Individual and Organizational Factors Distinguishing High versus Low Utilizers of Research in Nursing

by
Peggy J. Shepherd, MS, RN

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy, School of Nursing,
Oregon Health Sciences University
1993

Doctoral Committee:

Professor Jo Anne Horsley, Chair
Professor Joyce Crane
Professor Barbara Stewart

APPROVED:

[redacted]

Jo Anne Horsley, RN, PhD, Professor
Research Advisor

[redacted]

Joyce Crane, RN, PhD, Professor
Committee Member

[redacted]

Barbara Stewart, PhD, Professor
Committee Member

[redacted]

Carol A. Lindeman, RN, PhD, FAAN, Dean, School of Nursing

ABSTRACT

This study was undertaken to describe and develop predictions for differences between high and low users of nursing research. Eight predictors (education, individual change factors, position-related change experience, cosmopoliteness, organizational change factors, position-related change experience, opinion leadership, and organizational context) and five outcomes (cognitive, behavioral, and administrative use of new knowledge, use of research methods, and participation in research utilization activities) were studied using t-tests and discriminant function analysis.

Findings of the study offer support for the five types of research utilization as being distinct from one another in terms of the best predictive equations. All predictors across all five types of research use showed significant differences between high and low user groups. Cosmopoliteness, individual change factors, and position-related research experience were among the most powerful predictors. Variance accounted for by the discriminant function analysis ranged from 21% (behavioral use of new knowledge) to 48% (participation in research utilization activities). Subjects were accurately classified by the discriminant function equations from 71% (administrative use of new knowledge) to 82% (participation in research utilization activities) of the time.

The study provides convincing evidence for the complexity of research utilization as a phenomenon separate from the conduct of research and sheds light on the relationships between the predictor and outcome variables.

Financial Acknowledgements

This project was supported by the National Center for Nursing Research, National Institutes of Health, U. S. Public Health Service, under grant No. 5 R18 NR01180. The scientific work of the project was conducted at the Oregon Health Sciences University, Arizona State University, and the University of Washington.

Acknowledgements

This dissertation would not have been possible without the very real support of many people. Jo Anne Horsley, Joyce Crane, and Barbara Stewart gave me the opportunity to work on the RU-N Project early in my doctoral program. As a result of that opportunity, I developed a knowledge and interest base that enabled me to undertake this dissertation.

Few programs of graduate study are without obstacles, and mine has in that respect been typical. All three members of my committee have been unfailingly supportive and encouraging of my efforts, each in their own way. Jo I must thank for her never-failing judgement of when to produce the stick and when to produce the carrot. She kept me going. In addition, without her efforts as principal investigator of the RU-N Project, the data for this dissertation would not have existed. As my dissertation chair, she exhibited patience and great steadiness in keeping me focused on the goal of this project.

Joyce has a grasp of the literature base in research utilization that few can equal. She has been a treasure of ideas, thoughtful critique, and information. She has also provided the reality check that reassured me at critical times in the process. As the person on my committee who had most recently been through the dissertation writing and defense process, she offered a special kind of emotional support as well.

Barbara has challenged me in many ways in the years I have known her, starting from before I ever heard the term research utilization. To her I owe my interest in methodology and my courage in trying new things. She could always find something positive to comment on throughout the process of this dissertation. For that gift alone I would owe her great thanks.

I must also thank those in my personal life who have been friends, supporters, and cheering section. They've helped me get there and have pushed me to enjoy my successes when I could only focus on the next challenge. Special thanks go to Barbara Jo Cottrell who picked up the pieces of everyday life when I couldn't.

Final thanks go to two women who helped me tremendously at the very end of this process: Mona McBride and Cheryl Bond. Their attention to detail and willingness to step in at the 11th hour were invaluable.

This dissertation is dedicated to
Dorothy Martin Shepherd, my mother
who believed that education was a worthy goal
and who always encouraged me to "do my best"
and to
Alice Louthan Cottrell, who became a second "mom" to me
and who mothered me through most of this process.
These two women taught me much about life
and about what is worthwhile.
They also believed in me and inspired me to believe in myself.

TABLE OF CONTENTS

LIST OF TABLES

TABLE

LIST OF FIGURES

FIGURE

LIST OF APPENDICES

APPENDIX

CHAPTER 1

INTRODUCTION

Nursing science has grown rapidly over the past 50 years. The amount of new knowledge produced increases each year, and yet there exists considerable evidence that little of the new information ever makes it into the daily practice of nursing professionals (Brett, 1987; Brett, 1989; Champion & Leach, 1989; Coyle & Sokop, 1990; Ketefian, 1975; Kirchhoff, 1982) . It has been argued that much of the new knowledge produced is not appropriate or ready for practice or does not address the needs and interests of practicing nurses (Crane & Horsley, 1983; Haller, Reynolds, & Horsley, 1979; Horsley & Crane, 1986; Ketefian, 1980; Reynolds & Haller, 1986; Stetler & Marram, 1976). However, it remains inarguable that there is new knowledge produced that could and should have an impact on nursing practice and yet is not reflected in practice.

