CIOs have evolved only recently. However, changes in priorities should be effectively communicated to the analysts involved and reflected in modified evaluation standards.

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2 CIO is our term for the head of the DP department; typically, this is the Director or Vice President of DP, MIS or Information Services.

3 The Pearson R correlation coefficients of each CIO's ratings to average CIO ratings are .68, .69, .59, .83, and .72.
SA, CIO Skill Priorities Compared

To investigate the extent to which the CIO's priorities have been reflected in his department, we compared the skill priorities of the CIO in company Z with the priorities of one of his SAs for each skill in Table 1. These two people form one of the pairs of CIO-SA studied. Their level of agreement on skill priorities is shown in Figure 1.

If their agreement had been perfect, both bars would be the same height for all skills, one to sixteen. It is easy to see the extent of disagreement for this pair and consider the implications for productivity and successful software development.

For example, the CIO rates implementation planning, education, motivation, and training of users (skill #9) as very important, whereas this SA considers it irrelevant. Conversely, this SA rates technical skills (skill #16) as very important, while his CIO considers it only a necessary prerequisite. To the extent that a CIO-SA pair disagree on skill priorities, considerable efforts may be misallocated, allocated at cross purposes, or important issues may be unintentionally ignored. This is because an SA's skill priorities indicate what aspects of the systems development process he/she would emphasize -- in this example, technical considerations over implementation planning.

For each of the CIO-SA pairs studied, a Figure 1 can be prepared. To compare all CIO-SA pairs studied, we needed a composite index for level of agreement on the skills one to sixteen. We used a statistic called correlation coefficient which ranges in value from +1 for perfect agreement to -1 for perfect disagreement. Figure 1 has a correlation coefficient of .22 but is not statistically significant.

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4 For the 16 skills and variance in ratings assigned by SAs and CIOs, a Pearson R correlation coefficient of .50 or greater is statistically significant at the .05 level. Statistical significance indicates that there is a relationship between priorities (5% chance there is no relationship), however, it does not indicate the strength of agreement. A correlation coefficient of .80 is strong agreement and is statistically significant. A correlation coefficient of .50 is statistically significant but indicates only weak agreement. Any lower correlation coefficient, for example .22, indicates no agreement, i.e., only a random relationship.
Company averages for the level of skill priority agreement by CIO-SA pair were: .11, .11, -.19, .10, and .22. The highest company average correlation coefficient is .22, coincidentally the same as the pair in Figure 1, and simply managerially unacceptable.

To look at all the CIO-SA pairs studied we prepared the histogram in Figure 2. The correlation coefficient for skill priority agreement is the horizontal axis and the height of the bars indicates the relative number of pairs with that level of agreement.

The particular pair in Figure 1, with a correlation coefficient of .22, is now seen to be typical and above average for all pairs. The pairs with reasonable agreement, the 9% with positive and statistically significant correlations, are few and far between. For the other 91% of the CIO-SA pairs, their level of agreement on skill priorities is random. Random -- think about that for a minute.

Clearly, more effective communication and discussion of skill priorities for SAs is necessary. Productivity includes doing the right thing as well as doing it efficiently. Motivation relates to doing something personally considered important. It is hard enough to lead when everyone agrees on the direction. With our survey results, it is easy to see why both leaders and followers in DP departments feel frustrated.

Perceived Evaluation Standards

Each Systems Analyst also rated the 16 skills for perceived evaluation standards for positive feedback, raises, and promotions. We have compared these ratings with CIO skill priorities to see if important skills are being rewarded.

The perceived evaluation standards are reality for a systems analyst. It is possible that an SA may have a mis-perception of the actual evaluation standards in his/her own DP department. More likely, however, DP management has been too busy fulfilling users needs to revise its own obsolete evaluation standards. Even with revised standards, the evaluation system must be well implemented to send clear, consistent signals to SAs. It is the perception of what is rewarded that influences behavior.
Selecting the same CIO-SA pair from Company Z, we have displayed the level of agreement between CIO skill priorities and SA perceived evaluation standards in Figure 3. If agreement were perfect, the bars would be the same height for all sixteen skills. The disagreements evident in Figure 3 indicate the CIO is being actively subverted by his own department's evaluation system. Moreover, this SA is being encouraged to develop skills the CIO considers virtually irrelevant.

The CIO considers implementation planning (skill #9) to be very important. Unfortunately, this skill is not being effectively rewarded. The SA perceives skills in implementation planning to be virtually ignored by the evaluation system and will behave accordingly.

Conversely, the SA perceives skills 5 and 14 to be equally important. Unfortunately, the CIO considers skill 14 (estimating and rigid adherence to project costs and schedules) virtually irrelevant and skill 3 (organizational design and assessing system impacts on user departments) very important and will behave accordingly.

The result is the SA finds the evaluation system, and his CIO, to be arbitrary and capricious, while the CIO finds the evaluation system, and his SA, to be ineffective in improving or changing skills or behavior.

The level of agreement in Figure 3 expressed as a correlation coefficient is .08. The average correlation coefficient for all CIO-SA pairs in each company are: -.02, .20, -.14, .13, and .14. These results are unacceptable for all five companies. It is clearly necessary for these CIOs to devote some portion of their busy schedules to a revision of the evaluation system, its implementation, and effective communication.

