Vol. 11, No. 4

Systems Analysts' Attitudes Toward Information Systems Development

JAMES J. JIANG
Louisiana Tech University

GARY KLEIN
University of Texas of the Permian Basin

JOSEPH L. BALLOUN
Nova Southeastern University

Certain researchers argue that systems analysts are too technical, a situation that may contribute to system failures. The results of this study, however, contradict this argument. By applying a framework of Dos Santos and Hawk (1988), analysts were found to have three primary orientations: technical, socio-political, and user. No one orientation dominated. Using the framework applied in this study, managers can consider the analysts' orientations in assigning development activities. Researchers can identify diverse orientations in future studies where attitudes may be significant predictors of system performance or development success.

Researchers and practitioners observe that systems analysts play a key role in systems development success (Lyytinen and Hirschheim, 1987; Markus, 1983; Zmud, 1979). Besides other factors (e.g., organizational management, technology, complexity, political influences), systems analysts' attitudes toward system development are consistently and significantly related to the quality of the final products (Bostrom and Heinen, 1977a, 1977b; Lyytinen, 1988; Zmud, 1979). A diagnosis of the attitudes of systems analysts may provide insights leading to future system success.

Certain researchers argue that systems analysts subscribe to too technical and economic design ideals (Kaiser and Srinivasan, 1982; Kumar and Welke, 1984). Alleged causes of system failures include the analysts' ignorance of social, political, behavioral, managerial, and psychological factors. Suggestions for improvements to system development include formal training or education of systems analysts in managerial skills, behavioral ideas, and communications techniques (Benbasat, Dexter, and Mantha, 1980; Green, 1989). Others suggest improvements that include use of a socio-technical approach to system design (Bostrom and Heinen, 1977a, 1977b; Davis, et al., 1992; Markus, 1983). These approaches, however, are expensive and largely unproven. What is more important, the implicit assumption of these proposed solutions, that systems analysts have an undifferentiated technical attitude, may be incorrect. To clarify analysts' attitudes, Dos Santos and Hawk (1988) describe a survey study of 30 systems analysts. The study found that some systems analysts had a technical orientation, however, the majority had a user or socio-political orientation.

The intent of this study is to confirm or refute the identification of major attitudes toward system development held by systems analysts as identified by Dos Santos and Hawk (1988). This study will correct problems in the earlier study associated with the small homogeneous sample. Moreover, this study will describe analysts' attitudes, and examine relationships of several demographic traits to analysts' attitudes.

The sequence of issues follows a logical progression to help in addressing the following questions: 1) do systems analysts possess diverse attitudes toward system develop-

Manuscript originally submitted July 16, 1996; Revised November 27, 1996 and January 23, 1997; Accepted February 20, 1997 for publication.

ment; 2) which primary attitudes do systems analysts hold; and 3) are analysts' attitudes related to their demographic characteristics? Results of this study will have implications for information system (IS) practitioners and researchers by: 1) providing guidance for planning education and training programs for system analysts, 2) presenting information for effective development team formation, and 3) suggesting areas that IS researchers may wish to reevaluate and refine, such as current strategies for system development.

Methods

This study used the instrument developed by Dos Santos and Hawk (1988). Exploratory principal components analysis was used to decide if the three categories of orientation (user orientation, socio-political orientation, and technical orientation) hold for a larger, more heterogeneous sample.

Questionnaire

The survey instrument was a set of 33 statements on various aspects of system development (Dos Santos and Hawk, 1988); abbreviated statements are presented in Table 1. The set included statements on user/analysts communication, individual differences among users, technical capabilities of the development staff, and systems that alter the balance of power in an organization. Instructions requested respondents to rate how strongly they believed the listed statements were critical to successful system development. A Likert scale was used with *strongly disagree* at the low anchor of one and *strongly agree* on the high anchor at five.

Procedure and Sample

The questionnaire was pretested on a class of MBA students. Ambiguities in the instructions were corrected after the pretest. Questionnaires were then provided to six Chief Information Officers (CIO) from six organizations in the Kansas City metropolitan area. The number of employees in these organizations ranged from 2,500 to more than 25,000 employees with an approximate average of about 1,000 IS personnel. The CIOs in turn asked at least 40 of their staff members to complete the survey. Respondents were system analysts, IS project leaders, and IS department managers with experience in system development and were assured that their responses would be kept confidential. Apparently the direct request from the CIOs resulted in a full response. Two hundred forty four questionnaires were returned with 239 used in the data analysis due to question omissions.