The failure of nurses to use new knowledge is by no means universal. Some nurses do become aware of new information, are convinced of its usefulness, and change their practice to incorporate the new knowledge. However, the literature suggests that they are a minority of practicing nurses. As yet, we have little empirical knowledge of how these high utilizers of new knowledge differ from low or non-utilizers. The purpose of this study is to describe those differences.

Identifying the characteristics and antecedent experiences of nurses who do and do not use research is important to the study of research utilization. Although several projects in the past have, with mixed success, moved research into practice (Horsley, Crane, & Bingle, 1978; King, Barnard, & Hoehn, 1981;

Krueger, Nelson, & Wolanin, 1978), the methods undertaken by those projects have not been incorporated into most of the organizations that employ the majority of nurses. Yet the value of having nursing practice based on the most current, available research is now widely acknowledged. A better understanding of the differences between high utilizers and low or non-utilizers may lead to practical methods of encouraging use of new knowledge.

Nursing has come relatively late to the field of research utilization, but there exist several major studies that have contributed significantly to the knowledge about research utilization in nursing. These studies set the framework for the present study.

Research Utilization Studies and Projects in Nursing

Nursing scholars have explored research utilization both through empirical studies and the conduct of intervention studies designed to move research into practice. Taken together, these studies have provided the discipline with much of what we know about research utilization in nursing. In the next section, the most prominent studies are reviewed to provide an historical context for the current study, as well as to lay the foundation for the focus of this research.

Perhaps the first well-recognized study of research utilization in nursing was Ketefian's 1975 survey of nurses' knowledge and use of the correct procedure for measuring oral temperature. Research findings relating to that procedure had been widely disseminated through the nursing literature, and the findings themselves had been adequately replicated to support validity. The sample for the study was 87 registered nurses licensed to practice in New York

and Massachusetts. Ketefian had originally hypothesized that use of research findings by nurses would be positively correlated with educational level, number of courses taken since graduation, and frequency of use of oral temperature measurement in the nurse's own practice. She anticipated a negative correlation between use of research findings in practice and years since graduation from nursing school. Only a single subject in the entire sample indicated knowledge of the correct placement time for determination of oral temperature. That subject was opposite in every way to the hypothesized portrait of a nurse who would use research. Therefore, none of the hypotheses were supported.

Prior to the publication of Ketefian's study, most discussions of research utilization in nursing were theoretical and focused on the failure of nurses to read research. Ketefian was the first to attempt to quantify use or non-use. Her study raised the consciousness of the professional nursing community on this issue and paved the way for the studies that followed.

Subsequent to Ketefian's study, three projects were funded by the federal government to test methods of facilitating the movement of research-based knowledge into nursing practice. Reports of these projects (Horsley et al., 1978; King et al., 1981; Krueger, et al., 1978) make up the next major body of literature on nursing research utilization.

The first two of these projects were both initially funded in the mid-1970s. The Western Interstate Commission of Higher Education Regional Program for Nursing Research (WICHE) (Kreuger, et al., 1978) was designed in a workshop format. Nursing faculty and practicing staff nurses were recruited in four regions of the 13-state area. The participants were selected by their administrators to attend the program. Participants were paired based on geographic location.

Each pair consisted of one clinician and one nurse educator. Only one nurse per agency was invited to participate. Pairing was for the purpose of providing a support base for participants for information-sharing as well as problem-solving.

A total of three regional programs were conducted. The initial workshop in each region was designed to help nurses develop detailed plans for introducing a research-based change into their own practice settings. Each region used a different approach to match participants' clinical interests to relevant research findings. The approaches included the problem-solving process; the diffusion of an innovation; and the research, development, and diffusion process. The project staff used these theoretical approaches to provide structure for the workshops in each region. In addition, all three workshops used Lewin's force-field theory to discuss the management of change. A second workshop, five months later, focused on reports from participants about their experiences in attempting to implement the changes planned. Positive outcomes included increased communication between agencies whose nurses were "partnered" and a general perception by participants that the project had been a success. Major obstacles identified included a lack of sufficient support (release time, staff attitude, equipment, money, facilities) in the clinical agencies, insufficient contact between partners, and the differences in partners' work settings. The most frustrating obstacle identified by participants was in locating quality research findings that were relevant and significant to nursing practice.

