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ABSTRACT

This final section of the report of a study on resistance to technological innovation in libraries begins with a summary of findings related to six research questions: (1) Assuming that resistance to technological innovation does exist, can a measure be developed to identify the resistance factor from items which tap the various dimensions of a generalized resistance toward technology? (2) When resistance to technology does exist, what are its related attitudes, beliefs, and reasons? (3) What are the values of technology as seen by librarians? (4) Do librarians differentiate personal and societal values regarding the acceptability of technological innovations? (5) Are personality variables related to resistance to technology? and (6) Is resistance to technology related to work environment and professional self-perception variables? An analysis of the findings, focusing on behavioral implications, is then presented. Four papers by outside reviewers, who were asked to reflect on the findings as they relate to the future of the profession, follow this analysis. (MES)

FINAL REPORT: PART III

Project No. 475AH70073
Grant No. G007702319

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RESISTANCE TO TECHNOLOGICAL INNOVATION IN LIBRARIES:

Part III: REVIEWS OF THE STUDY

December 1, 1979

U.S. DEPARTMENT OF HEALTH EDUCATION AND WELFARE

Office of Education
Office of Libraries and Learning Resources

Resistance to Technological Innovation in Libraries:

Reviews of the Study

FINAL REPORT: PART III

Sara Fine
University of Pittsburgh
1979

Final Report: Part III

Project No. 475AH70073 Grant No. G007702319

Period: Oct. 1, 1977 to Dec. 31, 1978 Date of Submission: December 1, 1979

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Title of Project: Resistance to Technological Innovation in Libraries

Project Director: Sara Fine

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DESCRIPTION OF PROJECT: The purpose of this project was to study the phenomenon of resistance to change as it applies to technological innovation in libraries. The basic assumption of this study was that the kinds of transitions that will result from the "technological revolution" in the delivery of information and in the evolution of information networks will profoundly affect the traditional concept of libraries as we know them and the professional role of the librarian as it has been practiced in the past. A resistance reaction to this magnitude of change is inevitable. In fact, the evidence suggests that resistance to change exists, now as always, within the library profession, manifesting itself in both obvious and subtle ways.

This study sought to understand the degree and nature of that resistance, to probe its antecedents, to clarify its manifestations and its effect, and to offer recommendations for decision-making, re-education of professionals, and further research.

The study involved the development and distribution of a mail survey instrument directed toward a sample of public librarians. Six general variables which were hypothesized to be related to the resistance phenomenon were analyzed. In addition, a smaller sample of individual interviews was conducted to probe these areas more intensively.

Resistance to Technological Innovation in Libraries

Part III Reviews of the Study

This final section of the study consists of four parts. First is a summary of the results that are presented in full in Part II of this report. Second is an analysis of the findings by the principle researcher from her own professional perspective as a psychologist whose experience teaching in a school of library and information sciences, together with experiences as a consultant for libraries and library associations, led to the development of this study. The focus of this chapter is on the behavioral implications in the findings and is based on the theories of personality and organizational behavior that provided the constructs on which the study was developed.

The third part consists of three papers by outside reviewers who were asked to read the study and offer their reflections on the findings as they relate to the future of the profession. Two of these reviewers are library educators whose own research efforts have been directed toward the human dimension of library service. Both have strong records of significant research and were invited to contribute to this project because they would bring a critical analysis to the study itself and to the results. The third reviewer brings a different perspective, not as a researcher but as a journalist, observer and commentator on contemporary librarianship. His perspective represents a breadth of professional experience as a library administrator, number of regional library council boards, and editor of a leading professional journal.

The final part of this section is an article by a distinguished information scientist and educator whose reflections on librarianship as it faces

the information-loaded future with the many problems that technology can solve together with the dilemmas it generates--seemed to be a fitting conclusion for this study.

The inclusion of these five papers is intended to provide added perspective to the study and to help make the findings more meaningful to its readers.

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RESISTANCE TO TECHNOLOGICAL INNOVATIONS IN LIBRARIES

RESULTS OF THE STUDY: SUMMARY OF FINDINGS

Research Question A: Assuming tha resistance to technological innovation does exist, can a measure be developed to identify the "resistance factor" from items which tap the various dimensions of a generalized resistance toward technology?

- The results of the study supported the contention that resistance to technology is a complex, multi-dimensional phenomenon. In order to identify a resistance factor, an array of items representing the varied dimensions of resistance were subjected to a factor analysis. The result of the analysis justified the use of a barrage of measures to tap resistance. Nine classes of items, i.e., dimensions of resistance, made up the resistance scale. Seven items of the 16 items in that scale were found to relate strongly to the first factor extracted. These seven items came from six of the nine classes or dimensions composing the resistance measure.

A factor is a hypothetical variable that can be said to underly a set of analyzed items. The factor loading for each item is its correlation with the hypothetical variable. The meaning of the factor can therefore be determined by examining those items which relate most strongly with it. The factor in this case seems to have isolated the affective element in the items. The item relating most strongly with it (Q. 19) is a measure of negative affect determined by associative responses in which respondents were asked to check words that generally apply when they think of technology.

The second strongest item asked respondents whether technological advancements have already dehumanized their lives. The third strongest asked for agreement with the statement, "I went into librarianship to work with books, not machines." The fourth strongest asked about feelings related to technology already present in libraries.

This first factor, then, can be said to represent a measure of feelings about technology, not based on rational judgment or experience, but on personal affect and the sentiment of personal experience. This factor seemed to exclude judgments about future expectations of technology or about the appropriate response of libraries to increasing technology.

One of the major concerns in the development of this study had been to differentiate considered judgment and disagreement from the unreasoning, affective, reactive negativism that constitutes the psychological phenomenon of "resistance to change." Based on the theoretical considerations that led to the inclusion of a broad range of items that might be associated with resistance and on the factor analysis of those items, it would appear that the resistance factor can be identified and analyzed in a self-report instrument.

- An analysis to determine the presence of a "social desirability response factor" revealed the following: Respondents could be separated into those consistently giving professionally acceptable responses on the order of 88% and those giving deviating responses at 12%. It was further determined that the responses of those not giving professionally acceptable responses correlated much higher on the RESISTANCE index than those who did

give "correct" or acceptable responses, supporting the contention that such a response set was obscuring the presence of resistance.

It appears that the social desirability factor, as it emerged from the analysis of the responses, explains 18 to 20% of the variance when lack of resistance to technology was reported; that is, the more likely respondents were to give the socially desirable response, the less likely they were to give responses indicating resistance to technology.

- In general, the results of the interview phase of the study strongly paralled the results of the mail survey when items were similar or identical, an indication of validity in the mail survey questionnaire. The major value of the interview survey was in the extensive information obtained about library activities and processes in the surveyed libraries. It is interesting to note, however, that the social desirability factor appeared more strongly in the interview survey than in the mail survey.

Research Question B: When resistance to technology does exist, what are its related attitudes, beliefs and reasons?

Predominating Correlates

- The most significant correlates of resistance were those related to attitudes that technology (1) will result in loss of control and privacy, (2) will erode interpersonal relationships, (3) will replace people in their jobs and (4) will replace familiar, traditional and useful library processes. Fifty-eight (58%) of the variance in the RESISTANCE index was explained by this set of variables.

Technology and control

While the issue of technology as it relates to a sense of personal control was not specifically tapped by the correlation analysis, the distribution of responses indicated that 84% of the respondents felt that to some degree. technology has the potential to control their lives. In contradiction, the majority of respondents agreed or strongly agreed that technology gives us more control of our environment and that technology is an extension of self. The ambivalence in these responses suggest areas of stress.

It has been posited that the personality dimension described as "locus of control" may be a significant factor in the individual's adaptability to technological changes in the professional environment. The magnitude of the responses that reflect negatively on the controlling potential of technology suggests that the relationship between this dimension of attitude and some aspect of personality may be an important area for further study.

Attitudes towards technologists

It had been hypothesized from evidence in the library literature that attitudes towards the purveyors of technological innovation may confound reported attitudes towards proposed innovations. While the analysis did not elicit the degree to which resistance might be directed toward technologists, and thereupon misplaced to innovations themselves, there were descriptive responses that reflected negativism toward technologists and suggest an area for further investigation.

Regarding the perceptions of librarians about technologists, 76% responded that librarians should determine the technological needs of libraries. Some

67% disagreed with the concept that those with technological expertise should make such decisions for libraries. Feelings about "technologists," i.e., whether they are easy to understand, talk down to people, and are generally compassionate people, tended to be ambivalent or negative. Only 23% viewed technologists positively. Most respondents tended to believe that the language used by technologists is more complex than the technology itself.

When asked directly in the interview survey if technology is imposed by outside experts, 61% said Yes. They explained that "technologists" ignore the needs of librarians, that they spur artificial needs, and that they produce oversystematization. Fifty-nine percent believed that technologists make more money than librarians, and 88% reported that they do not or sometimes do not understand the language that technologists use.

The language of technology appeared as a significant aspect of reported attitudes. When asked about the complexity of the language, only 12% of the interviewed librarians said they understand it while 15% said they don't. The other 73% used terms to describe their level of understanding such as "usually," "somewhat," "depends on the amount of jargon," or "very little." One percent admitted that it makes them feel inadequate.

In one additional interview probe, respondents were asked if they believe that technologists are machine-oriented while librarians tend to be people-oriented. Forty-four percent believed that this dichotomy does exist and 41% believed it is partially true.

Other findings: distributions of responses related to aspects of the effects of technology (from items designed to assess the dimensions of resistance to technology).

- Sixty-eight percent of respondents tended to agree to some extent that technology will become so complicated that users will need to be trained by librarians.

- Respondents reported their opinions about the percentage of the library budget that should be spent on technological developments as follows: Eighty-eight percent believe that less than 25% of the library budget should be devoted to technology; 10% of the respondents would spend 26 to 50%; only 1.4% would spend more than 50%.

- There was a sizable number of librarians (45%) who, when asked: "Frankly, I would still prefer finding materials through use of the card catalog rather than through the mechanized devices," were in agreement (8.5% strongly agreed; 17.4% agreed somewhat, 19.1% were in the middle). In the interview survey, 27% of the respondents agreed with this statement.

- The responses from the interview survey showed that 87% of the respondents have genuine concerns about the danger of loss of privacy due to technology; 61% reported that technology in general or in the library has given rise to some personal concerns.

Research Question C: What are the values of technology as seen by librarians (or in which areas is technology seen as favorable)?

- The distributions of responses to the questions in this set, which were based on a generalized conception of the impact of technology on society, were unremarkable.

- Where the respondents expressed an eager acceptance of technological innovation in libraries, the responses relative to the nature of the technology and the degree of acceptance fell on a continuum from simple technologies, which were most readily accepted, to sophisticated technologies, which were least readily accepted. Most positive feelings were about audiovisual materials and projectors, with microform coming next. Less positive feelings were expressed about computer terminals and automated cataloging. Positive feelings were inversely related to the complexity of the technology.

- The responses from the interview survey revealed the following: In terms of general attitudes, the majority of librarians (61%) preferred access to an on-line information system over hiring more librarians. Most (78%) believed that technology would give them more time to provide better service to users. But 27% would still rather use the card catalog than deal with mechanized cataloging devices. Virtually all respondents saw the addition of a terminal in most libraries as beneficial, and even terminals in private homes as a good event. In the mail survey, however, the greatest uncertainty of benefit (i.e., "I'm in the middle") concerned the question of a terminal in every home (32%).