Table 2 shows the respondents' working experience in information systems design and development. More than half of the respondents (51%) had more than nine years of work experience, and about half the respondents (46.4%) had system experience in more than five application areas. Only 5.9 percent had less than two years of work experience and 3.8 percent had system experience in only one application area. The data showed that the respondents were experienced in the field of system development. Complexity of applications varied, suggesting that the analysts collectively had been involved in large and small projects.

S1	Positive user attitude towards system
S2	User on project team during system definition phase
S3	Project should be carefully monitored
S4	Prototyping is useful
S5	Good communication is necessary
S6	Steering committee should manage project
S7	Top management support
S8	User on project team during system design
S9	User confident in system analysts
S10	Turnover in IS staff causes problems
S11	Technically competent IS staff avoids problems
S12	Large project should be split into smaller project
S13	Quantifiable benefit to projects
S14	Users initiate projects
S15	Realistic expectation from users
S16	Post implementation follow-up
S17	Walkthroughs with user is important
S18	Careful planning for changes for new system
S19	Turnover in top management
S20	IS staff's commitment
S21	Analysts should be in users' area
S22	Projects address important problems
S23	User interface is important
S24	Proper user training on new system
S25	System design should be frozen before programming
S26	Users integral part of development team
S27	IS staff's political skills
S28	The urgency of the systems
S29	Turnover among users leads to lack of commitment
S30	Dealing with many different user personalities
S31	Different personnel should be involved
S32	Use of structure technique is important
S33	Project leader managerial skills

Table 1: Abbreviated Statements

The respondents were well educated, with 63 percent (149) having completed college and 22.3 percent (53) having completed a graduate degree program (Table 3). Within the 119 college educated respondents, 31 had a college diploma in Computer Science and 33 had a college diploma in Information Systems. Seventy-one percent (170) were male and 29 percent (69) were female. The sample was young, but still represented a wide age spectrum. The first, second and third quartiles of age were respectively 31, 34 and 41 years old. About half the respondents had management responsibilities.

Results

To classify respondents with similar attitudes, component analysis was done. First, principal components analysis was used to extract the dominant attitude components. Three components with eigenvalues greater than chance expectation were retained for further analysis (Lautenschlager, 1989). Components were then rotated by the varimax procedure (Table 4). The five highest loadings in each component served to identify associated questions.

Reliability of measurement for each component was computed as follows. First, the scores of the respondents on

1. Experience in Designing & Implementing of IS:	
Less Than 2 Years	14 (5.9%)
2 - 4 Years	36 (15.1%)
5 - 8 Years	67 (28.0%)
More Than 9 Years	122 (51.0%)
Total	**239 (100%)**
2. Experience in Different Kinds of Applications:	
1 Application Area	9 (3.8%)
2 - 3 Application Areas	61 (25.5%)
4 - 5 Application Areas	58 (24.3%)
More Than 5 Appl. Areas	114 (46.4%)
Total	**239 (100%)**
3. The Average Complexity of Projects Have Been Involved in (Measured by Staff Year):	
1 Staff Year	47 (19.8%)
2 - 5 Staff Year	98 (41.4%)
6 - 10 Staff Year	43 (18.1%)
More Than 10 Staff Year	49 (20.7%)
Total	**237 (100%)**

Note: Responses may not total to 239 due to response omissions.

Table 2: Respondents System Development Experience

1. Gender:	
Female	69 (28.9%)
Male	170 (71.1%)
Total	**239 (100%)**
2. Age:	
Below 31	67 (29.0%)
31 - 35	64 (27.7%)
36 - 40	35 (15.2%)
41 - 45	30 (12.9%)
Above 45	35 (15.2%)
Total	**231 (100%)**
3. Education:	
Community College/ Professional School Diploma	35 (14.7%)
College Diploma —	149 (63.0%)
Computer Science	31 (13.0%)
Information Systems	33 (13.9%)
Others	86 (36.1%)
Graduate Diploma	53 (22.3%)
Computer Science	4 (1.7%)
Information Systems	3 (1.3%)
Others	46 (19.3%)
Total	**238 (100%)**
4. Management Level:	
Executive/Manager of IS Department	43 (18.3%)
IS Project Leader	68 (29.0%)
IS Supporting/System Analysts	105 (44.6%)
Others	19 (8.1%)
Total	**235 (100%)**