At about the same time, the Michigan Nurses Association was funded to develop and test another method of moving research findings into clinical practice. That project, the Conduct and Utilization of Research in Nursing

(CURN) Project used a very different approach from the WICHE Project, based in part on the different conceptual base of the investigators. The CURN investigators viewed research utilization as "an enduring set of organizational functions which can positively influence the quality of care delivered in nursing service settings," (Horsley et al, 1978, p.5). For this reason, the CURN Project included elements of on-site consultants and off-site workshops in training participants. In addition, agencies, rather than individuals, were identified as the primary participants, with each agency identifying six to eight staff to attend workshops and work with the consultants. Project staff combed the research literature for research-based knowledge that met a set of specific criteria relating to reliability and validity of findings, as well as to clinical relevance. These findings were "translated" for study participants into clear, clinically applicable protocols. Consultants then assisted participants in each agency to identify which protocols addressed problems that existed in the agency. Although expensive and labor intensive, the process was effective in moving specific research findings into practice. By translating research findings into clinical guidelines, and by focusing on agencies as participants, the CURN Project addressed many of the difficulties and obstacles identified by the WICHE program, drawing on some of the early experiences of the WICHE program to shape the CURN interventions.

The third project was also initiated in the late 1970s. This project, the Nursing Child Assessment Satellite Training (NCAST) Project used yet a third approach, one that was based on a diffusion model of research utilization (King et al., 1981). In this case, a nurse researcher had an interest in the dissemination of a body of research-based knowledge derived from a series of longitudinal nursing child assessment studies. In the first phase (NCAST-I) of

the project, the goal was to disseminate the content as widely as possible and, therefore, both practicing nurses and nurse educators were recruited. In the second phase (NCAST-II), the goal was to teach specific assessment procedures for use in practice and, therefore, only nurses involved in direct care were recruited. NCAST-II included specific training and assignments to help the participants use the child assessment scales accurately; the focus of the assignments was on establishing interrater reliability. The third project in the NCAST series was NSTEP-P, similar to NCAST-II in containing specific training in scale use, but focusing on premature infants. In addition, recruitment was directed at agencies, with agencies asked to commit in advance to send more than a single practitioner and to allow the use of the scales in practice.

In all of the NCAST series, research-based knowledge was prepared for dissemination by transformation into language appropriate for practitioners, with emphasis on practical suggestions. Content was then delivered on a national scale, using communication satellite technology to reach large numbers of learners simultaneously. When possible, an interactive mode of transmission was used so that learners might ask questions and offer comments on the material. In addition, participants were provided with written materials that included references for further study.

The three projects (WICHE, CURN, NCAST) clearly used three very different conceptual models and approaches to research utilization. The projects themselves and subsequent published papers deriving from them made major contributions to the sensitivity of nursing to the issue of research utilization and to the understanding of the phenomenon. They also spurred further research in the field.

Miller and Messenger (1978) made a contribution to our understanding of use and non-use of new knowledge by nurses, but did not directly address amount or type of research utilization. They studied perceived obstacles to use of nursing research, surveying 177 practicing nurses regarding their perceptions of the obstacles to their use of research in practice. The problem most frequently cited by the subjects was difficulty in obtaining research findings. Educational level did not influence types of difficulties or perceptions of obstacles. Neither position nor age showed a significant association with perception of obstacles. The nurses surveyed for this study suggested that dissemination could be improved by wider distribution of summaries of reports, more conferences to disseminate research, and published reports that are both clearer and more numerous. Although these researchers did not attempt to measure research utilization, the study contributes to our understanding of factors affecting use of new knowledge. It is especially relevant in considering the influence of the new knowledge itself on utilization.

Kirchhoff (1982) surveyed nurses employed in coronary care units on their knowledge and actual practice of using two "coronary precautions" that had been repeatedly reported in the literature as being unnecessary. The questionnaire used made a distinction between awareness of a research finding and use of that finding. Again, however, this study failed to find support for most of the commonly hypothesized relationships among research utilization and individual differences in educational level, social participation and professional status. None of these factors (education, social participation and professional status) were found to be significantly associated with research utilization in this sample. Nor did awareness of the research findings relate to persuasion or use of findings. Only 24% of nurses reported discontinuing

restrictions on ice water, and 35% had discontinued rectal temperature restrictions, although many more reported awareness of these findings.