- The mail survey also revealed a remarkably strong belief in the value of a national information network (88%). Other technologies viewed as

favorable events are as follows: terminals in every home (54%); the increased use of microform (64%); two way television transmission between homes/businesses and libraries (56%); complete automation of cataloging (77%).

Research Question D: Do librarians differentiate personal values and societal values regarding the acceptability of technological innovations?

- Variables specified as personal were more highly intercorrelated than those specified as societal, suggesting that the respondents regarded technological issues as personal and internal rather than as societal and external from themselves.

Research Question E: Are personality variables related to resistance to technology?

- No significant relationship between personality variables and the RESISTANCE index could be identified. A resistant personality, i.e., a "library mentality," was not identified.

- In reviewing the distributions, the locus of control variable is the most interesting and ambiguous of the personality variables. Except for one item which has a strong "social desirability" feature, the responses were divided, even though there was a tendency toward inner directedness. There is enough discrepancy in the responses to indicate that this may be a fertile field for further investigation. While there was little evidence of a relationship to resistance, there is reason to believe that

the "social desirability" response tendency might have been obscuring the locus of control variable.

- In terms of personality and life-style reported by respondents in the interview survey, librarians tend to perceive themselves as non-rigid, liberal or middle of the road politically, and tending toward conventional life styles. These characteristics were not found to relate to resistance.

Research Question F: Is resistance to technology related to work environment and professional self-perception variables?

- Little interrelationship was evidenced between resistance and occupational or professional variables which included: training, library experience, perception of degree of respect accorded to librarianship as a profession, method of deciding upon librarianship as a profession, and subjective perceptions of the work environment. These variables explained little of the variance in the RESISTANCE index with the exception of feelings regarding promotion to jobs with a higher classification and level of feelings about whether decisions regarding the library are made at the top, without consulting those who do the work.

However, analysis of the interview process revealed that in considering occupational and professional variables, organizational climate expressed in terms of level of supervision enjoyed by the respondent was correlated with the RESISTANCE index, i.e., that higher levels of resistance are associated with restrictive supervision.

With questions concerning loyalty to their director, respondents were generally positive and consistent over behavioral, affective, and cognitive dimensions.

- Librarians reported positive perceptions about librarianship as a respected, intellectually demanding profession, one which was chosen for positive reasons. Perceptions about the work environment were generally favorable. Supervisors were seen as available for discussion, jobs were perceived as relatively secure, work environments were seen as open and participatory. However, 37.7% of the respondents were not optimistic about their potential for promotion. Of those, 20% said that they were not interested in advancing their careers. In addition, while library environments were described as open, 63.8% of the respondents strongly or somewhat agreed that decision-making appears to be the prerogative of the administration "without consulting the people who are going to do the work."

Research Question F: Demographic variables.

- The findings which resulted from the cross-classification of the demographic variables by the RESISTANCE index were that female, older individuals, those who have worked in libraries for many years, and the individuals whose backgrounds are in the humanities are more likely to be resistant to technology. Individuals who work with computer terminals, automated cataloging, and to a lesser degree audiovisual materials are less likely to appear in the resistant group.

- In the assessment of "current awareness" aspects of professionalism, 90% of the respondents indicated current use of at least one technology. But attention to technology-related matters beyond the individual's own library was rare, with few librarians participating in technology-related activities within a professional association. Librarians reported in the interview survey that they do not read technology-related professional literature, either because they have no time or interest or because they get needed information on the job.

Descriptive Findings: Librarian Responses

Personality Items

- On a scale that was included in the interview to assess a tendency toward risk-taking as a personality characteristic, librarians reported a low level of risk-taking behavior, even in fantasy. About 64% had never considered joining an encounter group, 58% would not consider becoming an organic food advocate, 60% reported that they have never engaged in any kind of non-traditional activity. Only 22% reported that they have changed their lives in some major way such as leaving a job or leaving home. Seventy-eight percent neither gamble nor would buy lottery tickets. Forty percent have threatened to quit their job, and of those, 22% have voiced such intentions to their administrator. Fifty-eight percent would not accept a promotion if they were not sure that they had the experience or qualifications for it. Respondents did not like the idea of being hypnotized (56%), or parachuting from a plane (81%), or jumping into a cold pool (54%).

Of particular interest is the relationship of the kind of risk-taking described to the tendency to be resistant to change. In the question concerning joining an encounter or sensitivity group, higher values of the RESISTANCE scale were associated with higher numbers of people who have not considered that particular type of risk. The relationship is reversed, however, for the questions concerning parachute jumping and cold water. The higher the resistance, the more likely respondents are to want to try parachute jumping and to dive into cold water.

- In three out of five "locus of control" items, responses were evenly split between "inner" and "outer" responses. These three items were more obscure than the other two, and the "right" answer was less obvious. In the more socially obvious questions, one concerning experience over heredity and the other concerning direction over one's own life, 87% gave the socially desirable response.

  In the technology/control items, respondents tended to accept technological innovations in their private and social lives, with the exception of the 93% who preferred to die naturally rather than to be kept alive through life-preserving machinery.

- Librarians reported themselves to be gregarious, friendly and sociable.

World view items

- The Librarian respondents tended to report a moderate view about the welfare system (52%), to favor abortion (56%) and to be moderate (36%) or negative (48%) about capital punishment. Forty-six percent reported that formal

religion is very or moderately important in their lives and 52% viewed it as slightly or not at all important. Only 1% felt unsure about an accurate answer.

Items related to work environment

- Regarding organizational climate, a majority of respondents viewed their organization as open, social, pleasant, participatory, innovative, and people-oriented.

Supervisors were viewed positively. Respondents reported that they can discuss problems freely; subordinates know how their work is regarded and are allowed the freedom to work without close supervision. However, staff is singularly uninvolved in the decision-making or policy-making process, and new ideas or changes are not discussed with staff in consultation. The picture painted is that of a benevolent but authoritarian organizational climate in which subordinates agreeably comply.

- Almost all respondents prefer organizing their own time as opposed to having someone else do it.

- Reports relative to opinion leadership were contradictory. Fifty-eight percent do not see themselves as opinion leaders, yet 65% try to get other people to agree to an idea, and 68% speak often at staff meetings and feel that what they contribute is treated as important. When the direct question "Do you see yourself as a leader of opinion" was crosstabulated with RESISTANCE index, there was a suggestion that higher levels of resistance are associated with a greater tendenc, on the part of respondents to perceive themselves as op' .ion leaders.

- It is interesting to note that while respondents reported a warm and comfortable work environment when asked closed-ended questions, further probing revealed some discrepancies. When asked, "In general, how would you like to see the administration of your library changed?" the respondents reported the following: Fifty-five percent would like to see the climate changed with administration moving closer to staff, more innovativeness, more openness, more staff input, more administrative cooperation. The strongest relationship was observed with the question concerning level of supervision of the respondent. When this question was cross tabulated with the RESISTANCE index, the results suggested that a higher level of resistance is associated with closer supervision by superiors.

Items related to librarianship, professionalism and training

- Librarians' perceptions about librarianship were favorable, and the feelings of respondents about being part of the profession were positive. Most respondents saw librarianship as having the same status as that of a media specialist, social worker, teacher, information scientist and library school professor and having a lower status than a physician, lawyer and psychologist.

- The demographics of the interview survey corresponded with the results from the mail survey. Lower levels of resistance were associated with Masters of Library Science degree holders and with younger respondents.

- In terms of preparation for working with technological innovations, most respondents learned to work with technology "on the job" (66%); only 27% reported that they had received adequate preparation during their formal training.

- Only 15% of respondents were active in the American Library Association; of those, only 1% participated in activities related to technology. Sixty-one percent were not familiar with the National Plan for Libraries. An additional 25% had heard of it but had no opinions about it.

- Eighty-three percent of the librarians indicated that they did not read "information science" or "library technology" articles in the library literature, either because they had no interest or time or because the necessary information was obtained on the job.

Items related to technology

- While 10% of the respondents indicated no current use of technology in their work, 86% of the librarians who worked with technology enjoyed their work, generally finding it more efficient.

- Librarians were equally divided in the matter of whether or not technology has changed their role, but only about 20% believed that their role will not be changed by the end of the century. About one third of the respondents felt that libraries will one day be obsolete due to technology, with this group equally divided between whether obsolescence will be good or bad. Finally, only one in five librarians expects to see a national information network linking all kinds of libraries within this century, even though they view this event as desirable.

Resistance related item

- One final item of interest concerns the interviewers' perception of the respondents' cooperativeness and interest in this research study. Results

of these estimations show a tendency for those respondents who were interested in this study to be less resistant than those whose interest was moderate.

The Current State of Technology

The current state of technology in libraries is a descriptive but major finding of this study. Data were collected through a mail survey of administrators of libraries in the sample and were to a large extent verified by a small interview sample.

- Three of the computer-related technologies (circulation, cataloging, and some kind of on-line system) are currently used by 15 to 27% of the libraries in the sample, with a large number of libraries planning to adopt these innovations. The total number of libraries using or planning to use automated circulation systems is nearly 70%, with about 60% planning for computer cataloging and 40% for on-line systems. Present and planned uses of automated information storage systems is low. Some use of other technologies, mainly automated acquisition systems and audiovisual equipment, was noted. Microfilm collections and equipment are the most frequently used technologies and have been used in libraries for about ten years. Technological aids for service to special clients are the second most frequently used technologies.

- In response to questions about the effectiveness of various technologies, the results showed that about three fourths of the uses of technology were ranked as high or very high. There was some difference in these rankings based on the length of time the technology had been operating. In libraries

where the technology had been in place for more than five years, rankings were somewhat higher, except for automated circulation systems. Sixty-eight percent (68%) of all library administrators using such a system ranked them as high, but only 52% of those who have had circulation systems for more than five years found them highly or very highly effective.

- The results suggest that most of the computer technology now in place in libraries was installed under the direction of the current administrator.

- When asked about the problems associated with currently implemented technologies, administrators responded as follows: Resistance by the public (18% of all problems mentioned); mechanical (15%); planning problems (14%); service problems (13%), funding (10%), and staff resistance (6%). Those sensing staff resistance indicated that the primary manifestations of it were undercurrents of talk and unvoiced anxiety.

- Forecasts of the future as perceived by administrators indicated several unlikely occurrences such as the demise of the printed book in favor of microform for many materials and the replacement of the library as a storehouse in favor of a transfer-of-information center. Most of the projected events were considered likely, however, including the automation of technical service functions in libraries, acceptance of resource sharing, a thrust of technology towards bringing data to people rather than people to libraries, changes in training of library professionals, and the development of the library as an electronic education center. Opinions on the likelihood of a national information network were split, with a small bias in support of its development.

- Administrators' perceptions of the desirability of future library-related technological events tended to be consistent with their perceptions of the likelihood of their occurrence. Examples of this are the obsolescence of the printed book, which was clearly felt to be both unlikely and undesirable, and resource sharing, which was seen as both probable and desirable. An exception to this pattern can be observed in the matter of the establishment of a national information network embracing all public, academic and special libraries -- which was viewed as more desirable than likely to occur. It is interesting to note this discrepancy between a future event that is seen as desirable and the view of the improbability of its occurrence.

- There was no specific attempt to measure the degree to which administrators may be resistant to technological innovation and no such resistance was evidenced in the responses to the survey. It cannot be determined whether or not the administrators' patterns of belief and behavior in this regard are similar to those of librarians in general.

