The Information Professional and the New Technology: An Investigation of Possible Differential Responses by Gender

PAUL F. DUMONT AND ROSEMARY RUHIG DUMONT

THE STUDY OF PROFESSIONAL careers in librarianship has gained considerable momentum in the past few years. Historically, theoretical and empirical work in the field has been somewhat limited in the variables chosen for study. A major portion of this effort has centered on the demographic characteristics associated with library positions (Heim, 1983; DuMont, 1985). For example, the male/female ratio in management positions in libraries has long been of interest to researchers in the field (Phenix, 1985). But recently, new conceptual frameworks developed to aid in the study of professional careers have expanded the set of variables useful to the explanation of career development.

This expansion includes exploring the linkages between libraries as organizations in unique environments and the careers of library professionals. Hiatt (1983), for example, describes the professional career primarily in terms of management skills that can be learned by librarians. His view emphasizes two equally important components. First, he prescribes an ordered sequence of management skills that can be learned by individuals in professional positions. Second, and perhaps more significant, Hiatt describes an assessment process that provides a mechanism for individuals to identify personal strengths and weaknesses including managerial skills. From this it follows that the development of career or job mobility is not only a function of learning skills but also of personally realizing that these skills can be parlayed into career advancement. Thus, mobility is contingent upon the self-assessment of individuals that they can indeed apply those skills in a work setting. Self-assessment, in turn, is partly determined by the organization's structural and exogenous variables such as size or technology

Paul F. DuMont, Graduate School of Management, Kent State University, Kent, OH 44242
Rosemary Ruhig DuMont, School of Library Science, Kent State University, Kent, OH 44242
LIBRARY TRENDS, Vol. 37, No. 4, Spring 1989, pp. 510-20

or the environment in which the library operates. For example, an individual may perceive an expanding or contracting financial base as encouraging or inhibiting opportunity to apply skills. Such an expanded definition of the professional career emphasizes the subjective aspect of job mobility—i.e., people's attitudes toward, perceptions of, and expectations about their careers.

As an exogenous variable, technology is exerting an increasing influence over libraries and professional careers. Recent advances in the use of computers and information technology have accentuated the importance of technology to libraries. Thus the present study explores the role of attitudes toward technology as a determinant of careers.

Conceptual and operational definitions of technology are many and varied. A simple definition states that technology is the set of "man-machine activities which together produce a desired good or service" (Thompson & Bates, 1957, p. 325). The complexity of technology is reflected in the distinctions made of technology types including:

1. operations technology: the sort of equipment the organization uses in the performance of daily activities and the way the equipment is linked together;
2. materials technology: the types of materials used in the workflow (note that human beings may be considered as "materials" in specific settings, e.g., patients in hospitals, students in schools, etc.);
3. knowledge technology: the organizational apparatus whereby problems are analyzed and resolved (Donaldson, 1976, p. 256).

An assumption included with many of these definitions is that technology is at worst neutral and at best essential to progress. This leads to a belief in what Wright calls "technological determinism"—i.e., that technological discoveries and applications occur according to their own inner necessity, from laws that govern the physical and biological world, and that they, in turn, unilaterally affect social reality. From this perspective, human beings have few alternatives in their response to technology besides enthusiastic or resigned acceptance (Wright et al., 1987). Wright et al. identify critics of technology who oppose this deterministic view. They view technological development as part of a pattern responsive to the cultural and ideological values of society and are particularly concerned with the ways in which new technologies serve to reinforce dominance based not only on class or race but on sex, age, and sexual preference (Wright et al., 1987).

In particular, the computer gender gap has claimed much of the attention of those who study the social impact of new technology (Sanders & Stone, 1987). Many research reports provide evidence of the gender gap. For example, Anderson reports that the gap between males and females taking programming courses actually widened between 1978 and 1982 and the Project of Equal Education Rights tells of surveys on computer course enrollments in California, Maryland, and Michigan which discovered a 2:1 ratio in favor of males (Sanders, 1986). Other

studies show that women are more afraid of computers than are men and that women also believe that other women feel the same way (Dambrot et al., 1985). Such sex differences in attitudes toward computers are shown to be strongly established by grade 8. At that stage, males are consistently more positive about using computers than are females and more likely to express interest and pleasure in using a computer (Collis, 1985, p. 209). Advancing to secondary school, male dominance in computer use exists in a substantial proportion of schools (Becker, 1986). In addition, males are much more likely to seek out extracurricular training in computer programming than females; the disparity between females and males increases with age, is greater in advanced than in beginning classes, and is larger for expensive programs (Hess & Miura, 1985). Only one recent study appears to contradict these findings. A 1987 study at the University of Michigan shows that, although male students were purchasing more computers, more females were planning to take computer classes (Michigan Study, 1987, p. 15).