One interesting point about this study is that it attempted to measure discontinuance of a practice found by research to be unnecessary. This is, indeed, a form of research utilization, but one not often measured. It may be, however, that this fact in itself contributed to the lack of significant findings. It may be a very different matter for nurses to stop using precautionary measures (restricting ice water and rectal temperatures) than for nurses to start using a new method that demonstrates significant benefit to them or to their patients. Also, in the case of the coronary precautions, a portion of the sample reported that the precautions continued to be ordered by physicians, demonstrating one area of constraint on nursing decision making.

Two important articles in the field derive from the doctoral dissertation of Brett (1987; 1989). Brett developed an instrument for her study which she labeled the NPQ (Nursing Practice Questionnaire). The NPQ is a list of 14 nursing practice innovations with questions about the subject's awareness of the innovation, attitude toward the innovation, and implementation of the innovation. Nurses were asked specifically about their knowledge of the innovation (awareness), whether they thought the innovation was valid and appropriate for use (persuasion), and whether they used it in their own practice (implementation). Nurses were also asked whether their institution had policies or procedures relating to the innovations. The innovations themselves were selected for inclusion on the NPQ based on the CURN Project criteria (Haller et al., 1979).

In the first published report of this study, Brett (1987) focused on the responses of the nurses to the NPQ. She found that in this sample, nurses were

in varying stages of awareness, persuasion, and implementation of the different innovations. For each innovation, some nurses were at each stage of adoption. The innovations themselves varied widely as to the overall stage of adoption typical of the innovation. On a scale of 0 (no awareness) to 4 (use always), the innovations ranged from 1.02 (deliberative nursing) to 3.60 (closed urinary drainage).

In this same article, Brett (1987) also described characteristics of the nurses in the sample in relation to their NPQ scores. Significant relationships were found between NPQ scores and the number of hours spent weekly reading professional literature (r=.163, p <.01), reading Nursing Research (X^2 = 12.422, df=3, p <.01), and reading RN (X^2 = 8.925, df=3, p <.01). No significant relationships were found between NPQ scores and years since basic education, type of basic nursing degree (ADN, BSN, Diploma), level of education, hours of continuing education, participation in a research study, completion of a nursing research class, or current pursuit of classes toward a degree. Another negative finding is also interesting. Hospital policies and procedures were reviewed on the 14 nursing innovations. No relationship existed between nurses' perception of the existence of a hospital policy and the actual existence of a policy. There was also no relationship between the number of policies on the innovations in a hospital and the NPQ scores of nurses from that hospital. However, the innovations on which nurses most often fell in the "use always" range were those on which virtually all hospitals do have clear policy and procedure statements. It is likely that on these innovations nurses would be aware of a clear message of "this is how we do it" even if they had not thought about the existence of an actual policy or procedure.

Brett's second published report (1989) dealt with organizational variables and adoption of innovations by nurses. That study is described in the review of literature relating to organizational variables. The study is a further analysis of data from the same dissertation work described above, with the addition of surveys of the hospitals in which nurses practiced. As discussed later in this proposal, the study design and instrumentation were both considerably more problematic than that reported in the 1987 article and, in the end, the study does little to advance understanding of the phenomenon of research utilization by nurses.

Coyle and Sokop (1990) used Brett's Nursing Practice Questionnaire (NPQ) in their survey of 200 nurses from 20 randomly selected medium-sized hospitals. In using the NPQ, they took an important step toward establishing a base of knowledge about adoption of innovations by nurses. For the first time, the published literature includes work by multiple authors reporting separate studies using the same outcome measures. Just as replication is needed for establishing the validity of research findings for use in practice, so is it needed to build a valid knowledge base regarding research utilization.

Coyle and Sokop (1990) report findings similar to those of Brett's initial study (1987). Each innovation in the NPQ (14 in all) had some nurses at each stage of adoption (awareness, persuasion, use). Again, the highest score (the most nurses indicating implementation of the innovation) was for closed urinary drainage systems (3.59). The lowest score in this study was for intramuscular injection technique (.86) with deliberative nursing (the lowest scoring innovation in Brett's study) having a score only slightly higher (.88). Like Brett's study, this one found that none of the innovations was in the unaware stage but only one fell into the "use always" range. Thus, nurses, though aware of the innovations,

had not incorporated them into their practice. And, as in Brett's study, those innovations on which the sample showed the highest scores were those likely to be implemented by administrative mandate in the form of policy and procedure statements. This issue brings into question the amount of individual initiative involved in the use of these innovations particularly, and suggests the need to ask respondents why they adopted the innovation.

Coyle & Sokop (1990) also replicated Brett's (1987) analysis of the relationships among characteristics of individual nurses and innovation adoption. These findings are reported in the section of the review of literature addressing individual variables affecting research utilization. At this point it is sufficient to note that they did not substantiate Brett's findings reported above.