A Study of Resistance: A Psychological Perspective

Sara Fine

There is little doubt that libraries have made peace with the age of technology. In some sense, the question of whether technology in libraries is desirable and beneficial is moot. The acceptance of technology for the generation, collection and transfer of information has become a professional norm. The inevitable "violent rejection" stage,[1] the first response to a change of such magnitude, is over. Librarianship is coming of age in a technological era.

A first review of the findings of this study, focusing on the technological changes that have taken place in libraries, would confirm that the past decade has seen major technological innovation installed in a majority of large libraries. The library administrators who were surveyed for this study were generally in agreement that most technologies that are currently in place in their libraries are effective and beneficial. Most of the respondent librarians, the primary population of this study, reported that they make some current use of technology in their work, that they are comfortable working with technology, and that they find it to be efficient in retrieving and transferring information. A first review of this study, then, focusing on technology itself, would seem to give evidence that there is little resistance to technological change in libraries.

This study was not, however, primarily concerned with technology; it was a study of a complex human phenomenon that is an inevitable if sometimes obscure companion to major change. It was a probe into the psychological state that is triggered by a major social or professional external event.

[1] Peter F. Drucker, Adventures of a Bystander. New York: Harper & Row, 1979.

A review of the findings as reported in the preceding chapter reveals, as expected, patterns and trends. But it also reveals inconsistencies and contradictions, areas of unease and tenuousness, subtle "stress points" that tend to be discounted or ignored because they appear to be insignificant blips in the overall picture. It is, however, these inconsistencies and stress points that allow us to understand the workings of resistance and suggest the ways in which it becomes manifest in attitudes, beliefs and, eventually, in behavior.

The purpose of this review is to identify and describe these elusive points of contradiction and ambiguity, to relate the results of this study to previous findings in behavioral research, and to review the theories of human behavior that are concerned with human reaction to stress produced by change. The intent in these final review chapters is to approach the phenomenon of resistance and the results of this study from a broad set of perspectives--administrative, technological, professional and, in this chapter, psychological.

This discussion, then, will look at the "stress indicators" in the results in relation to the four major questions of this study: (1) the phenomenon of resistance to change; (2) librarians facing technological change: personality and behavior; (3) librarians' perceptions of the library as an organizational environment; and (4) librarian attitude toward technology.

The Phenomenon of Resistance to Change. Librarianship itself is in a process of change, struggling to maintain traditional values and definitions while at the same time reacting to external societal and professional events with re-evaluations and new definitions. The particular external event which this study addressed was the application of technologies which could reorder

the very nature of services that libraries provide. It was the reported opinion of many respondent librarians that the process of change initiated by the application of technology will not decrease, that it will in fact accelerate to the point where "libraries as we know them today will become obsolete." It was a major assumption of this study that any event that would alter existing behaviors and beliefs would trigger a resistant reaction. While the study probed both the triggering events and the existing behaviors and beliefs, one of the primary areas of inquiry concerned the nature of the resistant reaction.

This study of resistance by librarians to one of the major changes that confronts each of them reflects some of the complex dimensions of the resistance phenomenon: its elusive nature that makes it difficult to differentiate from other phenomena; its variability under situational and intrapsychic conditions; its susceptibility to social and professional pressures; and its ability to be disguised and distorted by rationalization. The results of this study, however, also underscored the predictability of its occurrence and supported the contentions of previous research in other disciplines that resistance increases and diminishes in relation to variables that are inherent in the environment in which a change is proposed.

The index of resistance that emerged when the data were subjected to a factor analysis revealed some of the characteristics of the resistance phenomenon. First of all, was the nature of resistance as an affective rather than an intellectual process. One of the major suppositions of this study was that true resistance as a psychological construct based on fear and affect can be differentiated from rational disagreement, an intellectual construct. The factor of resistance that was isolated in the analysis of the data was strongly affective, confirming the assumption that resistance is an emotional block to adaptability in an individual, an unconscious

reaction based on fear of the unknown. It would seem, then, that "resistant" is not a suitable label to be applied to those who challenge the benefits of a proposed innovation. Resistance is rather a reactive defense measure against that which threatens the intrapsychic status of an individual.

A second implication from the findings is that resistance is not a static phenomenon, the result of a particular set of personality characteristics within an individual. The study failed to reveal a personality that is inherently resistant to change. Rather, resistance emerged as a phenomenon strongly dependent on the environment in which an innovation is proposed. An individual's perception of impact on decision-making in the organization and on independence from "close supervision" (questionnaire item) were related to the tendency to be resistant. It would seem that the personality of individual librarians, certainly not an actionable matter, need not be viewed as a constraint to innovation. On the other hand, the organizational climate and the style in which innovation is proposed is subject to redefinition and is therefore an appropriate target for change strategy.

A third implication from the findings of this study is that resistance can be disguised and at least its overt manifestations suppressed. The strong effect of a "socially desirable response" on the reported views of librarians toward technology suggests that the tendency toward professional conformity will obscure and distort the expression of resistance. It may be noted, for example, that this inclination toward giving responses perceived as appropriate operated even more strongly in the interview survey than in the mail survey, perhaps because the interviews were conducted within the professional setting while the mail surveys could be completed totally in privacy and away from the work setting. Another obscuring effect came from the fact that the survey instrument made no allowance for modification of responses and demanded an unequivocal position. The rationalization that

usually accompanies resistance was thereby inhibited. It may be that if rationalization is thwarted, the manifestation of resistance will be repressed.

The librarian respondents in this survey reported themselves to be moderate-to-conservative in their political, social and religious beliefs and practices. It could be that since technology in libraries is no longer an innovation, that the general tone of acceptance is the posture of a new kind of traditionalism. If so, the majority of professionals would not be expected to voice anti-technology sentiments; it would be the minority "activists" who would speak the professionally unspeakable.

A fourth finding, most important in terms of future research, is that resistance can be defined and is measurable. While this study did not suggest that resistance of librarians to technology is rampant, it did suggest the importance of its existence. If a library has a staff of a hundred professionals, the study indicates that twenty of them will actively or passively deflect the impact of innovation on the organization. What is not known is the degree to which resistance which has been diverted or repressed in the majority will be triggered. What <u>is</u> indicated by the findings is the existence of a set of factors which are associated with and perhaps predictive of resistance, and which of those factors are environmental circumstances likely to trigger a resistance reaction.

These environmental circumstances are closely related to the findings of studies in the diffusion of innovation literature which was reviewed in Part I of this study. For example, the diffusion literature suggests that an organization's informal opinion leaders will have a strong effect on the acceptance or resistance of an innovation. In addition, it is suggested that when the system's norms favor change, opinion leaders tend to be more innovative. But when the norms are traditional, opinion leaders tend to be non-innovative. Opinion leaders tend to reflect the posture of the organization

or the profession rather than being agents to change that posture. The tendency toward innovativeness in an organization, then, is one of its norms. There were indications in the findings of this study that the librarians who perceived themselves as opinion leaders tended to be higher on the resistance scale than those who did not describe themselves this way. This issue perhaps needs to be flagged as a stress point, an area for further research and an area for administrative sensitivity.

A fifth implication from the findings, one which is also supported by the literature on innovation, is that resistance to innovation may originate in reaction to the agents of change and then be misdirected to the innovation itself. A "trigger point" in the findings which cannot be disregarded is that while a majority of librarians seem to accept technological innovations in libraries, there is a strong expression of negative sentiment about technologists, i.e., that they should not be making decisions for libraries, that the language they use and the writings they produce are unnecessarily complicated, and--primarily--that they are machine-oriented while librarians are people-oriented. The literature on innovation may be suggesting a corollary principle and identifying a potential trigger for resistance--that when the agents of innovation are viewed negatively, future innovations may become the associated targets for resistance. The literature on technology-in-libraries suggests over and over that if librarians were trained in technological uses, they would thereby accept the technological innovations. The findings here suggest, however, that attitudes towards technologists would not necessarily be altered by training librarians in the use of technology; it may be the technologists, or those who propose technologies to libraries, who need to be trained in the art of effecting change in organizations.

The findings of the study, from a behavioral perspective, suggest that the tone of general acceptance of technology by a majority of librarian-

respondents may be an expression of a new kind of traditionalism rather than an expression of adaptability to innovation. If so, then the acceptance of current technologies by librarians at this point in time is no indication that future innovations--technological or otherwise--will gain easy acceptance. The tendency for opinion leaders to exhibit a higher level of resistance adds weight to the premise that future innovations may well trigger new resistances.

Librarians Facing Technological Change: Personality and Behavior. The concept of "rigidity" has been described in the behavioral science literature as the tendency of an individual to perceive and interpret ambiguous situations as sources of threat. It is suggested that the "rigid personality" will (1) exhibit religiosity, (2) will have a lowered ability to interact socially, (3) will report low levels of risk-taking behavior, (4) will be strongly opinionated on social and political issues, and (5) will be powered by an external "locus of control," i.e., the belief that outside forces rather than inner control determine the process of one's life. Resistance is described as a defensive response to a perceived threat, to that which the individual fears will disrupt his inner stability. Resistance is the response by the rigid personality to the ambiguity of unacceptable change.

One of the questions that this study probed was whether a "resistant personality" would be revealed that would correlate with the RESISTANCE index. The phrasing of the research question suggested the expectation that such a finding was at least a possibility. But the personality variables that were assessed in this study, as well as the resistance phenomenon itself, are far too complex and elusive to reveal themselves in ready fashion. The study did not identify a relationship between the rigid personality or its components (i.e., sociability, religiosity, tolerance of ambiguity) and resistance to technological innovation. Rigidity did not appear as a

generalizable personality characteristic that can be attributed to librarians.

In terms of personality and behavioral characteristics, the study did, however, identify "stress points" that do deserve observation and do indicate areas for future consideration. From a behavioral perspective, stress points can be identified by contradiction, ambivalence and by unexpected intensity. These are the clues that the therapist working with an individual recognizes as indications of stress; these are the indicators that social and behavioral science researchers follow in trying to understand group and organizational behavior. In several areas, the contradictions in the results about the personality of librarians as a professional group are more revealing than the consistencies.

One of the surprising findings, for example, was the strength of the tendency for the librarians in this study to respond in a socially acceptable direction and the fact that this tendency to give professionally "appropriate" answers was inversely related to the resistance factor. The person who gave "inappropriate" responses, (i.e., those that projected a negative perception of the library, technology, or librarianship, etc.) also tended to indicate more resistance to technology in response to resistance items.

The effect of this factor was to depress the evidence of resistance in the study. To the degree that the items elicited a socially desirable response in the direction of non-resistance, the amount of resistance exhibited would be reduced. But, in addition, the presence and intensity of this factor suggests that a personality characteristic may exist in librarianship that was not directly assessed in this study but which may be an important predictor of librarian behavior and attitude. The tendency to give acceptable responses seems to operate in all professional groups and to impose a limitation on all self-report studies. It was the unexpected strength of

this finding that indicates a stress point and suggests that a "conformity variable" may be operating in librarianship that is as powerful as the resistance dynamic. A further study, then, might consider the investigation of this personality variable and pose a question with actionable implications for the profession: Is "conformity" a characteristic that brings individuals to the profession--a hypothesis often posed in the library literature--or could it be that the traditional and accepted administration style that pervades the profession acts to induce this characteristic? Is this quality inherent in the individual or is it, like a passive cousin to resistance, a reactive defense against real or perceived threat in the professional environment?