Careers in Librarianship and Technology—an Exploratory Study of Gender Differences

In the present study, it is suggested that certain boundaries may be set on librarians' career movement by the actual need (or even by a perceived need) for specific technological skills to enter into selected positions. Perceptions and attitudes toward technology can thus affect individual perceptions of career choices. Specifically, aspirations to advance into management positions may be affected by the view that technological expertise is necessary for such advancement. Attitudes about technology thus may impact career aspirations in general. The hypothesized view holds that women librarians are less interested in technology than men and thus this difference in attitude may be the one reason inhibiting female mobility into managerial positions. If this difference in attitude exists, a self-selecting process may be at work leading to a higher proportion of men interested in technology who are in management settings because of a more positive male disposition toward technology. This study is exploratory in nature since there are limited theoretical bases for these hypothesized relationships (Bailyn, 1987).

Because there is a paucity of information available on the impact of technology on career perceptions or the psychological impact of technology on the workplace in general, it was decided to conduct a small-scale pilot survey study to examine the relationship between motivation to manage (MTM) by professional librarians and their attitudes about technology. The concept of motivation to manage has been discussed previously in the library science literature (Swisher et al., 1985). One conclusion of that research is the suggestion that female librarians, although motivated to manage, may not be opting for top administrative positions in the same proportion as males because they do not see

themselves capable of such positions. The basis for the present research is to test that perception in relation to technology.

Hypotheses: Technology and Gender

From the discussion presented earlier, three hypotheses were derived. They concern the relationships among interest in technology and motivation to manage and gender. First, it was hypothesized that MTM and interest in technology would be consistent—i.e., high levels of motivation to manage would mean that high interest in technology would also be present. Hypothesis 1: Motivation to manage is positively correlated with attitudes toward technology (AT). Second, it was hypothesized that those individuals already holding management positions would have a high interest in technology. Hypothesis 2: Persons in managerial positions have stronger positive attitudes about technology than persons not in managerial positions. Third, since it was expected that there would be more men in the sample than women who held management positions, high interest in technology and high MTM scores were projected to be predominantly male characteristics. Hypothesis 3: Males have higher MTM and AT scores than females.

Method

Sample

The sample used in this study consisted of 105 members of the Ohio Library Association (OLA). These 105 members were selected on the basis of their probable association with an academic library since they listed an academic library affiliation for the 1987 address list.

A two-wave mailing of a composite questionnaire generated seventy-one usable responses for a 67.8 percent return. Since our interest in this study was in academic librarians, the seventy-one respondents were categorized as being employed full-time in an academic library ("academic librarian") or as "other." This generated a second smaller pool of responses of fifty-seven or 40.4 percent.

Data Collection and Analysis

A 135 item composite questionnaire was sent in two mailings to selected OLA members. The composite questionnaire was accompanied by an explanatory letter on Kent State School of Library Science stationery and a stamped return envelope.

The composite contained two separate questionnaires, both of which were previously developed and separately reported in the literature. Motivation to manage was measured using the forty-item multiple choice version of Miner's Sentence Completion Scale (Miner, 1977). The form adopted had been previously modified to remove gender bias (Swisher et al., 1985). Attitudes toward technology were assessed by using the seventy-six item Resistance to Technological Innovation in

Libraries Instrument (Fine, 1979). This latter instrument was modified only to the extent that items (questions) with similar response scales were grouped together. This resulted in five "checklist" scales being removed from context and placed at the end of the composite instrument.

Before the tests of the hypotheses are reported, it should be noted that the attitudes toward technology scale used in this research is not separately identified or reported by Fine (1979); this scale is a subsection of the Resistance to Technological Innovation in Libraries Instrument. Fine's research focused upon identifying personality factors associated with resistance to technological change. Thus, Fine's instrument contains many items assessing personality dimensions such as "locus of control" and higher order needs (achievement, affiliation, dominance). For Fine's instrument to be useful to this project, the items associated only with attitudes toward technology had to be separated and evaluated.