Champion and Leach (1989) explored the relationships among attitude (toward nursing research), availability (of nursing research), support (for research utilization) and research use. The measures of both independent and dependent variables were developed for the study. The measure of research use is different from those used by Brett, Ketefian, and Kirchhoff in that no specific research-based knowledge was used as a basis for the measure. Rather, the scale contained general statements relating to use of research in practice (e.g.. I base my practice on research). This scale is more similar to some of the outcome measures used in the present study than any of those reported by other nursing researchers.

Champion and Leach (1989) found no relationship between perceived support as a total scale and research use. However, when the support items were analyzed individually, several were significantly correlated with research use. Specifically, perceived support for nursing research utilization from unit directors (r=.35, $p \leq$.004), chairperson (r=.32, $p \leq$.02), and director of nursing

(r=.44, $p \leq$.001) were all significantly related to research utilization. Attitude toward nursing research and availability of nursing research information were positively related to research utilization (r=.55 and r=.52, respectively). Age, education, taking a graduate research course and years employed were not found to be related to research utilization. Of these demographic and previous experience variables, only having had an undergraduate research course was found to have an association with any of the four major variables of interest in this study. Having taken an undergraduate research course was positively related to attitude toward research (t=2.27, $p \leq$.03).

The Champion and Leach study (1989) was small (n=59) and used a convenience sample of nurses from a single hospital. Thus, the findings have only limited generalizability. One interesting sidebar to this study relates to the finding that perceived support of the director of nursing was significantly related to research utilization. Since a single hospital provided the sample, all of the nurses in the sample had the same director of nursing. This fact clearly highlights the significance of perception.

Crane (1989) made a significant contribution to our knowledge of nursing research utilization in her study of nurses who had participated in one of two mechanisms of research dissemination. Her sample was small (n=74), but it is of particular interest because it consisted of nurses who had either attended a research conference (n=34) or purchased a published, transformed report of research (CURN Project, 1980-1983) (n=40). Both of these may be considered traditional routes of dissemination, at least as compared to the three research utilization projects described previously. Crane used regression analysis with this sample to examine the extent to which three types of research use could be predicted by a set of seven predictor variables. The predictor variables were

education, cosmopoliteness, opinion leadership, change experience, research experience, and individual and organizational change factors. Crane was able, using these predictors, to account for 18% (9% adjusted) of the variance in use of new knowledge in patient care; 32% (25% adjusted) of the variance in generalized use of new knowledge; and 45% (40% adjusted) of the variance in use of research methods. These findings suggest that not only is research utilization not a uni-dimensional variable, but that different types of research utilization are subject to varied and complex influences.

Funk, Champagne, Wiese, & Tornquist (1991) described the development and testing of an instrument for measuring the perceptions of nurses regarding barriers to utilization of research. Factor analysis confirmed the four factors of characteristics of the adopter, characteristics of the organization, characteristics of the innovation, and characteristics of the communication (presentation and accessibility of the research findings). The first three factors reflect the theoretical and empirical work of numerous others working in the field of research utilization. The fourth factor, characteristics of the communication, addresses the concept of transformation of research into practice-ready materials. This factor, also, has wide support.

Nursing studies of research utilization, then, have contributed much useful knowledge. They have consistently shown a lack of association between educational level and use of research findings. Likewise, they have found no relationship of age to research utilization. Other individual factors have mixed support for their influence on nursing research utilization. Organizational factors have been less well explored, but it appears probable that at least nurses' perceptions of their organization are related to research utilization. Issues involving availability and accessibility of research findings are identified

repeatedly as obstacles to research utilization. Although the studies are weakened by sample size in some cases, and by immature measures in most cases, as a group they offer at least an outline of the phenomena of research utilization in nursing. That outline offers direction for the present study.

Context and Aims of the Study

The present study is undertaken as part of a larger study, the Research Utilization - Nursing (RU-N) Project, a 3-year study funded by the National Institutes of Heath, first through the Division of Nursing and then through the newly-created National Center for Nursing Research. The project was conducted from 1985 to 1988. The RU-N Project had several aims (Horsley, 1985b):

1. To develop instruments to measure research utilization variables including (1) components of research utilization treatment programs, (2) individual and organizational change factors that intervene in the process of research utilization, (3) research utilization outcomes, and (4) individual professional characteristics associated with openness to new knowledge.
2. To determine the long-term effect of each research utilization treatment program on the research utilization behavior of practicing nurses.
3. To determine which components of the research utilization treatment programs are most highly related to the long term research utilization behavior of practicing nurses.