Even though there were no significant relationships between classes of personality variables and the resistance factor, there were a number of other stress points that were indicated by the findings. Why are many librarians, with some degree of intensity, reluctant to risk taking a job they are not "qualified" to perform? Why do they accept, with some degree of complacency, that there is little potential for career growth for themselves? It is not the nature of these responses that is surprising. It may indeed be true, for example, that there is little career potential for most librarians. What is surprising, and disturbing, is the degree to which librarian responses report that they don't care. Why are a significant number of librarians relatively comfortable with external, physical risk-taking behavior yet reluctant to take interpersonal risks? There is evidence in the findings to suggest that non-risk taking is related to resistance; there is also evidence that risk-taking--like its counterpart, resistance--is a complex dynamic with many dimensions. While the overall findings relative to personality characteristics suggest no strong relationship to resistance, there are significant indications within these findings of inconsistencies and unexplained personality tendencies.

One other personality characteristic, the locus of control variable, needs to be flagged as a target for further probing. This variable, with its basis in the psychological principle that a sense of control over the environment and over one's own fate in the environment is a component of psychological maturity, cannot be dismissed, even though its relationship to resistance could not be identified in the study. It has been suggested by one of the outside reviewers of this study that this variable did not show itself because the analysis of the data was not sufficiently powerful to tease out the relationship. This variable will therefore be retained in the study subsequent to this one.

There are other reasons to explore this variable further. First is the strong theoretical basis for its inclusion, i.e. the assumption of a relationship between acceptance of technology and locus of control. Theoretically, technology allows us greater sensory, manipulative and memory control of our environment, the ability to see, hear, operate and remember more efficiently. An internal locus of control in an individual describes the belief that the environment is controllable. The hypothesis derived is that "internalness" will co-exist with a view that technology will enhance one's ability to control, while "externalness" will result in the view that technology is another external event with a power and will of its own. There was some evidence in the study that this relationship, while not clearly identified by the analyses, does exist, as, for example, by the strength of a correlation between a questionnaire item ("I see technology as an extension of myself that enables me to see and hear better...") and the resistance index.

A second basis for maintaining this variable as a focus for further study is the theory that an internal locus of control represents psychological and situational strength. It would seem, therefore, that a professional group that has achieved professional maturity would exhibit a tendency toward

internalness, suggesting a belief that the profession has control of its own direction and its own destiny. The distribution of responses on the locus of control variable, however, were almost evenly split, suggesting that librarians are not inclined as a group in either direction. While there are no conclusions to be drawn at this point, there is enough ambiguity to suggest that this variable represents an untapped source of understanding about resistance to technology. It may further be suggested that an internal locus of control may be enhanced by changes within the organization and by changes in administrative style. It may even be extrapolated that education for pre-service professionals needs to build an educational philosophy and follow educational practices that enhance a sense of potency for students that results in a sense of internalness.

In the overall findings of this study, personality characteristics seem to recede into unimportance. The possibility that the librarian would emerge in profile as not only resistant, but as resistant predicated on rigidity, anti-socialness, and fatalism, was not confirmed. The sterectypical expectations were not fulfilled. Yet there were enough trigger points in the findings to suggest not a librarian personality, but an interrelationship between attitudes and behaviors on the one hand and situational and environmental factors on the other.

Librarians' Perceptions of the Library as an Organizational Environment. The relationship that exists between the organizational climate in which people are professionally engaged and (1) the generation of resistant behavior and (2) the emergence of personality characteristics has been emphasized in the previous discussions. Neither resistance nor personality, in the context of this study, can be isolated from situational factors. The ways in which resistance to technology is affected by the

interaction between the individual and the organization provides an important implication from the findings of this study.

The perceptions that librarians hold about the organizational environment of the library--its style of administration, its concern for the people who staff it, its decision-making policy, the warmth or detachment which characterize its collective personality--would seem to be an important determinant of adaptability to innovation by librarians. While the findings suggest the direction of this relationship, (e.g. there is more resistance in the face of "close supervision"), there is no clear picture of how librarians actually view the environment in which they work. There is instead a set of contradictions which suggest ambivalence and stress:

- In general, respondents reported the library environment to be warm and open. Yet when asked in the interview phase of the study how they would like the library to change, many respondents reported that they wish the library were warm and open. It is, of course, a human condition to see things in contradictory terms--to both love and hate, to be attracted and repelled, to wish for one outcome yet to agitate for its opposite. There is no conclusion to be drawn from this contradiction except to note it as a red flag, an unresolved area with unanswered questions, an issue for further probing.

- The respondents reported that their organizational structure in general is participatory in nature; at the same time they reported that decisions are made "at the top, without regard for those who are going to do the work." (Questionnaire item) The question is not "which is true?" The question that this contradiction raises concerns the meaning of the ambivalence implied. Is the librarian

by nature a compliant professional? Or do certain administrative styles generate compliance?

- Many librarians seem to be reluctant to describe themselves as "opinion leaders," even though they report that they are active and verbal at staff meetings. As with the other contradictions noted, the conflict implied seems to concern "appropriate" professional behavior and appropriate response to the dictates of the organization's norms versus the inclination to be professionally assertive and to participate in professional decisions and policy making.

These contradictions were evident in differences between the mail survey and the interview survey. On close-ended questions, the results of both studies were remarkably comparable, suggesting a strong degree of reliability for the mail survey. The interview process, however, allowed respondents to qualify responses and to add disclaimers to their responses. It was through this process that contradictions in the mail survey responses were pinpointed and, to some degree, explained. As was expected, much of the dissonance that appeared concerned organizational factors and their effect on the behavior and attitudes of the professional.

These findings are not surprising. It would have indeed been surprising if librarians, in contrast to other professional and non-professional groups who have been subjects of previous research, did not reflect some principles that have been derived from studies of the diffusion of innovation: e.g., that system effects may be as important in explaining individual innovativeness as individual characteristics; that when the system's norms support change, opinion leaders are more innovative; and that member acceptance of collective innovation-decisions is positively related to the degree of participation of members of the social system in the decision (Rogers, 1971).

Librarians, for the most part, reported satisfaction with their work situation and were generally positive in questions concerning loyalty to the director. In addition, their reported perceptions about librarianship were of a respected, intellectually demanding, interesting profession. The question here addressed, however, has to do with the factors that trigger resistance and with the subtle indicators that the perceptions reported about the organizational environment, while generally positive, have enough stress points--contradictions, ambiguities and intensity--to suggest ambivalence in the beliefs and attitudes expressed.

Librarian Attitude Toward Technology. As with the other three areas of this study, the findings suggest that, on the one hand, librarians in their self report of their own attitudes are generally positive toward the technological innovations in their libraries and, on the other hand, are ambivalent toward them. This was especially evident in comparison between the mail and the interview surveys. Even though the results of the mail survey suggested little negative attitude, when asked if technology has caused them any concerns, 62 out of 86 respondents on the interview survey responded "Yes," and then expanded on their responses. For almost all of the "no" responses, some qualifier was added: i.e., "No, except...." Following are some examples from the interviews. These examples are representative of almost all the responses given:

QUESTION: Has technology caused you any concern:

ANSWERS: "Yes, I have worked in libraries for a long time and technology was frightening in the beginning. I felt it might be something I couldn't grasp."

"Yes, partly from an effort to keep us with it and to understand its application to the jobs I do. I try to be positive and not defensive about it."

"Yes, especially with my staff who are coping with the stress they feel about technology that is being installed."

"I can see that patrons are unhappy about what we are doing to them about technology. All people get is a recording when they call the library. I've had to handle calls from patrons who were unhappy about receiving a recorded phone message."

"There is not enough time to learn."

"It seems like it is coming too fast. I have to constantly learn to keep up."

"Only that we may blow the world away."

"I've been concerned with invasion of privacy."

"My records take a year to get to me. I need to learn a whole new field of science to really be good in my own field."

"People tend to adore it. They seem to feel that technology is everything. It isn't."

"Aside from my lack of comprehension of its operation, my concern is how to pay for it."

"It has too much control of our lives, our privacy, and often of our intentions."

"Big brother '1984' is potential with the interlocking information files of the government."

"My main concern is that for the common citizen, things are not as simple as they used to be. I want to help the common citizen."

"In the library it has caused me concern when the terminal is down."

"I'm afraid it will advance beyond my capability to use it and I'll be out of a job."

"Some technologies take away from personal relationships."

"I'm concerned that it's taking away our privacy, that its used without our knowledge, and that we don't have it totally under control."

"It breaks down too much; we can't depend on it to work all the time."

"In the library we've had to settle for less with mechanical systems than we did with manual systems because of expense, etc."

"The overreliance or dependence on the machine to do certain human functions."

"We are considering an on-line catalog and my real fear is that our patrons will be intimidated by it and our librarians will have to work harder to show patrons how to use the computer. When the computer is down we don't have access to our collection."

"Quality is not as important as expedience, in my experience, at the time the design is being developed. For example, in our library we are talking about being a research library and I'm not convinced that, in our tie-in with national cataloging, we won't be making exceptions. We will have access to special collections but that won't necessarily be what the scholar needs."

"In my job I'm using a lot of technology and I know what the problems are. I can't get good enough people to come in and run some of the terminals. People are working in a different area of knowledge than before."

"Technology offers opportunities but also problems, disappointments in terms of promises that can't be fulfilled. It's the failure of planning. People doing it are stupid dumb-clucks who start it and get it fouled up."

"Very often your whole life can be laid out by someone you don't know and used against you."

"...a great deal of concern."

"I would hate to see technology rising above the humanism of the people."

"Trying to keep up with it, trying to afford it."

"Concerns about the misuse of technology because of the distribution of power. I'm concerned about the power really, not the technology."

"Panacea concept held by many administrators may be a collosal misconception."

These responses reflect the same kinds of issues that were raised in developing the attitude measure for the mail survey, attitudes suggesting that the effect of technology on professional activity may be to generate as many problems as it solves.

Aside from the equivocations represented by the examples above there are several other stress points in the results that deserve to be flagged:

- The expression of negative feelings about technologists and the language of technology by many respondents, the feeling that technologists are making the decisions, the perceptions that technologists are machine-oriented while librarians are people-oriented.

- The wistful expression by 53% of the respondents that they would still prefer using the card catalog to a computerized system.

- The finding that resistance to technology rises as the sophistication of the technology increases, suggesting that while there may be acceptance of what is, this cannot be assumed to imply acceptance of what is yet to be.

At the conclusion of the interview survey, respondents were asked if they had any comments that they would like to add to the report of the interview. For many, the statements concerned their reactions to the interview process and their approval or disapproval of its subject, style and content. Some librarians, however, took the moment to reflect on their true feelings about librarianship and its changing face in the age of technology. Some of these summary statements belong in the report of the findings. Perhaps they reveal as much as the other data:

> "My answers have been contradictory, but that reflects my true feelings. I am a Star Trek fan, and there is an episode where Captain Kirk brings a book to Mr. Spock. It's very valuable because books have become almost non-existent. I hope we don't reach that point. There are questions we should ask."

> "Directors are using technology as solutions to all problems, and they find that their problems can't be solved with machines. I don't think libraries should be run like the government."

"I'm black and I think in some ways technology would mean less jobs for blacks. Also technology can make librarians less personal and that can hurt the less educated because they need more encouragement to get involved."

"I think technology is inevitable and basically good. It will really depend on people who develop it and implement it. It will impose conformity but I hope it doesn't dampen creativity--that's the big danger."

"I'm not sure but I think libraries have gone past the point of no return with technology. Administrators have made a commitment to it and we'll have to get used to it. If we can't, we'll have to get out."