Table 3: Respondents Demographic Information

the rotated components were computed. The standardized scoring weights of the 33 questions were found for each rotated component. The reliability of each individual question was then estimated by its adjusted squared multiple correlation with the other 32 questions (Table 4). Cliff (1988) provided the correct formula for the reliability of principal component scores. Component score reliabilities were 0.98, 0.99, and 0.98 for rotated components one, two, and three respectively. Component score reliability depends on the reliabilities of the questions that define it.

Examination of the rotated component analysis revealed that the three rotated components corresponded well to the three attitude orientations of Dos Santos and Hawk (1988). Component one corresponded to the user orientation, component two to the socio-political orientation, and component three to the technical/economic orientation. The interpretation of component three is equivocal, for it also seems related to political rationality.

Questions 2, 8, 17, 24, and 26 loaded strongly on component one. A high loading of a question on a component means that the question is correlated with other questions loading highly on that component. The common contents of

Statement	Factor 1	Factor 2	Factor 3	Reliability[1]
S1	0.23	0.39	0.26	.99
S2	**0.56**	0.03	0.03	.99
S3	0.44	0.23	0.23	.99
S4	0.19	0.15	0.01	.97
S5	0.43	0.07	0.09	.99
S6	0.19	0.00	**0.55**	.95
S7	0.39	0.14	0.48	.98
S8	**0.55**	0.06	0.09	.98
S9	0.15	0.43	0.31	.98
S10	0.11	0.50	-.25	.97
S11	0.18	**0.57**	-.03	.98
S12	-.07	**0.51**	-.06	.93
S13	-.01	0.30	**0.49**	.97
S14	0.23	0.50	0.10	.94
S15	0.22	0.22	0.38	.98
S16	0.29	0.08	0.33	.98
S17	**0.58**	0.12	0.17	.99
S18	0.27	0.12	**0.55**	.99
S19	0.11	**0.53**	0.31	.96
S20	0.13	0.31	**0.55**	.99
S21	0.08	0.23	0.21	.90
S22	-.02	0.37	0.45	.97
S23	0.11	0.45	0.13	.96
S24	**0.64**	0.08	0.14	.99
S25	0.29	0.12	0.10	.96
S26	**0.76**	0.12	0.09	.99
S27	0.12	0.39	0.31	.97
S28	0.21	0.46	0.18	.95
S29	0.16	**0.70**	0.14	.97
S30	0.01	**0.71**	0.08	.97
S31	-.28	-.11	0.37	.82
S32	0.05	-.10	**0.56**	.97
S33	0.15	0.04	0.40	.98

Note: refer to Table 1 for statements.

Table 4: Rotated Factor Loading of Analysts' Attitude Orientation

questions loading most strongly on a component allow an interpretation of the meaning of the component. The questions loading most strongly on the first component included: "Users should be on the project team during system definition phase" (2), "users should be on the project team during system design"(8), "walkthroughs with users are important" (17), "proper user training on the new system" (24), and "users are an integral part of the development team" (26). These questions have a common theme of user project involvement. The questions of component one were concerned with taking measures to ensure the involvement of users. Affirmative answers to these questions showed a high importance of user involvement in the eventual success of an information system. Analysts dominant in this orientation have a user orientation.

Component two placed was most strongly related to questions 11, 12, 19, 29 and 30. These questions were "technically competent IS staff avoids problems" (11), "large projects should be split into small projects to ease development" (12), "turnover in top management can cause loss of critical support" (19), "turnover among users leads to loss of commitment" (29), and "dealing with many different user personalities complicates systems design and development" (30). These questions fell under the socio-political aspects of system design, except maybe number 12. The questions of component two were concerned with avoiding complications leading to problems, ensuring support and commitment, and were essentially social issues associated with development progress. There was a lack of questions about project economics, technology details, or any concern for detail. Analysts dominant in this orientation have a socio-political orientation.