4. To determine those individual and organizational characteristics and change factors that are related to the research utilization outcomes for each of the treatment programs.
5. To develop a refined, comprehensive model for research utilization in nursing that is based on the results of aims 2, 3, and 4.

The methods and procedures used in the RU-N Project are detailed in Chapter 3. However, it is important to note here that the variables, sample, and conceptual framework used in this study derive from that larger study. The RU-N Project provided the context within which the current study was designed and conducted.

Aims of the Current Study

The current study built upon the work done previously in nursing and specifically in the RU-N Project. The purpose of the current study was to increase our understanding of the differences between nurses who are high users of nursing research and those are low or non-users. For this study, use of nursing research may be cognitive, behavioral, or administrative. Use of research methods and participation in research utilization activities are also defined as types of research utilization. Specific aims of this study were:

1. To determine whether there are organizational and individual differences that distinguish high users of nursing research from low users of nursing research for each of the five types of research use.

2. To identify the combination of individual and organizational variables that best predicts high versus low use of nursing research for each of the five types of research use.
3. To determine whether the pattern of significant predictors of high versus low research use is similar or different across the five types of research use.
4. To compare the extent to which nurses with intermediate levels of research utilization resemble high versus low users of each of the five types of research use.

Summary

Research in nursing is, itself, a relatively new undertaking when compared to the research tradition in such fields as chemistry, biology, or history. However, research is, to a greater and greater extent, providing the new knowledge upon which practicing nurses can build their practice. Nursing has so far been unable to demonstrate that the daily practice of our professionals is based on available research-based knowledge. In this, it is little different from many other applied disciplines. However, if nursing research is to have an impact on nursing practice, we must better understand who uses research, and what factors are associated with research use. This study is undertaken to contribute to that knowledge.

CHAPTER 2

REVIEW OF LITERATURE

Two broad areas of research are relevant to this study. These areas are: types of research utilization and factors affecting research utilization. Types of research utilization include direct use of research findings, use of research methods, and participation in research utilization activities. Factors affecting research utilization include individual factors, organizational factors, and attributes of the innovation. Of these three, only individual and organizational factors will be used as variables in this study. However, because of the clear importance of the nature of the innovation in understanding the process of research utilization, that literature will also be reviewed.

It is worth noting that one of the difficulties in studying the field of research utilization is the lack of a common terminology across disciplines or even within disciplines across studies (Huberman, 1987; Larsen, 1986; Mohr, 1969; Rich, 1975) . Innovation, new knowledge, research, and technology are all terms used to describe the object in this broad field of study, while dissemination, use, transfer, utilization and change are all terms used to describe the process. Innovation is used to describe both process and product. Variables from study to study are defined and described differently even when a common label is used. Research-based and theoretical writing in the broad field is copious and spans the disciplines of sociology, social psychology, nursing, medicine, agriculture, business, communications, political science, and others.

For this study, research utilization is viewed as a special type of innovation in which the new knowledge adopted is based on research. The

terms innovation, knowledge utilization, and research utilization are used interchangeably. Innovation is used in the literature reviewed to describe both a product and a process, but for the purposes of this study, innovation is the product or new knowledge while innovative behavior is the process.

Types of Research Utilization

Most early work in the field of research utilization focused primarily on a behavioral definition of utilization (Rogers, 1973; Rothman, 1980). Views of "utilization" tended to be direct and instrumental. Research was utilized if the findings were directly applied by the user with fidelity to the original research findings. Application was the only outcome to be sought or measured. In nursing, there have been three major projects that attempted to move research findings into practice in a systematic way. Two of these, the Nursing Child Assessment Satellite Training Program or NCAST Program (King et al., 1981) and the Western Interstate Commission of Higher Education or WICHE Program (Krueger, 1978)) defined use exclusively in this behavioral way. In contrast, the Conduct and Utilization of Research in Nursing (CURN) Project (Horsley et al., 1978), although primarily focused on behavioral use of specific nursing research findings, included measures of use of research methods, participation in researdh utilization activities, and diffusion of research.

Others have suggested that Weiss' (1979) formulation of types of use of research could be helpful for the study of nursing research utilization (Stetler, 1985). Weiss (1979) described several models of research use. These include: 1) knowledge-driven model (basic science first, followed by application research, followed by direct use); 2) problem-solving model (direct application

of research to an identified problem; user seeks out a research-based solution); 3) interactive model (not orderly research-to-application path but rather research as one piece in the puzzle of decision-making); 4) political model (positions of decision-makers are pre-determined but research is used to bolster the validity of the decision); 5) tactical model ("we're studying it" as a tactical response to public concern); 6) enlightenment model (concepts and perspectives engendered by a body of research permeates the policy-making process); and 7) research as part of the intellectual enterprise of the society (not the independent variable, but another dependent variable like policy, history, etc., all influencing each other and being influenced by the larger fashions of social thought). In Weiss' view, research utilization is not a single discrete activity but rather research may be used differently depending on the needs and goals of the user.