Resistance to innovation, whether that innovation is beneficial or harmful, is a dynamic that operates for every individual and every organization. Change produces stress, and stress must be accomodated in some form. Resistance based on fear of the unknown, on past situations which are restimulated by current events, on defense against an unreal or imagined threat can have a paralyzing effect on a person or on an institution.

Yet all human behaviors have value under some circumstances and can serve as self protective mechanisms to avoid danger. Resistance to organizational change may demand that the organization slow down, attend to its people, reflect on its direction. Resistance by staff may be an untapped resource of information to administrators in the following ways:

(1) Resistant reactions may be pointed against real dangers facing the organization and may be targeting unanticipated consequences of a proposed change.

(2) Resistance may be directed against change that is threatening the basic values and the integrity of the organizational belief system.

(3) Resistance may be pointing out when change is happening too fast, both for the resistant individual and for the organization itself.

(4) Resistance may be an indication that a change has been initiated by the few for the many, and the resistance may be to the tyranny of change rather than to the change itself.

Conclusion: Perhaps what this study really reflects is an irony. Librarianship has adopted technology as a means of coping with external change--the information explosion, increased costs of organizing and retrieving that information, new demands for "accountability" by local governments. In coping with these changes, libraries have produced a change of even greater magnitude--the integration of technology into the operation of the library. Coping with this second order change has produced yet another change, one that is iterated and emphasized in the interview discussions as well as reflected in the mail survey--the re-emphasis of human values. This theme underlies many of the responses to questions that probed the intuitive, often unvoiced feelings of the librarians in the study. As one of the respondents summed it up, "I would hate to see technology rising above the humanism of the people."

Three Critical Reactions

Thomas Childers

Drexel University
School of Library and Information Science

MEMO TO: Principal Investigator, "Resistance" Study

FROM: Thomas Childers, A Researcher

RE: The Method of the Study

While I am acquainted with some library technologies--mostly old, some new and a few impending--it is a mere nodding acquaintanceship, a superficial knowledge that sometimes lets me to push the right buttor at the right time. The literature has allowed me to look on as the state of the technological present and prospects for the technological future have been discussed. My knowledge of library technologies is, in short, limited. Compared to my grasp of the subject of library technologies, my grasp of "resistance" is purer. That is, I have none. I am untutored in the psychological and socio-psychological sciences on which such a study must rest, although I am acquainted with the literature of change in human organizations as it applies to management. These vantage points necessarily color my reaction to the study.

One is impressed by the thoroughness with which the complex topic of "resistance" is unfolded, dissected and analyzed and then reconstructed around the population of public librarians. The overall impression is that (1) "resistance"--an unconscious phenomenon, a psychological mechanism to avoid what is threatening--is as complicated and large as any aspect of

the human mind; it is as hard to define as "love" or "need" and as difficult to measure, inasmuch as it cannot be observed directly; (2) "resistance" is an abstract construct, perhaps composed of numerous sub-constructs, and it is far from certain in what behaviors the construct "resistance" is manifested; (3) the topic of resistance, per se, has received some, primarily oblique, attention in the research literature; (4) it takes guts to investigate as large and complex a construct as "resistance" in a single study, even if the investigation is limited to just part of a middle-sized profession.

One is also impressed by the masterful use of existing studies in the area of human psychology and human behavior. Through the adaptation of relevant research instruments, or parts of them, from earlier studies, the present study has been strengthened in several ways. First, other studies have provided pretested questions that can be expected to be reasonably valid for the current study. Second, by building on both the concepts and instrumentation of preceding research, the current study contributes to the growth of knowledge about "resistance" in other fields and about the psychological or behavioral factors that comprise this study's concept of "resistance."

The reviews of the literature on resistance to change and on technology and change in libraries, and the state-of-the-art chapter on library technology provide valuable backdrops for the findings and applications of the study. As in any research where subtle attitudes and their manifestations are probed, there are limitations in methodology. The methodological limitations, as well as the parameters, of this study are pointed out often enough and with

enough detail that the reader should never be lured into unwarranted application of the findings. For example, the "Social Desirability Response Set" chapter explores the possibility of the data's having been distorted by the tendency of respondents to give "socially acceptable" answers.

As well as the limitations of the study method, the parameters that define the overall study are clearly explicated. Two of them, however, deserve extra mention. First and simplest, it is important to emphasize that the study's subjects are public librarians. Just as we expect different kinds of people to be drawn to different occupations--heavy machinery operator, civil engineer, accountant, fashion designer, physician, librarian--likewise we must expect somewhat different kinds of people to be drawn to the different subsets of a given field. It is at least a credible hypothesis that there are personality differences among public, school, academic and special librarians, and that these differences could be reflected in their profiles of resistance and its manifestations. To be brief about it, we do not expect the degree or nature of resistance to technology found in the public librarian subset to be the same in other subsets of librarians.

A second parameter worth discussing is the matter of "technology." Early in the introductory discussion it is stated that "the meaning ascribed to the term (technology) by librarians in general and in particular by the subjects of this study, is unknown." We can assume that resistance varies with the topic at hand, that an individual's resistance to, say, salacious literature may be quite different from his/her resistance to welfare reform. The assumption seems easy to accept

when the topics are widely divergent, as in the example given. Yet the assumption holds intuitively even when the topics are more closely related. For instance, a person's resistance might vary depending on whether the topic at hand is a new complex budgeting technique or a new tax base for the library, whether the topic is automated classification or automated payroll disbursement. This point is being tortured to reassert what is evident in the present study itself: resistance can be considered issue-specific. So what?

So this: <u>if</u> resistance is issue-specific, then how the issue is defined matters very much. In order to know what we are measuring resistance <u>to</u>, the issue must be defined deliberately. In the present study the definition of "technology" is necessarily a major determinant of the nature and degree of resistance that we can detect <u>with regard to technology</u>.

In the Mail Survey Instrument "technology" is defined in this way:

> Interpret technology to mean those functions in or out of the library that are mechanized, automated, organized into a "system," or make use of a mechanism that was designed by scientists or technologists.

In the Interview Schedule applied to librarians, "technology" is defined in the same way, with the addition of

> ...for example, microforms, audio visuals, circulation or security systems, computer technologies, etc.

In the Administrator's Questionnaire there is no indication that technology was defined.

Within these definitions there is considerable latitude for interpretation by the respondents. As is said in the body of the report, "In order

to account for the discrepancies between a concrete, practical interpretation based on personal experience and on abstract philosophical interpretation that reflects on social and ethical considerations, questions were included to touch both perceptions." This is a useful accommodation. Yet it remains unknown what the respondents viewed as "technology" and so it remains unknown precisely what they are resistant to. The safe assumption is that each person has exhibited resistance or non-resistance to his/her own personal picture of "technology" or that part of his/her own personal picture of "technology" conjured up by the definitions provided or the the illustrations embodied in the survey questions.

This study is a valuable beginning. In future research we will be interested in the precise nature of the thing being resisted. Does it run the gamut from static-free carpeting to McBee Keysort "systems" to OCLC "systems," or does it lie at the "high technology" end of the technology spectrum, with computerization and sophisticated communications media.* We shall be interested in how someone who is "resistant" to a technology that he/she conceives of as everything from the date stamp on the end of pencil to automated cataloging, differs from someone who is "resistant" to a technology that he/she conceives of only as electronic inventions. There need to be data to tie a respondent's particular view of technology to his/her level and kind of resistance. In this way the correlations between resistance and factors of personality and demography stand a chance of being sharpened.

*The latter is implied in Williams and Montgomery's chapter on technology in libraries, although a broader interpretation is conveyed via the survey instruments.

MEMO TO: Principal Investigator, "Resistance" Study

FROM: Thomas Childers, a Management Consultant

RE: Implications of the Study for Library Practice and Management

The results of the study were surprising. It has been easy for some people in the field, including myself, to see librarians as all but morbidly fearful of technological innovation. This particular viewpoint was undoubtedly held by the research team at the outset of the present study, for there are points in the introductory material of both volumes where such a bias is revealed. That is, the library field is represented as recalcitrant and reactionary vis a vis technology. This is not an uncommon intuition in the field.

However, the findings contradict such widespread intuition by indicating that, even though resistance to technology does exist, it seems to be at a fairly low level. This is evident from the overall responses by the librarians. It is corroborated by data that show that managers tend not to see much resistance to technology among their staff, and that almost all librarians currently make use of at least one technology and most of them enjoy it. Moreover, there are additional data from the study that show that the field of public librarianship, generally--both professional workers and library management--expects technology to effect changes in the role of librarians, even to the dramatic point of some day--we don't know when--possibly making libraries obsolete.

The lack of resistance, positive past or current experience, and the willingness to see a substantial role for technology in the future of

libraries leaves us with the overall impression that technological innovation in public libraries might come easier than we have expected. The staff seem prepared. Management seems prepared. If this is true, the job of introducing technological change in a library organization should be simplified. It should be less work to "unfreeze" resistant attitudes and old behaviors. This is not to say that the introduction of a technology will not encounter resistance or that management will not need to be deliberate in strategizing the introduction of a technology, as it must be in introducing anything new. But the forces opposed to technological innovation seem to be less than many of us expected, and it appears that management's job will be easier.

That may be a reasonable general picture. It may not, however, apply for the innovation of a specific technology. Certainly we expect there to be more or less resistance depending on the nature of the technology that is being introduced and on the particular person or persons who see themselves as effected by it. Job and career displacement, loss of control, loss of prestige, and anticipated benefits of the technology, are a few of the factors to be considered when trying to estimate the resistance that a particular person will feel toward a particular technological innovation.

Perhaps the low levels of resistance can be explained by the high number of libraries that are either using or planning to use specific technologies. We could conjecture that professional workers and management both have had sufficient experience with technologies themselves or with concrete plans for implementing them that their overall view of "technology" is relatively positive. This conjecture is strengthened by

the data indicating that use of a particular technology almost always seems to result in improved feelings toward that technology. The actuality more than satisfies the expectations.

Further discrediting our collective intuitions are the data showing that a "resistant personality" cannot be identified--at least in the terms employed for this study. Such factors as rigidity, gregariousness, locus of control, self-perception of librarianship, political leaning, life style, and religiosity turn out to have little or no predictive power over the factor of resistance. If we are to find personality-related variables that can be associated with resistance, we must look further. In fact, however, the manager may find it enough to have these variables--ones of such great intuitive strength--debunked; to know that resistance to technology is likely to occur in the whole spectrum of personality types.

The study also shows that some social descriptors do predict high levels of resistance to technology; women, older persons, more experienced staff and those with humanities orientations are more inclined toward resisting technology than their complements. Such knowledge may help the manager predict the level of resistance that might surround a particular technological innovation in the organization. However, the data could be as damaging as useful, inasmuch as they could lead one to stereotype individuals and groups with regard to resistance.

On balance, it may be that the public pose a greater concern to the manager introducing a technological innovation than does the staff. At least, the findings suggest that managers view the public as substantially

more resistant to technology than staff; and for certain innovations, resistance by the public can be critical--for instance, catalogs in microform, on-line search services, or automated self-charging of borrowed materials.

A final observation related to management and resistance: The interview data indicate that resistance is related to organizational climate, that the staff member who perceives he/she is supervised closely tends to demonstrate a higher level of resistance. This seems to suggest that high levels of resistance by the staff may be attributed to a general climate of tight control, rigidity, and lack of risk-taking in the organization.

MEMO TO: Principal Investigator, "Resistance" Study

FROM: Thomas Childers, a Library Educator

RE: Implications of the Study for Library Education

Many of the findings bear on education for librarianship--education to prepare new professionals, continuing education, and inservice training.