To accomplish this, both authors and a graduate research assistant identified the items that clearly assessed technological attitudes. Consensus resulted in thirty-five items being identified in Fine's instrument as relating to technology. Four of these were checklist items not capable of being added to the scales used in the remaining items. Thirty of the items used a five-point anchored Likert-type scale from "strongly agree" (+5) to "strongly disagree" (+1) and also included a "no opinion" option (0). One question, concerning future budget allocations for technological improvements, used a different five-point scale which was compatible with, but not identical to, the Likert type scale illustrated earlier. Because of the small size of the sample and the large number of items on the four checklist questions, these four questions could not be subjected to rigorous statistical procedures such as factor analysis. For these reasons (scale incompatibility and small sample size) these four items were *not* included in the instrument used here to measure attitudes about technology.

Another problem faced in this research concerned the scoring of the various items. Fine does not report whether items are positively or negatively related to technological attitudes. In fact, Fine does not report scoring protocols for any items or any statistical analysis of the instrument (validity or reliability). The original questionnaire was not tested for validity, reliability, or generalizability (Fine, 1979). The Fine questionnaire was used anyway because it is the only one of its type to measure attitudes about technology held by librarians. Thus, the two authors and research assistant again used "face validity" to judge whether positive or negative scoring was appropriate.

Participants recorded responses directly on the questionnaire. Responses were transcribed to the Kent State University IBM mainframe computer for analysis. Standard statistical routines (as available under SPSSX) were utilized for data analysis.

Analysis

The seventy-one returns were used in two ways in this research. First, the entire pool of seventy-one returns was used to test hypotheses and to establish the AT scale reliability and internal consistency. The pool was then reduced to the fifty-seven responses from full-time academic librarians and the same tests repeated. Both procedures were used because the size of the study's data pool was so small.

Demographics

The full pool of seventy-one responses was split 36.6 percent male (26) and 60.6 percent female (41) with two "nonresponses." Fifty-seven academic librarians constituted the largest group (80.8 percent) with fourteen others responding. (Demographics of academic librarians are reported in detail later.) Thirty-three (46.5 percent) reported having managerial responsibilities while twenty-nine (40.8 percent) did not, and nine did not respond to the determining question.

The fifty-seven academic librarians represented a cross section of academic libraries. The respondents were mainly from educational institutions which offered degrees through the doctorate (59.6 percent) while 12.3 percent worked at institutions with a terminal master's degree, and 22.8 percent worked at wholly undergraduate institutions. Three returns (5.3 percent) were blank. The size of the academic libraries represented in this sample was measured by holdings and staff as shown in Table 1.

The predominant library represented had between 1 and 2 million volumes in the collection (38.5 percent) and had a staff in excess of twenty-five full-time professionals (35.1 percent). The academic librarian respondents were split 40.4 percent males and 59.6 percent females. Individuals working primarily as professionals with supervisory responsibilities (45.6 percent) considered themselves to be administrative staff (43.8 percent) rather than functional staff and had budget-making authority (50.9 percent) (see Table 2 for more details).

Experience in the profession and in the current job was reasonably distributed (see Table 3). The typical respondent earned $35,000 or more per year and was forty years of age or older (see Table 4).

Results

Hypotheses

Face validity for the individual items in the AT scale was established as discussed earlier. Thus, when read, the individual questions do appear to measure a person's attitude toward technology. Internal reliability (the consistency with which individuals respond to related questions in the same scale) of the AT scale was very good with a Cronbach's Alpha of .817 and a Spearman-Brown coefficient of .739 for the full respondent pool ($n = 65$). Similar measures for the academic librarians ($n = 53$) were marginally higher at .832 and .777 respectively.

TABLE 1
SIZE OF ACADEMIC LIBRARIES REPRESENTED

	Percentage of Respondents ($n = 57$)		
Collection Size	*Percentage of Respondents by Size of Library*	*Number of Full-Time Professionals on Staff*	*Number of of Staff*
Under 100,000	24.6	28.1	Under 5
Between 100,000 and 1 Million	24.6	21.1	5 to 15
1 Million to 2 Million	38.5	12.3	16 to 25
Over 2 Million	8.8	35.0	Over 25
Not Reported	3.5	3.5	
Total	100.0	100.0	

TABLE 2
RESPONDENT JOB CHARACTERISTICS

	($n = 57$)				
Position	*Percentage*	*Functional Area*	*Percentage*	*Budget Authority*	*Percentage*
Para-professional	1.8	Technical Services	8.8	Yes	50.9
Administrative	29.8	Reference	15.8	No	45.6
Non-supervisory Professional	19.3	Cataloging	14.0	No Response	3.5
Supervisory Professional	45.6	Administration	43.9		
No Response	3.5	Special Collections	3.5		
		Other	10.5		
		No Response	3.5		
Total	100.0		100.0		100.0

Hypothesis 1 states that motivation to manage and attitudes about technology will be positively correlated. A correlation (Pearson's r) of .414 between MTM and AT scores ($n = 55$ complete cases for the full response pool) was highly significant ($p = .001$). When singled out, academic librarians also reported a highly significant correlation between these scores ($r = .442$, $n = 47$, $p = .001$). Thus, Hypothesis 1 is supported.