Larsen (1980) in her essay comments that, "traditionally, a basic assumption of researchers was that knowledge was used when it was implemented as part of a program or directly led to some decision or course of action..." but, over time, researchers came to realize that "...knowledge utilization is more complex than initially hypothesized," (p. 423-4). Later, Larsen (1986) identified three types of research products that may be used: knowledge, technology, and research methods.

Rich (1975) used the terms "instrumental utilization" and "conceptual utilization" in describing two ways in which knowledge might be utilized. Instrumental utilization is similar to traditional definitions of knowledge use; that is, an outcome results from use. Conceptual utilization refers to knowledge having an influence on the thinking of a user without any other documentable outcome.

The Research Utilization - Nursing (RU-N) Project (Horsley, 1985; Crane, 1989; Crane, Horsley, Stewart, & Shepherd, 1992) used a broad definition of research utilization outcomes. Investigators measured cognitive, behavioral, generalized and administrative use by individuals as well as diffusion of research. Use of research methods for practice purposes was also defined as a type of research utilization.

For this study, research utilization is defined as the cognitive, administrative, or behavioral use of new research-based knowledge or use of research methods for practice purposes (as opposed to using research methods to conduct research). It also includes participation in the activities that, taken together, can result in research utilization. A single subject may show high levels of one or more types of use and low levels of other types of use. For this reason, the characteristics of high and low users will be described separately for each type of use.

Individual Characteristics Influencing Research Utilization

Many factors have been hypothesized as potentially influencing individual adoption of innovations. For some of these, considerable support has been found in repeated research in a variety of fields. For others, plausible though they sound, little support has been found. The following section briefly reviews many of the variables hypothesized to be associated with adoption of innovations.

Characteristics of individuals are those factors that may be said, in combination, to uniquely describe the individual. Such factors may or may not be subject to influence or change. Characteristics of individuals include such

demographic variables as age, educational level, socioeconomic status as well as characteristics that may be thought of as relating to communication styles and behaviors. Examples of the latter are opinion leadership and cosmopoliteness (Crane, 1985 & 1989; Rogers, 1983). Another group of individual variables are those that may be viewed as directly describing the inclination of the individual toward change. These include individual need for and readiness to change, resources for change, and resistance (Barton, Grieshop, Miyao, & Zalom, 1990; Crane, 1989; Glaser, Abelson, & Garrison, 1983b; Horsley, 1985a; Hunt, 1981). These variables are relevant since research utilization is fundamentally an issue of change. Finally, there are variables that describe the past experience and present situation of the individual. These factors, also, are thought to affect research utilization (Crane, 1989). The next section, therefore, includes brief reviews of these four types of individual variables--demographics, communication styles and behaviors, inclination toward change, and past experiences and present situation of the individual.

Demographic Factors

Although age, socioeconomic status, and educational level all have been proposed in the literature as influential on the potential innovativeness of the individual, the theoretical relationships have not been consistently supported in empirical studies. Of the three factors, age has perhaps been the most exhaustively studied. Plausible as is the hypothesis that age might be associated with adoption of innovations, there is little or no support for age as a significant factor. Rogers (1983), in reviewing 228 studies which included age

as a variable, noted that half of the studies demonstrated no relationship, while 19 percent found that earlier adopters are younger and 33 percent found them to be older. Baldridge and Burnham (1975) studied school districts, large and complex organizations which might be supposed to be similar in those ways to hospitals and health departments in which most nurses are employed. They found that individual characteristics, such as sex, age, and personal attitudes, seemed not to be important determinants of innovative behavior among people in complex organizations. However, administrative positions and roles did seem to have an impact on the involvement of an individual in the innovation process.

Findings in the nursing literature are equally mixed. Kirchhoff (1982) studied nurses' ratings of the importance of adherence to two "cardiac precautions", the need for which had been refuted by research. Although Kirchhoff did not report age as a variable, she did report years since graduation, years since most recent graduation, and years of nursing experience in relation to nurses' ratings of importance. These variables can be viewed, with some caution, as surrogate measures of age. She found all of these variables to be positively and significantly correlated with nurses' ratings of the importance of restricting ice water, but found no relationship with restricting rectal temperature measurement. Crane (1989) in a sample of nurses who had either attended research conferences or read research-based publications representing transformed knowledge, found age to be negatively but not significantly correlated with several measures of research utilization. Only use of research methods was found to have a significant positive correlation with age. One composite outcome measure, research utilization activities, was found to be significantly and negatively correlated with age.