The data make it clear that most librarians are either in contact with a technology, or will be shortly if things go as they are planned. The new graduate as well as the practicing professional must expect that in the near future he/she will have a serious and permanent brush with technology. The technology may be as mundane as a new carousel slide projector or as challenging as a homemade on-line real-time automated information bank. Regardless, technology will come.

The clear message for professional recruits and for people who are in control of their professional education is that they must be prepared for three things: (1) technology will greet new professionals as soon as they cross the threshold of their first libraries; (2) technology will change (as evidenced by the numerous technological plans reported); and (3) the variety of technology, present and future, will be remarkable. New professionals must cope with these three things in three different ways. First, on the affective plane they should harbor an attitude that is at worst neutral with regard to the wide range of technologies. That attitude should include a generous share of flexibility, so they can adapt to the technology that will greet them and to the technologies that will be introduced as the years go by.

On the cognitive plane, new professionals should master understanding of the potential applications, limitations, capacities, conceptual foundations, costs and payoffs of the various major technologies. This knowledge should be as transferrable as possible rather than specific to particular "machinery," for it will be hard to predict which particular "machinery" they will find in place or what will arise in the future. An important facet of the training--especially as it relates to computer technology--will be introducing the novice to the language of the various technologies. Very few respondents (12%) claimed to "understand" the technology literature they read.

On the behavioral plane, some skill in using technologies should be included in the entry level degree program. In two-year programs there may be adequate time to provide enough hands-on exposure to many different technologies to assure a broad repertoire of technological skills. In the typical one-year program, however, time is so short that students may only be able to gain the merest acquaintance with several skills and, perhaps, master none. It then falls to the first organizations employing them to supply the machine-specific training tnat will be needed.

The study's implications for continuing education and in-service training are many. It conjures a picture of a body of professionals who forsee the importance of technology in the present and future life of the library; who are not displeased with their experience with technology to date; who read technology-related library literature, but with some difficulty; who have participated in some kind of continuing education or inservice training already and were favorably disposed toward it; and whose topics of interest are spread evenly among "procedures, technology, and service-oriented topics."

By all indications, public librarians as a whole--and we must be careful not to forget that they must be considered as individuals and not as aggregates in predicting their behaviors--are prepared to acquire the knowledge required to adapt to new technologies, by virtue of both their attitude toward and prior experience with technology.

The fact that many also tend to see the need for a "major change in the training/preparation/selection of future professionals" underscores such a claim.

Librarians and Change: A New Synthesis

Karl Nyren

The significance of this study, which it is to be hoped is the first step of an exploration of the developing machine/person interface in our area of professional concern, is its revelation of the complexity of attitudes toward technology held by librarians. From the point of view of the administrator concerned with the intelligent management of change in his institution, there is a real need to be able to assess the role of the socially acceptable responses instilled in librarians by professional education. Experience in other areas shows us that this can be a powerful influence: witness the almost universal support of intellectual freedom in a group that tends to be personally on the conservative side and to be exposed to community sentiments on this area which can be positively antediluvian. The library administrator will, on the basis of what this study shows, want to include a greater or lesser component of recognizably authoritative professional blessing of substantial institutional innovation. How much is certainly not clear on the basis of this initial exploration. But a recent report received from a fairly prestigious library director, one who had the respect of his staff, says that he wasn't getting anywhere with the adoption of a new kind of staff involvement in book acquisition until he brought in a well known library educator--who immediately won staff acceptance of the new procedures.

One discovery of this study worth further research is the odd discrepancies noted between what many librarians express as their personal attitudes toward new technology and their attitudes as spokespersons for a profession and an institution. Here is an area of stress clearly identified--but

what a further understanding of it would tell the administrator, planner, or educator, we cannot begin to say yet.

A close reading of the study report raises some questions. There is no way to read from it the effect on attitudes of whether a respondent identifies with management or not. There is a good likelihood that being a manager, or being identified with management (as opposed to being a member of a professional peer group without direct line management responsibilities) could make a big difference and confuse the results of any study in this area.

There is also apparent more than one semantic problem with the research instrument. Clearly the word "technology" or "new technology" can have a variety of referents, even in such a relatively homogeneous group as librarians. Technology which has been accepted for years--typewriters, telephones, microforms, and manual mechanical charging systems--are fully accepted into the library frame of reference and there is no questior of their acceptance. There is bound to be a problem in asking questions that lump these familiars of the librarian with devices which are unfamiliar: the automated circulation or acquisition system, the online database, the electronic catalog. Clearly there is no sharp line to be drawn between the forms of technology counted as "new." In some libraries already the automated circulation system and the OCLC terminal are close to being beloved companions and indispensable to their operators. Do they make it easier to introduce an online catalog? We don't know. The presence of a typewriter and a telephone certainly doesn't seem to be a factor in the acceptance of an electronic theft-detection system.

Another intriguing question which arises from this study concerns the frequent discrepancies noted between librarians' perception of their standing in the institution as personally rewarding and reflecting esteem of their contribution--with the seemingly contradictory perceptions that they see little opportunity for advancement and find their suggestions to management

unheeded. Here is an area of almost certain stress revealed--one on which planners of participative management structures and other forms of human engineering could use more enlightenment.

The element in the study of most immediate interest to the library planner would seem to be the "resistance factor." The library manager who identifies resistance to change with an unthinkable breach of loyalty to him--and thus denies the possibility of its existence--may find himself with unexpected difficulties. Moving an institution into a new way of life is likely to demand the good will and creativity of its entire staff. Without this ingredient, unnecessary pitfalls may make the process painful and disruptive.

Perhaps the most valuable element in this study is one which has clearly been a concern of the author, one apparent in her writings and dramatically so at a conference a couple of years ago at the University of Pittsburgh. Against a barrage of statements and assumptions of the individual librarian as one of the most intractable opponents of the adoption of change in libraries, she turned the whole discussion around, demonstrating that librarians may well be the hapless victims of managers and technologists who haven't taken the trouble to learn how to communicate with them and to draw on their special expertise.

We have come a long way fast in mastering the techniques of distributive processing, with a number of machines joined in a network to perform tasks of magnitude far beyond any one of them. In a few years we have replaced the Library of Congress as the sole source of bibliographic information with a network that includes LC but offers potential far beyond its capabilities. We are making our first tentative steps toward a linking of human intelligence on the distributed pattern with experiments in indexing vocabularies. And it may be that we are ready to start working on the

linking of the resources of human intelligence and creativity in our libraries to provide what may be a far more important "new technology" than any mere hardware can bring us. It is to be hoped that this study represents a first step along that promising path.

Resistance as a Response to Imposed Change

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This study of resistance to technological innovation has two qualities which, in combination, provide an unusual perspective on the subject being studied. First is the convergence strategy of the research design which the investigator has described as a "wide net" probe. This global approach, incorporating personal attitudes, social behavior, personal characteristics, organizational climate, demographics, and experience with technology as variables which may be related to resistance, recognizes the complexity and depth of the subject being studied. This research strategy allowed the study to have the best chance of identifying which critical variables relate with resistance and to suggest measurable aspects of resistance to pursue in further studies. It is a study to be commended in many ways for its boldness and ambition.

The second unique aspect of this study concerns its focus, the examination of resistance from the point of view of the individuals subjected to change rather than from the perspective of the promoter or agent of change. In the context of this study, the librarian is the subject and is viewed as the reactor to change. The "agents of change" are those who initiate, plan for, and sometimes impose innovation--technologists, consultants, administrators, or other librarians. It is the perspective of the librarian that is the major concern of the study. This perspective provides important insights about the factors that can influence how libraries introduce and cope with change.

The term "resistance" has been often invoked by the promoter of change

as an explanation of why a proposed change is difficult to effect, is slow to take hold, or does not occur at all. It has been the only alternative explanation for faults which may lie in the proposed change itself, shifting the responsibility for the failure of diffusion from the change agent to his subjects. The literature of innovation and the diffusion of change and the reviews of the library and technology literature cited in Volume I of this study expressed the moral judgments of uncooperativeness, traditionalism, and lack of imagination as explanations for non-acceptance of innovation. The reader can sense the frustration of the change agent as resistance is described as a "vice," a barrier to innovation which must be overcome if progress is to be made.

The change agent views the rejection of an innovation from a particular point of view and is likely to level a charge of "resistance" when a favored innovation is thwarted. This study of resistance was not pursued as support for the change agent's brief. Rather, the study attempts to see resistance from the point of view of the individual who may be resisting the innovation. The study tries to see what resistance looks like and feels like to that individual, what kinds of people tend to feel resistance in what kinds of situations. The contributions of this shift in point of view are, first, that the individual may be better able to understand his own feelings and to work through them when necessary; and second, that those interested in promoting change may come to see resistance not as an amorphous source of frustration, but as differentiated, individual reaction responsive to organizational climate and interpersonal relationships.

This shift in point of view brings up another aspect of the change agent's role: people are not changed by others; people change themselves. Change agents can create the conditions under which change by others is made possible or at least reduce those conditions under which a resistant

reaction is virtually inevitable. Sometimes the change process is nurtured by the change agent, sometimes it is forced. In either case the change response is not in the agent's control. What is in the control of the change agent is the form in which a change is proposed and the degree to which that form takes into account the information we have about what "triggers" resistance. Whether a response to a demand to change is growth or resistance will depend on variables such as are examined in this study: the attitudes of the individuals involved, their work environment, and their individual histories.

Before reviewing what has been learned about these variables, some observations should be made about the nature of resistance as determined in this study. The study design assumed that there was a generalized resistant attitude toward technology. However, no instrument had yet been developed to tap that generalized attitude. A set of questionnaire items was developed for this study which would probe various aspects of that generalized attitude. These aspects were (1) denial of technology, (2) perceived loss of control, (3) perceived harmfulness of technology, (4) perceived professional detriment, (5) unwillingness to act, (6) negative feelings about technology, (7) reluctance to probe the subject, (8) inability to recognize the breadth of technological potential, and (9) negative affective reactions. It was assumed that a major convergence of responses to these aspects would represent a generalized resistant attitude and that no one of these aspects would alone represent such a condition. The degree of convergence was determined by submitting the full set of responses on these aspects to a factor analysis. This procedure is designed to isolate coherent, underlying variables from a set of theoretically related variables such as were used here. The analysis revealed that two-thirds of the variance in the responses converged strongly on one dimension which was used as the index for resistance.

There are several significant contributions to be noted from this analysis. There was a risk that the procedure might fail to identify the desired coherent measure. The first significant contribution was that the procedure succeeded. In addition, of the original set of sixteen measures, only seven related strongly to the isolated index. Future studies will therefore be able to use fewer items with greater accuracy. Most importantly, the aspects which related most strongly to the newly developed RESISTANCE index allow an interpretation of the meaning of the findings. The index is essentially tapping resistance as originally defined for the study: 1) an unconscious reaction, 2) motivated by unnamed or unsubstantiated fear, 3) explained by rationalization rather than rationale, 4) manifested by behavior that does not confront the issue directly, and 5) not leading toward problem resolution.

This index measure of resistance does not tell us whether public librarians are resistant. There is, after all, no method for determining how much resistance is too much or whether a bottom level of resistance exists. What is available, however, is a RESISTANCE variable which can be related with other variables to reveal some of the dimensions of the resistance reaction. Such relationships permit observations about which predispositions or conditions are likely to promote or lessen feelings of resistance.