Component three had high loadings with questions 6, 13, 18, 20, and 32. These were that "a steering committee should manage projects" (6), "quantifiable benefits are important" (13), "careful planning for changes for the new system is necessary" (18), "IS development staff should be committed to the project" (20), and "use of structured techniques is important" (32). Though these questions included project management and economic issues, they were detailed questions important to the success of system development. To be consistent with prior terminology, analysts dominant in this orientation have a technical orientation.

To classify each respondent, component scores were computed according to the procedure in Gorsuch (1983, pp. 262-263). From these component scores, a simple process would have been to select the highest score to categorize the individual. However, a respondent would have been able to exhibit only one attitude type under such a process. A second problem is that psychometric data of this type has been notoriously imprecise (McDonald, 1985). Still a third complication is that such comparisons suffer from reliability difficulties (Peter, et al., 1992).

To overcome these three problems, we formed subgroups of respondents who were homogeneous in their endorsement of one, two, or three values as measured by their component scores. For example, if a respondent's second (and third) highest component score(s) did not differ from the first by a significant amount, the respondent also had the second (and third) orientation(s). Component score reliabilities were used to compute the standard error of measurement for the differences between each pair of component scores (Lord, 1958). The estimated standard error of the difference between component two and component three was .20, and the standard errors of the differences between the other two pairs of components were .17. For a given respondent, we considered a difference between two components to be nominally significant if it were at least twice the standard error of the difference (Lord, 1958).

For example, respondents were classified into group A (user orientation) when their component scores on component number one were significantly higher than their component scores on both component two and component three. Respondents were classified into group D (user and socio-political) when their component scores on component one and component two were not significantly different from each other, but both component one and component two were significantly greater than component three. Respondents showing no significant dominance pattern were placed into group G (all three orientations). Final groups (Table 5) were verified by a MANOVA with the component scores as the dependent variables and the group assignment as the categorical variable. The resulting model tested significant at .05.

Examination of the demographic variables is summarized in Table 6. Chi-square tests on homogeneity were conducted in a cross-tabs analysis on each primary demographic measure with orientations as the reference variable. Management level and experience were not related to the analysts' attitudes. Such lack of change throughout experience and managerial levels may be due to the constant updating required of IS professionals (Kirkley, 1988; Lucas, 1989). Gender, age and education, however, were found significant at .05. Each of these are detailed in Table 7.

Discussion

The similarity of the groups found in this study to those found in the earlier study of Dos Santos and Hawk (1988) is encouraging. The improvements to technique and sample size have added significance to the groupings found earlier. These

Group	Observed Subjects
A - user orientation (Factor 1)	53
B - socio-political (Factor 2)	54
C - technical (Factor 3)	47
D - user and socio-political (Factor 1 & 2)	17
E - user and technical (Factor 1 & 3)	16
F - socio-political and technical (Factor 2 & 3)	22
G - (All Factors)	30
Sum	239

Table 5: Attitude Groups

Demographic	Test	Result
Gender	Chi-square on homogeneity*	significant at .05
Age	Chi-square on homogeneity (with breaks every 5 years)*	significant at .05
Education	Chi-square on homogeneity*	significant at .05
Management Level	Chi-square on homogeneity*	not significant
Design Experience	Chi-square on homogeneity*	not significant
Application Experience	Chi-square on homogeneity*	not significant
Project Complexity	Chi-square on homogeneity*	not significant

*(cross tabs analysis)

Table 6: Analysis of Demographic Variables

groups show an almost even distribution among the three major orientations but combinations were rarer. The data did not show that a technical orientation dominates systems analysts, but instead supported the hypothesis that multiple orientations were present in the profession as a whole and even in individual members of the profession. Such diversity can be important in achieving success (Klein and Aronson, 1996).

There was little gender difference in the user orientation and the technical orientation categories, but females showed much less socio-political orientation (Table 7). Perhaps of more interest is that females had a higher percentage in the combined groups, showing more complex or complete orientations. This latter trait is found in earlier studies where females believed more strongly in the need for a comprehensive scope in IS work (Smiths, McLean and Tanner, 1993). In the same report, males seemed to find themselves more goal oriented, a socio-politically oriented trait.

The relation between the older age groups and those having socio-political interests could be a result in the career growth of an individual over time, a reflection of one becoming more aware of social and political issues (Dalton et al., 1977). In addition, "getting young IS professionals socialized into the organization and work group may be a real challenge for IS managers" (Chusmir, 1989). This may be especially true for those technical professionals who enter the field for the challenge posed by the technology.