The skill priorities of the CIOs have precious little affect on what gets rewarded in their own departments. Figure 4 makes this point dramatically by summarizing the level of agreement for all CIO-SA pairs studied. Only 13% of these pairs have a statistically significant correlation between CIO skill priorities and SA perceived evaluation standards. The rest, 87%, are random, and more than 50% of all the pairs are worse than the pair detailed in Figure 3.
We could have selected CIO skill priorities with a random number generator and had an equal chance of comparable agreements for 87% of the CIO-SA pairs. When perceived evaluation standards do not agree with intended priorities, the effect is to both stimulate and reinforce undesired behavior, generating the cross purposes and frustrations discussed for Figure 3 on a massive scale.

The Evaluation System is Key

When an individual's perceived evaluation standards do not agree with his/her own skill priorities, considerable frustration is generated. This frustration is manifested in lower job satisfaction, motivation and productivity, and a higher propensity to quit.

We don't really know what level of agreement between an SA's skill priorities and perceived evaluation standards is adequate to prevent frustration. For example, Figure 5 displays the effect of perceived evaluation standards on skill priorities for our favorite SA from Company Z. There are regular but reasonable differences on the 16 skills. Only skills 7 and 13 are out of balance, and this doesn't appear to be sufficient to cause a real problem.

Figure 5 has a very high and statistically significant correlation coefficient of .87. The company averages are generally good: .52, .60, .29, .65, and .67. Even without knowing the exact threshold level of disagreement for frustration, it is easy to see why some companies experience higher SA turnover than others. Company X, with a .29 average, is definitely driving SAs out of their DP department. When SAs are hearing the abandon ship alarm, it is not the time to rearrange the deckchairs on the Titanic.

There is a very strong relationship between an SA's perception of evaluation standards and his/her own skill priorities. Figure 6 summarizes the correlation coefficients for all SAs studied. Sixty-one percent of the relationships are statistically significant.
These are encouraging results. There is no doubt that evaluation/reward systems work. Revision of the evaluation standards, their implementation and effective communication are managerially feasible and will affect SA's perceptions, skill priorities, motivation, productivity, skill development, and turnover. However, there are three aspects of this strong relationship between perceived evaluation standards and skill priorities which must be considered very carefully in planning.

First, some people leave an organization rather than modify their behavior in accordance to evaluation standards with which they strongly disagree. Consequently, we do not know what proportion of this strong relationship is due to self-selection. More importantly, we do not know what proportion of the current SAs would choose to leave if they perceived a major change in evaluation standards.

Second, as Figure 6 demonstrates, evaluation standards are quite influential. The evaluation/reward system not only influences overt behavior but, over time, influences deep-seated personal opinions like skill priorities. Conversely, changing personal opinions requires equivalent influence over time. A quick, light fix would be ineffectual.

Third, this strong relationship is not necessarily good. In fact, for these five companies it is making matters worse. We have already demonstrated that the perceived evaluation standards are wrong -- they disagree with the skill priorities defined as desirable by the CIO. Remember, Figure 3 revealed a basically random relationship between SA perceived evaluation standards and CIO skill priorities.

The evaluation/reward system does work. But, being obsolete, it is driving SAs away from their CIO's evolving priorities. It is sending the wrong signals throughout the department, emasculating the skill development program, rewarding the wrong skills, mis-directing emphasis in systems development, and driving the wrong SAs out of the DP department. In this situation, the longer the delay in modifying the evaluation/reward system, the worse the problem.
Conclusions

These results are so strong and nearly uniform across the five companies that they can probably be generalized to a larger number of DP departments. Managerial actions to improve this situation can and should be taken.

The CIO and his DP management team must conscientiously and explicitly identify and prioritize skills for SAs. To the extent that the CIO's priorities are uncertain or evolving over time, a continuous and effective communication and discussion process must be established.

The current situation in DP must be diagnosed. A customized version of the straightforward methods used in our research could be used for an internal diagnostic and discussion vehicle.

The longer the delay, the more obsolete evaluation standards influence SAs away from the CIO's priorities. Moreover, the duplicity of the situation, the CIO's espoused priorities versus perceived evaluation standards, understandably frustrates SAs. The result is misallocated and cross-purpose efforts, lower productivity and motivation, and higher turnover.

The evaluation standards must be revised to agree with the desired priorities. This entails revision of the evaluation/reward system, effective communication of the new evaluation standards, and clear, consistent signals from its implementation. During this process, SAs will experience pressure for change. Your plan should anticipate disbelief with the new priorities and evaluation standards until actual practice has demonstrated real implementation.

If the current skill development program is both irrelevant to organizational rewards and SAs' skill priorities, its impact on SAs' skills, irrespective of level of expenditure, is quite predictable.