One such class of variables which relate with the resistance index are the personal attitudes of librarians toward technological events. Respondents who were more resistant tended to be unable to see technology as a means of extending their own capability. More resistant individuals feared that interpersonal relationships would suffer if technology became an important part of librarianship. They still prefer the card catalog to retrieval through mechanized devices and they worry about staff reductions resulting from technology. The change agent cannot take heart from the fact that, for any of these items, only about 25% of the respondents reported holding

the attitude that correlated with resistance. The attitudes will need to be acknowledged and defused if resistance is to be worked through and change allowed to occur. Two factors need to be emphasized: The first is that 25% is likely to be an underestimate since the social desirability response set was found to be so strong. The second represents a crucial organizational dynamic: those respondents who saw themselves as opinion leaders tended to be more resistant. Resistant attitudes are likely to be voiced, not muffled. The opinions of the vocal minority are likely to be infectious.

The relationship of these attitudes to the resistance index is one of the strongest findings of the study: 58% of the variance in resistance was explained by the set of eleven attitude measures. Even though the promoter of technological change may be a specialist in the technology and not in attitude change, adoption of new technologies by librarians will be more difficult if the issue of librarian attitudes toward technology is not addressed.

The variables which tap aspects of the work environment raise intriguing questions deserving further study. The overall picture is one of librarians satisfied, even complacent, in their organizations. By and large they feel positive about the organizational climate; they feel that communication with their supervisors is open; they feel secure; and they are mildly interested in promotion. However, this picture is contradicted by over half of the respondents who agree that "In my library decisions are made at the top without consulting the people who are going to do the work." One explanation for the contradiction is that social desirability accounts for the general picture of a "good organization" but that respondents could not disagree with an accurate description of their organization.

This perception about decision-making is of interest to the change

agent because it relates with the resistance measure. Higher resistance also relates with a low estimate of opportunities for advancement in the organization. Even though the person responsible for introducing a new technology is often brought in from outside the organization, the organizational members' ability to adapt to the required changes may be affected by their perception of their own role in the organization. This relationship, supported by extensive evidence from the field of organizational development, suggests that the change agent cannot ignore the interaction of the proposed change with the characteristics of the total organizational system.

The individual histories of the respondents seem to have some relationship to the degree of their resistant feelings. Though these relationships provide only a rough indication, they may alert the change agent to those persons who may be more adaptable to new technologies and those who may experience a resistance reaction to innovation and may therefore need more support. The profile of the less resistant person is not surprising. Librarians who are younger, male, have educational backgrounds other than in the humanities, have less years of experience in library work, and who already work with audio-visual or computer technology will be more receptive. The size of the relationships are modest, however, and these indicators cannot be taken as strong predictors. Since a multiple regression was not run on this class of variables, we do not know if some of these predictors are redundant (e.g., age and years of experience in libraries may be measuring the same thing), nor do we know which of the individual history variables is the strongest predictor of resistance.

Resistance to technology is a specific case of resistance to change. Any demand upon an individual to change, whether self-generated or imposed by the environment, will cause stress and some feelings of resistance. The experience of change-related stress occurs even with such welcome changes

as taking a vacation, beginning a new job, or purchasing a new television set. Organizations understand that change is costly and so budget extra funds to allow for adjustments. What is less often recognized is that change is costly in personal terms for the organizational members. Administrators and change agents might also consider budgeting the amount of personal stress organizational members will experience at the same time they are proposing an innovation. In addition, this study identifies conditions under which change-related stress, feelings of resistance, are likely to be greater, such as where advancement is seen as limited or changes are seen to be imposed from above. It is easier for a librarian to resist an innovation than to confront organizational restrictiveness. It might be helpful for both the change agent and the librarian to understand how these factors affect each other and that they need to be differentiated before change can be effected.

The general experience of change, either personal or organizational, is that of a U-shaped cruve. Changes produce stress, feelings of low self-esteem, loss of productivity. If technology-related changes are introduced, those persons with negative attitudes toward technology are likely to suffer greater stress. On the other hand, most people will eventually adjust to the change, some more easily and some at greater personal cost than others. The finding that librarians with more experience with technology were less resistant is evidence of having "worked through" previous changes and therefore having overcome previous feelings of resistance.

Statistical Footnote

Some observations might be made about the analysis procedures used in this extensive and complex study. The study is a landmark work for its ambition and broad conceptualization of an elusive phenomenon. The fund of

data that have been collected can support a number of further analyses and should stimulate valuable future studies. It is likely that further analysis of these data would not change the direction of the findings and that the following suggestions would serve to strengthen the findings already determined.

In the formation of the resistance variable, the seven variables relating most strongly to the resist factor were selected for the index. Although parsimony is a value in research, contributions to the first factor from the remaining nine variables were lost in the process. A stronger resistance inde would have resulted either from incorporating all sixteen variables or by re-calculating a new factor analysis using only the seven chosen variables. Regarding predictor variables, questionnaire items which were designed to be incorporated into scales were instead related to the resistance index item by item. For example, the items measuring locus of control are designed to be collapsed into a scale variable and are not meaningful as individual items. Since the reliability of a measure is related to the number of items incorporated in it, not incorporating the items into the intended scale clearly weakened the variable and may account for the lack of a finding. Should a second phase of this study be undertaken, the locus of control variable should not be disqualified from inclusion since the conceptual rationale for its inclusion is strong.

As mentioned earlier, multiple regression would have been a useful tool for simplifying the findings. We did find through multiple regression that 58% of the variance in the resistance index was explained by the set of eleven attitudes toward technology variables. If, in addition, a stepwise procedure had been used, we would know which of the eleven variables were most important. The simple correlations alone did not reveal which variables are redundant with another in their relationship with resistance. Stepwise multiple regression would identify the three or four strongest, non-redundant

predictors of resistance. A further use of multiple regression would allow observations of which demographic variables were most critical as predictors of resistance, or whether attitudes toward technology were better predictors than work environment variables.

Finally, more might be done to control for social desirability. The discovery of the social desirability response set was insightful, and the post hoc identification of items which would compose a social desirability scale was imaginative. Given such a scale and given the demonstrations of its utility, the scale might be used as a control variable throughout the analysis to remove the noise obscuring the pattern of resistance and its correlates.

The Information Explosion and the Publications Glut: Portents and Implications

Allen Kent

The topic is laden with issues, issues which concern the ways in which we will move into the future in dealing with information problems. The resolution of these issues introduces dilemmas. Some of the dilemmas are in terms of not knowing the ramifications of one or another course of action. The ramifications may relate to implementation--will the suggested course of action really work? Or there may be social ramifications--how to balance sensitively technically feasible national or institutional solutions with individual styles and preferences? And there are economic ramifications--will the solution really be less expensive than maintaining the status quo? Also there are technological ramifications--will a solution soon become obsolete as advances crowd one upon the other?

Only a few of the major issues surrounding the "information problem" will be developed here, starting with institutional issues that relate to the "publications glut," which I would like to relabel as "publications overload on the institution"--and I will deal with the issues in terms of institutions of higher education and their libraries.

The dollar resources available to sustain the primary mission of instruction and research will be constant, at best, and there is every reason to believe that they will decline in real terms over the next decade. Libraries face an even more difficult problem in accommodating to fiscal reality because of increasing costs (costs that are rising faster than inflation) of domestic and foreign materials, both in print and out of print, as well as substantial increases in the total quantity of information necessary to support research and instructional programs.

Increased allocations to libraries to offset inflationary cost increases have not been sufficient, nor are they likely to be sufficient in the future, to support appropriate levels of quality and scope in the provision of scholarly information. It has become clear that this dilemma, shared by all research libraries, cannot be resolved through individual action. Libraries must work together to create new capacities for cooperative solutions in support of their collective best interests. The presidents of ten distinguished American universities have wrestled with the problem and the consequent dilemmas and have come to the conclusion that:

> ...although sharing the same mission and method, the (research) libraries lack the means for working together at the level of sophistication that now seems necessary. Powerful new capabilities for cooperative action by research libraries are required, not primarily to reduce costs but rather to help make certain that expenditures for resources, space, skills and technology in fact produce the desired results.[1]

Eleven institutions have developed a consortium with the aim of creating "powerful new capabilities for cooperative action"--in addressing the issues faced by research libraries, including the collection, organization, preservation and provision of scholarly information, through: (1) shared collection development, (2) preservation of library materials, (3) shared access to collections and (4) creation and operation of sophisticated bibliographic and other information tools for users, scholars and patrons of research libraries.

The eleven institutions involved are Columbia, Stanford, Yale, Michigan, Princeton, Pennsylvania, Dartmouth, Iowa, Rutgers, and Brigham Young Universities--as well as the New York Public Library. Some of these institutions have struggled over many decades to reach, separately, the standards of

[1] News release from Research Libraries Group, Inc., July 25, 1979.

outstanding research collections to support their programs, and now are ready to throw in the towel without even giving the appearance of trying to be self-sufficient. But the basic objective still must be to help students and scholars gain effective access to the knowledge record they need, in a manner that is affordable for the institution; to help students and scholars zero in on what is germane to their interests in a growing mass of published materials; to facilitate the conduct of the scholarly enterprise that is the reason the university exists.

A few facts are in order here to provide context. Book titles published in 1979 are expected to be in the range of 600,000 worldwide; periodicals in the range of 100,000. Book prices have increased during 1971-1978 by 81% in the U.S. and 91% for foreign titles; journal subscriptions increased in price in the U.S. by 122%, with science and technology journals averaging twice that figure.

The university presidents are not alone in their concern. Others who are dedicated to the current system of publishing and preserving the results of scholarly research have also been assessing the problem and note that, although the current system does not face the threat of imminent collapse, the system could fall prey to a lingering, wasting disease. A study by the National Enquiry on Scholarly Communication (under the auspices of the American Council of Learned Societies) concludes that:

> New forms of research sharing, the development of national collections accessible to all research libraries, and the linking of libraries through computerized bibliographic networks into a national system are essential steps that must be taken if libraries are to meet their responsibilities to provide all users with reliable access to the research literature.[1]

Three major steps to implement these recommendations are: (1) the

[1] The Chronicle of Higher Education, May 7, 1979, page 1 ff.

creation of a national bibliographic system; (2) a national periodicals center; and (3) a national library agency to manage these as well as other required new programs.

The ramifications of these steps are considerable. First the creation of a national bibliographic system is intended to provide access by all to the holdings of other than the local library. Standardization of cataloging is needed to ensure a workable system. But standardization has drawbacks as well as advantages. Special needs of local scholars may not be addressed appropriately, leading to less precision in payment for access to a wider range of collections. Also, how valuable is it to learn of the existence of desired books held elsewhere if it takes days or weeks to have them delivered to the scholar? How will this affect the processes of the scholar who is in the middle of creative thought? Will scholars be able to anticipate needs far enough in advance to be able to have materials on hand at the right time?

Second, the creation of a national periodicals center is intended to provide a "library of last resort" where at least one copy of every periodical is stored and readily available. The proposers of this center assure us that this approach will be cost-effective from an institutional point of view; but will it be time-effective from the point of view of the individual scholar?

Third, the creation of a national library agency certainly makes sense from an administrative point of view, since there must be a locus of management, control, and fiduciary responsibility. But to what extent would such a "capping" agency overwhelm and subdue individual preferences and styles? Can a governance structure be orchestrated which would balance sensitively the national and individual imperatives?

These issues and questions will need to be resolved, probably by

compromise, but meanwhile great efforts are being devoted to the development of the building blocks of a solution to the problem of satisfying information needs which cannot be satisfied by individual institutions working alone.