Hypothesis 2 predicts that librarians in management positions will have stronger positive attitudes toward technology than nonmanaging librarians. Comparisons of the distributions of AT scores between managers versus nonmanagers yielded marginally significant differences in the distribution of the two groups (chi square) for the full pool of seventy-one responses. Nine managers reported either very low or below average AT scores compared to twelve nonmanagers. In a similar manner, seventeen managers rated as above average or very high compared to only seven nonmanagers. However, a comparison (t-test) of the

TABLE 3
RESPONDENT EXPERIENCE

	(n = 57)	
Experience	*Percentage of Total Libraries*	*Percentage of Present Job*
Under One Year	-	1.8
1 to 5 Years	5.3	21.1
6 to 10 Years	28.1	33.2
11 to 20 Years	29.8	28.1
Over 20 Years	31.5	12.3
No Response	5.3	3.5
Total	100.0	100.0

TABLE 4
RESPONDENT CHARACTERISTICS

		(*n* = 56)	
Age	*Percentage*	*Salary ($)*	*Percentage*
		Under 5,000	1.8
20-29	5.4	15,000 to under 20,000	14.3
30-39	21.4	20,000 to under 25,000	17.9
40-49	33.9	25,000 to under 30,000	12.5
50-59	28.6	30,000 to under 35,000	12.5
60+	10.7	Over 35,000	41.0
Total	100.0		100.0

AT mean scores contrasting managers against nonmanagers was not significant ($t = -.99$, $p = .324$, $df = 55.5$). Data for the academic librarians alone yielded the predicted (but not significant) results. Twelve nonmanagers compared to seven managers scored low, while only five nonmanagers compared to twelve managers achieved high AT scores. This grouping (chi square = 4.099, $df = 2$) approached significance ($p = .1290$). More important, a comparison of AT scores of managing versus nonmanaging academic librarians also approached significance ($t = -1.37$, $p = .176$, $df = 53$). These data provide marginal support for hypothesis 2.

The third hypothesis suggests gender differences with males scoring higher on MTM and AT measures than females. Again *t*-tests of means were used. However, this hypothesis was *not* supportd. Both the full pool and the reduced pool of academic librarians yielded insignificant comparisons (see Table 5 for *t*-test values).

DISCUSSION

Previous research has established several relationships between a variety of variables and the professional academic librarian's career. Most notably, family background and personal characteristics such as age, marital status, and educational attainment have been examined in relation to library position held. Other characteristics were examined by

TABLE 5
LIBRARIES AND MOTIVATION TO MANAGE (MTM)/ATTITUDES ABOUT TECHNOLOGY (AT)

Sample	*Scale*	*t*	*df*	*p*
Full	MTM	- .56	53	.58
Full	AT	.60	61	.55
Academic Librarian	MTM	- .06	32.8	.95
Academic Librarian	AT	1.03	55	31

Irvine (1985) including mobility patterns, career history, the availability of role models and mentors, professional activities, and publication record. The striking nature of Irvine's findings is that women who make it as administrators are not unique or special. They display many of the same characteristics as their male administrative colleagues. Female administrators are mobile and obtain varied experiences as middle managers. Other studies show female administrators to have similar levels of interest in managing libraries as their male colleagues (Swisher et al., 1985). In fact, when these studies are compared using such instruments as Miner's Motivation to Manage Questionnaire, there seems to be little interest in management among professional librarians. This characteristic applies whether the professional librarians are administrators or not and whether they are male or female

Why then do women fail to occupy upper-level managerial positions in libraries in proportion to their numbers in the profession? The current study examines the potential explanatory power of attitudes toward technology as a determinant in the lack of women in top managerial ranks. Hypothesis 1 which establishes a correlation between motivation to manage and attitudes toward technology is strongly supported. Hypothesis 2, which projects a strengthening of attitudes toward technology by the holding of managerial positions, is not supported by statistically significant results. The statistical tests do, however, approach significance (see Table 5).