The CIO's skill priorities should drive the emphasis and offerings in the skill development program. Most skill development programs concentrate on the traditional technical skills found in the bottom six priorities in Table 1. These are indeed "necessary prerequisite" skills. However, the skill development program should not stop there; rather, a concerted effort to identify program elements (courses and task assignments) for the development of higher priority skills is required. The revised evaluation system will stimulate SAs' interest in top priority skills and their development.
The shortage of skilled DP personnel is definitely a long-term problem. It is clearly desirable for the CIO, manager of systems development, and SAs to identify relevant skills and agree on their priorities for SAs. The skill development program and evaluation/reward system should develop and reinforce these skills effectively. Unfortunately, our research results demonstrate that this is not typical practice. A company specific diagnostic could be performed in any DP department by customizing the research approach we used. However, for most DP departments the recommendations we have discussed could be directly applied -- yielding significant benefits by closing the gap between typical and desired practice.
Table 1

Systems Analysts' Skills*

<table>
<thead>
<tr>
<th>Skill Description</th>
<th>Priority Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. strong user orientation, ability to work with users, and delivering systems users really like</td>
<td>6.0</td>
</tr>
<tr>
<td>2. ability to work with ill-defined objectives and resolve conflict productively</td>
<td>5.4</td>
</tr>
<tr>
<td>3. skills in organizational design and assessing system impacts on user departments</td>
<td>5.0</td>
</tr>
<tr>
<td>4. behavioral sensitivity to impacts of systems on individuals</td>
<td>4.6</td>
</tr>
<tr>
<td>5. project management skills (planning and control)</td>
<td>4.4</td>
</tr>
<tr>
<td>6. broad view of company goals and operations, senior management orientation</td>
<td>4.4</td>
</tr>
<tr>
<td>7. in-depth knowledge of user departments' operations</td>
<td>4.0</td>
</tr>
<tr>
<td>8. dedication, hard work, and hustle</td>
<td>4.0</td>
</tr>
<tr>
<td>9. implementation planning, education, motivation, and training of users</td>
<td>4.0</td>
</tr>
<tr>
<td>10. cost consciousness, hardware and operational efficiency</td>
<td>4.0</td>
</tr>
<tr>
<td>11. expertise in system design of monitor and exception systems</td>
<td>3.6</td>
</tr>
<tr>
<td>12. leadership ability, administrative experience, sensitivity to political issues</td>
<td>3.4</td>
</tr>
<tr>
<td>13. ability to work intimately with senior user managers</td>
<td>3.4</td>
</tr>
<tr>
<td>14. estimating and rigid adherence to project costs and schedules</td>
<td>3.0</td>
</tr>
<tr>
<td>15. expertise in system design of inquiry and analysis systems</td>
<td>2.8</td>
</tr>
<tr>
<td>16. technical skills (programming, database design, telecommunication, etc.)</td>
<td>2.6</td>
</tr>
</tbody>
</table>

*CIOs rated the priority of each skill for SAs using the seven point scale above. The list has been re-sequenced and re-numbered by average priority of CIOs.
FIGURE 1.
SKILL PRIORITY AGREEMENT
CIO Skill Priority vs SA Skill Priority
FOR
One CIO-SA Pair from Company Z

CORRELATION COEFFICIENT = .22

SKILL NUMBERS (SEE TABLE 1 FOR SKILL DESCRIPTIONS)

KEY: □□ CIO Skill Priority □ SA Skill Priority
FIGURE 2

SKILL PRIORITY AGREEMENT

CIO Skill Priority vs SA Skill Priority

SUMMARY OF

ALL CIO-SA PAIRS IN ALL COMPANIES

NUMBER OF
CIO-SA
PAIRS

PAIR DETAILED IN FIGURE 1

LEVEL OF AGREEMENT (CORRELATION COEFFICIENT)

FIRM AVERAGES

V W X Y Z

.11 .11 -.19 .10 .22
FIGURE 3

EVALUATION STANDARDS AGREEMENT

CIO SKILL PRIORITY VS SA PERCEIVED EVALUATION STANDARDS
FOR
ONE CIO-SA PAIR FROM COMPANY Z

CORRELATION COEFFICIENT = .08
FIGURE 4

EVALUATION STANDARDS AGREEMENT
CIO Skill Priorities vs SA Perceived Evaluation Standards
SUMMARY OF
ALL CIO-SA PAIRS IN ALL COMPANIES

FIRM AVERAGES

<table>
<thead>
<tr>
<th>V</th>
<th>W</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>-.02</td>
<td>.20</td>
<td>-.14</td>
<td>.13</td>
<td>.14</td>
</tr>
</tbody>
</table>
FIGURE 5
SA SELF AGREEMENT
SA PERCEIVED EVALUATION VS SA SKILL PRIORITIES
FOR
ONE SA FROM COMPANY Z

CORRELATION COEFFICIENT = .87

SKILL NUMBERS (SEE TABLE 1 FOR SKILL DESCRIPTIONS)

KEY: ☐ ☐ SA PERCEIVED EVALUATION STANDARDS ☐ ☐ SA SKILL PRIORITY
SA SELF AGREEMENT

SA PERCEIVED EVALUATION VS SA SKILL PRIORITIES
SUMMARY OF ALL SAs IN ALL COMPANIES

![Bar chart showing level of agreement (correlation coefficient) across firms V to Z with values .52, .60, .29, .65, .67.](image)