Major differences were found in the lower levels of education (Table 7). Lower levels of education had the higher number of socio-political analysts with a lessening in the number of technically oriented analysts. This is not surprising as IS educational programs are oriented to the technical aspects of IS delivery. The results are also consistent with the four stage-career model which encourages a technical orientation in the early stages (Dalton et al., 1977).

Conclusion

A large sample replicates the attitude orientation structure of system analysts discovered by Dos Santos and Hawk (1988). Analysts are found to have a user orientation, socio-political orientation, technical orientation, or some combination of the three, and considerable attitudinal heterogeneity. The diversity of attitude orientation among systems analysts is supported. The results do not support the idea that most systems analysts hold a technical orientation as assumed by some researchers. This diversity discredits a common allegation that systems analysts are too technical in their orientation. Researchers must look elsewhere when searching for a cause of system failures.

Dos Santos and Hawk (1988) suggest that people with different orientations may be best assigned to particular types of projects. It may also be argued that each project should have each orientation represented to be certain all bases are covered. The success of a project involves aspects of all three orientations. Teams can be organized to incorporate systems analysts representing all major orientations, helping to ensure system success. Such a task requires further research into quick, reliable techniques for identification of individual orientations.

Age, gender, and education level were related to attitude categories. Females tended to be less socio-political and more complex than their male counterparts. Older analysts tended

Orientation	Female %	Male %	Average Age	<= Jr. College Education %	Undergraduate Degree %	Graduate Degree %
User	17	23	34.9	21	21	26
Soc-pol	12	27	38.3	38	20	19
Technical	22	19	34.5	6	22	20
User/Soc-pol	4	8	37.4	15	6	6
User/Tech	17	3	31.9	0	9	6
Soc-pol/Tech	12	9	35.5	6	11	7
All Three	16	11	38.3	15	11	17

Table 7: Orientations by Demographic Variables

to have a more socio-political orientation. Those with higher education tended to replace a socio-political orientation by a technical orientation. These relations provide initial guidelines for the composition of complete teams. Not surprisingly, a good mix of backgrounds in education and diversity in age and gender will contribute to creating a group with diverse attitude orientations.

The results of the current study still need to be viewed with care. To our knowledge this is only the second study of this nature. Though a broad set of individuals is represented, the respondents are regional, and the survey examines them for a single time period. Possible shifts over time need to be investigated. The sample was also limited to large organizations. Small operations may require even more generalists (individuals with a mix of orientations) than do large firms.

Topics for future research include formalization of a metric for categorizing analysts by their orientations. Once an instrument is in place, confirmation studies can be conducted. Of particular interest would be studies regarding information system successes and failures as a function of the orientations and composition of project teams.

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James J. Jiang is an associate professor in the Computer Information Systems Department, Louisiana Tech University. He has a Ph.D. in Information Systems from the University of Cincinnati. His principal areas of research interest are decision support systems (DSS), DSS evaluation, computer-human interaction, and computer personnel. Dr. Jiang's work on these areas have appeared in IEEE Transactions on Systems, Man & Cybernetics, Journal of Systems & Software, Computer in Human Behavior, Data Base, Information Systems Management, Computer Personnel, and other outlets.

Gary Klein is dean of the School of Business at the University of Texas of the Permian Basin. He has a Ph.D. in Management Sciences from Purdue University's Karanert Graduate School of Management. His research interests include multiple criteria optimization, automated system design, integer programming, and model management and his papers have appeared in Management Sciences, Decision Sciences, Naval Research Logistics, MIS Quarterly, Journal of Management Information Systems, IEEE Transactions on Systems, Man & Cybernetics, Information & Management, Data Base, and other outlets.

Joseph L. Balloun is associate professor of Quantitative Analysis at Nova Southeastern University. He has a Ph.D. in industrial psychology from the University of California at Berkeley. His research interests include cluster analysis of objects, dimension analysis, ordinal response data, robust and resistant estimators, and general sciences. His papers on these and other topics have appeared in various leading journals. Besides being an active participant in national and international conferences, he has presented a variety of papers on statistical methodology in the social sciences.