Thus, attitudes toward technology can be posited as a variable which might intervene in the career paths of women if a strong gender bias can be demonstrated. However, hypothesis 3, which predicts a gender bias in attitudes toward technology, is definitely *not* supported. This finding suggests that attitudes toward technology cannot be used to explain gender imbalance in management positions in libraries.

The authors would be remiss, however, if they did not advise caution in the interpretation of these results. This study was limited to members of the Ohio Library Association who appeared to be working in academic libraries. The full pool of seventy-one responses and the qualified pool of fifty-seven academic librarians is not a sufficient base upon which to draw sweeping generalizations for the profession at

large. This study, because of the limited sample, should thus be considered as only a pilot study.

Another caution concerns the instrument used to assess attitudes toward technology. While the instrument items have obvious face validity, this is not sufficient in and of itself. Further study needs to be done to establish construct validity through concurrent validation with similar instruments such as computer anxiety questionnaires, etc. In addition, the stability of the instrument has not been established although internal consistency measures are very good.

Clearly, more research on the personal and organizational determinants of job mobility of males and females in the library profession is necessary before researchers will have sufficient knowledge upon which to construct models of career mobility. The present study suggests that technology is not a significant variable in the career paths of library managers. Other unknown factors must be impacting on job movement. Once factors impacting career development are more commonly recognized, there may be some impetus for the control of those organizational and personal factors important in the development of career paths for both male and female librarians.

REFERENCES

Bailyn, L. (1987). Experiencing technical work: A comparison of male and female engineers. *Human Relations, 40*(May), 299-312.

Becker, J. H. (1986). Our national report card: Preliminary results from the new Johns Hopkins Survey. *Classroom Computer Learning, 6*(January), 30-33.

Burrington, G. (1987). *Equal opportunities in librarianship? Gender and career aspirations.* London: Library Association.

Collis, B. (1985). Psychological implications of sex differences in attitudes toward computers: Results of a survey. *International Journal of Women's Studies, 8*(May/June), 209.

Dambrot, F. H.; Watkins-Malek, M. A.; Silling, S. M.; Marshall, R. S.; & Garver, J. A. (1985). Correlates of sex differences in attitudes toward and involvement with computers. *Journal of Vocational Behavior, 27,* 71-86.

Donaldson, L. (1976). Woodward, technology, organizational structure and performance-a critique of the universal generalization. *Journal of Management Studies* (October), 255-273.

DuMont, R. R. ed. (1985). Women and leadership in the library profession. *Library Trends, 34*(2), 163-353.

Fine, S. (1979). *Resistance to technological innovation in libraries: Part II: Data Analysis and statistical report.* Alexandria, VA: ERIC Document Reproduction Service (ED 226 730).

Heim, K. M. (1983). *The status of women in librarianship: Historical, sociological and economic issues.* New York: Neal Schuman.

Hess, R. D., & Miura, I. T. (1985). Gender differences in enrollment in computer camps and classes. *Sex Roles, 13,* 193-203.

Hiatt, P. (1983). Should professionals be managers? *Journal of Library Administration, 41*(Spring), 21-39.

Irvine, B. J. (1985). Differences by sex: Academic library administrators. *Library Trends, 34*(2), 235-257.

Mich. study finds most computer buyers are men, but more women want courses. (1987). *Chronicle of Higher Education,* (April 29), 15.

Miner, J. B. (1977). *Miner sentence completions scale: Multiple choice version,* Form H. Atlanta, GA: Organizational Measurement Systems Press.

Phenix, K. (1985). Sex as a variable: A bibliography of women in libraries 1975-85. *Library Trends, 34*(2), 169-183.

Sanders, J. S. (1986). Closing the computer gender gap. *Education Digest, 52*(October), 20-23.

Sanders, J. S., & Stone, A. (1987). *The neuter computer: Computer for girls and boys.* New York: Neal Schuman.

Swisher, R.; DuMont, R. R.; & Boyer, C. J. (1985). The motivation to manage: A study of academic librarians and library science students. *Library Trends, 34*(2), 219-234.

Thompson, D. J., & Bates, F. L. (1957). Technology organization and administration. *Administrative Science Quarterly, 29,* 325-343.

Wright, B.; Feree, M. M.; Mellow, G. O.; Lewis, L. H.; Samper, M. D.; Asher, R.; & Claspell, K. (1987). *Women, work and technology: Transformations.* Ann Arbor, MI: University of Michigan Press.