Now I wish to shift from institutional issues that relate to the "publications glut" (relabeled "publications overload on the institution") to the individual facing the "information explosion," which I will relabel "information overload on the scholar."

Information overload leads to psychological difficulties. Rational behavior depends upon a ceaseless flow of data from the environment. The more rapidly changing and novel the environment, the more information the individual needs to process in order to make effective, rational decisions. But there are in-built constraints on our ability to process information (to receive, to process, to remember); once exceeded there is a marked change in performance. Overload can lead to thinking in arbitrary and highly personalized ways.

There is still another type of overload--or overstimulation--decision stress. More problems, faster, with less time to weigh alternatives--with transience, novelty and diversity posing contradictory demands, influence human actions.

In my own information overload situation, the number of journals I would like to review exceeds by an order of magnitude the number I can possibly deal with. So I have developed a personal view of the Utopian information system. I would wish to have provided to me rapidly, conveniently, economically, and with precision, that portion of the current or previous literature that

- I will wish to have at any particular time
- to satisfy a particular problem or interest
- and in a form that I find useful

regardless of

- where it was generated
- in what form or language
- or how it must be located or processed.

My Utopian dream continues with a desire to have information available to me on the day of publication, neatly translated into a language I can read, and packaged in units that are of infinitely variable size and content. My dream, now perhaps a fantasy, is that all this will be available to me free of charge.

There has already been some experience with the information systems needed to alleviate my information overload, if not to support my Utopian dream. For example, one commercial information network, Lockheed's DIALOG, has in machine-readable form some 30 million records (the citations with associated indexes and/or abstracts of mostly journal articles and reports). These records, covering a wide range of disciplines, are available in over 100 "data bases" which are being incremented continuously. The system, utilizing a worldwide communication network, is accessible via local terminals.

One report estimates that seven million on-line searches of computer-readable data bases were conducted in 1978.[1] If the growth of usage continues, it may be that ten million searches will be conducted this year.

Library networking is also proceeding at a rapid pace.

OCLC (formerly the Ohio College Library Center), which was developed for shared cataloging of books and monographs, now has nearly 3000 terminals tapping into its nationwide computer-communication system. The Washington Library Network, in May, encompassed 120 individual libraries (48 library systems), including academic, state, and public libraries in the Northwestern

[1] Martha Williams, ASIS Bulletin, August 1979.

states. Recently it has stretched its legs into Alaska, Arizona, and even Australia. And finally, quoting from a September 1979 report:[1] "In another giant step toward the concept of a national library network, the Research Libraries Group (the eleven institutions whose presidents made the statement I quoted at the start), the Washington Library Network, and the California Library Authority for Systems and Services (composed of 170 libraries) have agreed to work together."

Even more advanced systems and information technologies are on the horizon. As examples, AT&T has a test underway in Albany, NY offering electronic access to phone directories, information on products and services as well as weather reports and sports results. This service is expected to add interactive videotext access. OCLC has announced a new program of "Home Delivery of Library Services," a comprehensive structure within which to investigate development of innovative systems offering library patrons easy and inexpensive home access to library services.

For years the new library and information systems have been said to cause a disturbance of the library ecology. The means for identifying and locating needed materials rapidly were well developed, but the means for delivering these materials had not advanced very much, being dependent mostly upon the postal service and the parcel service. Now we have indications that there is a great improvement in speed of facsimile transmission which suggests that this medium may be increasingly used in the future to deliver the source materials once the items have been identified and located.

But if you wish to take a giant leap into advanced information technology, consider the forecasts being made about a paperless society. Since the invention of printing from movable type in the middle of the fifteenth

[1] Advanced Technology/Libraries, September 1979, p. 3.

century, and more especially since the development of the scientific periodical some 200 years later, formal channels of professional communication have been very heavily based on printed documents. We tend to take this medium completely for granted. But can we necessarily assume that print on paper will always be the major vehicle for formal communication in science and other professional fields? Almost certainly not.

As early as 1975, the National Science Foundation has suggested the need for a replacement for paper in the following terms: "The limits of what can be communicated by printing, mailing, storing, and retrieving pieces of paper may be at hand. Certainly, for any real improvement in the accessibility and usefulness of information an alternative must be found." One solution suggested is an electronic alternative to paper-based systems, which would permit computer sensible storage of libraries in central facilities for presentation at terminals wherever and whenever it would be useful.

Something resembling an electronic (i.e., paperless) information system has been predicted by various writers for some time.

Already we have seen one major evidence of the paperless society with the development of computer conferencing. In preparation for next month's White House Conference on Libraries and Information Science, computer conferencing has been used to permit widely scattered members of the Advisory Committee and staff to communicate. "Committee members can enter and edit data on a typewriter-like keyboard, store the data in the built-in, non-volatile bubble memory and transmit the data via standard telephone lines to the host system for later access by other members around the country. They can talk for $3.75 per hour. White House Conference chairman Charles Benton points out that the cost for convening the Advisory Committee for a two-day meeting is approximately $23,000 and that 'it is difficult to

schedule because of the diverse and busy activities of our 28 members.'

"Usage of the electronic system has tripled or quadrupled in the past month, according to project facilitator Elaine Kerr, a sociologist in Worthington, OH, who herself communicates by computer rather than commuting to work. Kerr said that the group of 39 people, 28 on the committee plus WHCLIS staff, use the computer terminals to replace the telephone, mail and travel; cost is below even that of first class mail when the expenses involved in a secretary typing and filing the message are figured in.

"Nicholas Johnson, chairman of the National Citizens Communications Lobby and former FCC commissioner, signs into the system several times every day for a couple of hours. He feels strongly that 'This is an age and a time when computers and electronic information gathering systems have become so reduced in price and so widespread that all of us must develop some capacity for understanding and using them or we will become part of a new group of illiterates, as severely handicapped as someone who cannot read books.'"[1]

How will all this affect students and scholars in coping with information overload?

As new information systems are developed and presented for use, there is another type of danger to face: studies of the impact of change on various organisms have shown that successful adaptation can occur only when the level of stimulation--the amount of change and novelty in the environment--is neither too low nor too high. ...If too high, then shock is the response to overstimulation.... Behavior under these circumstances is irrational, with actions taken against one's own clear interest and reaching an anti-adaptive state. There is typically a refusal to accept facts. This results

[1]Advanced Technology/Libraries, September 1979.

when one is caught in a situation in which familiar objects and relationships are transformed--the environment is filled with change and novelty. The response is marked by confusion, anxiety, irritability.

Unpredictability arising from innovation undermines the sense of reality, and one longs for an environment in which the gratification of important psychological needs is predictable and less uncertain.

Stories have been told of the shock experienced by the unprepared visitor to an alien culture; the same shock is experienced by the person who, still in his own society, is rocketed into the future without sufficient warning. The arrival of the future in the form of novelty and change makes one's painfully pieced-together behavioral routines obsolete. It is discovered that these old routines, rather than solving problems, merely intensify them.

A number of symptoms are exhibited:

(1) Blocking out unwelcome reality.

(2) Specialization; not blocking out <u>all</u> novel ideas or information. We witness the spectacle of the physician or financier who makes use of all the latest innovations in his profession, but remains rigidly closed to any suggestion for social, political, or economic innovation. Superficially he copes well; but he is running the odds against himself.

(3) Obsessive reversion to previously successful adaptive routines that are now irrelevant and inappropriate. The more change threatens from without, the more meticulously he repeats past modes of action. Shocked by the arrival of the future, he offers hysterical support for the not-so-status quo, or he demands, in one masked form or another, a return to the glories of yesteryear. What is witnessed is an exaggerated contempt

for science and technology.

(4) Super-simplification--which seeks a single neat equation that will explain all the complex novelties threatening to engulf us.

Most of us can quickly spot these patterns of behavior--sometimes in ourselves. Some of these strategies or patterns of behavior may be necessary in overload situations, but unless the individual begins with a clear grasp of relevant reality, the strategies will only deepen adaptive difficulties, with little events triggering enormous responses, and large events bringing inadequate responses.

The library and information systems being developed are intended to reduce information overload on the individual by making it possible to select material of interest in a more precise manner, as well as to select this material from a larger stock than the local library holds. But as in every problem solution, there are also drawbacks. One of these is the unfamiliarity of the mechanisms that will have to be used--unfamiliar machinery and processes. Another drawback is that, for the foreseeable future, until the systems are better worked out, it will take longer to lay hands on materials of interest which are not held locally. This will cause distress to many scholars whose creativity is stifled by this delay--a clear choice will have to made between accepting the delay or limiting horizons to those materials which the local library can afford to acquire.

Returning to the topic of "publications overload on the institution," there are many who may question whether the costs of collective action may not exceed the costs of going it alone--relying on current procedures of interlibrary loan to acquire materials not held locally. It is not possible today to refute the assertion that the overhead of collective action will cause the cost of borrowing to exceed that of purchasing the same item locally. From an institutional point of view, however, it is obvious that the specific

needs of scholars often cannot be predicted and in order to increase the probability of a given book's being locally available when wanted, many more than that item would have to be purchased. The cost of increasing that probability increases geometrically--well beyond local capabilities.

For example, suppose a university library is currently buying 10,000 books a year, at an average cost of $10 each, and spending a total of $100,000 a year on books. It finds that it is able to provide 50% of the books students and faculty ask for. If, in seeking to improve on this, the university administration doubles the book budget, making it possible to buy 20,000 books a year, the library will not be able to provide 100% of the books wanted by its users. Rather it will provide about 70% of them. If the university again doubles the book budget, raising it from the original $100,000 a year to $400,000 a year, the library will then be able to supply about 80% of the titles asked for. If the university again raises the book budget to $800,000 a year, the 80,000 books a year the library is now buying will satisfy about 85% of student and faculty requests. Thus, an 800% increase in support will achieve about a 70% improvement in user satisfaction--and, in all likelihood, bankrupt the university in the process!

Conclusion

I have tried to deal with the information explosion and the publications glut in terms of how they effect institutions and individuals. I have termed these effects "publications overload on the institution" and "information overload on the scholar."

I have described some of the novel approaches to the problems entailed, some of these beginning to assume the characteristics of a bandwagon--with some or many climbing on before all the implications are known.

The novel approaches are leading to such developments as:

- Placing catalogs online which entails the closing of traditional card catalogs.
- Installation of library access terminals in dormitories, faculty offices, and even at home. After all, it is more convenient to move data than to move people.
- Substituting technology for labor-intensive functions.
- Changing library standards which entail access to library materials held elsewhere, rather than only local ownership.

The developments so far involve the application of unfamiliar technology, unfamiliar in the context of a library.

There may develop, or there may already exist, a resistance to technology and new systems. But the same technology and systems are becoming familiar in other societal contexts and use in libraries may eventually become more acceptable, especially as the new generations take our places, having been conditioned to a technological world since birth.

The portents and implications point toward collective action by libraries to contend with the information explosion and the publications glut. As individuals, the portents of the information explosion and publications glut may be viewed as good or evil, but there is no way to escape the reality of the problem. It is necessary to develop a rational strategy to cope: a strategy which takes into account the alternative styles and needs of the several disciplines--a strategy which does not leave us behind, or not too far behind, the developments of our society. All of us will be obliged to examine or re-examine our views and attitudes as realistically as we can--in terms of our specialized environments, in the context of the larger society.

For myself, I am convinced it is necessary to take maximum advantage of the assistance that technology provides, if we are to be able to cope with the twin problems of information explosion and publications glut.