Although Ketefian (1975) did not specifically measure age in her study of knowledge and practice of taking oral temperatures, she did measure educational level and years since graduation. None of these factors was found to be related to her outcome measures of research utilization. In fact, she found only one nurse of a sample of 87 who was both aware of and used the correct procedure.

Yet another nursing study (Champion & Leach, 1989) examined relationships among attitude (toward nursing research), availability (of nursing research), support (administrative, colleague, physician) and research use. Age, education, and years employed were found not to be related to research utilization.

Taken together, the available literature is markedly mixed regarding the influence of age on research utilization. In nursing, there is little empirical support for age as a variable with a significant relationship to research utilization.

In many non-nursing studies, early adopters have been found to be better educated and more literate than late adopters (Glaser et al., 1983b; Rogers, 1983), although again, this relationship is far from consistent. In nursing, neither Ketefian (1975) nor Champion (1989) found support for educational level as positively associated with innovative behavior. Nor have other nursing studies found support for this proposed relationship (Brett, 1987; Coyle & Sokop, 1990; Kirchhoff, 1982). In dentistry, Sadowsky and Kunzel (1986) also failed to find support for the correlation of educational level and innovative behavior .

Socioeconomic status has also been proposed as being positively correlated with innovation. Most studies have found early adopters to have

higher social status and a greater degree of upward mobility than later adopters (Glaser et al., 1983b; Rogers, 1983). In nursing, few if any studies have attempted to measure these variables. Although one could speculate on the reasons for this omission, the fact remains that the nursing literature offers neither support nor non-support for the proposed relationship.

Communication Styles and Behaviors

Early adopters are believed to have communication styles and behaviors that differ from those of late adopters (Glaser et al., 1983b; Rogers, 1983) . In general, early adopters have been found to be more interconnected in the social system, more cosmopolite, have more change agent contact, and have greater exposure to the mass media than do late adopters. They also seek information about innovations more actively and have a greater knowledge of innovations. Finally, they are more often opinion leaders than are late adopters (Rogers, 1983).

Barton, et al., (1990) examined the relationship of personality to research utilization, using a sample of farmers. Personality factors were found to account for 25-28% of the variance in use of a specific research-based method of pest management. Farmers who were more apt to use research were found to be less rule-oriented but more conservative (versus radical), more tough-minded, and to have a composite of other personality factors characterized as "leadership". Whether this construct can be translated to be equivalent to opinion leadership is debatable, however. Opinion leadership generally refers to how a subject is perceived by and functions within a reference group; it is viewed as informal leadership (Rogers, 1983). Barton's study concentrated

exclusively on personality attributes. It is probable, however, that functioning as an opinion leader in a group is to some extent related to possessing the personality of a leader.

In nursing, there is some research that addresses the relationship of communication behaviors to research utilization . The majority of that research uses behavior variables such as reading of professional journals or attendance at research conferences, and few conceptualize these activities as communication behaviors. The findings are mentioned here because these variables are similar to those alluded to in other fields as indicative of cosmopoliteness.

Coyle & Sokop (1990) derived TIAB (Total Innovation Adoption Behavior) scores using Brett's Nursing Practice Questionnaire (NPQ) (Brett, 1987). Attending conferences where research was presented, reading Heart & Lung, and job satisfaction were all positively related to TIAB scores. Level of education, years of nursing experience, professional memberships, CE hours, current pursuit of a degree, completion of a nursing research class or hours spent reading professional literature were not related to TIAB. Coyle & Sokop's study, then, provides very mixed support for the relationship of communication behaviors and demographic factors, as operationalized in their study, to research utilization among nurses.

Other nursing studies have also investigated variables related to communication behavior. Kirchhoff (1982) surveyed 524 coronary care unit nurses regarding their awareness and use of coronary precautions following myocardial infarction (restrictions of ice water and rectal temperatures). Reading the American Journal of Nursing, number of journals read, and number of hours per week spent reading correlated with awareness of current research

information. Awareness of published studies was not, however, related to change in practice. Kirchhoff concluded that passive diffusion had some association with awareness but little with persuasion or adoption.

Crane (1989) found considerable support for the association of both opinion leadership and cosmopoliteness with research utilization, although the strength of the association varied with the type of research utilization. Her study, using a subsample of the RU-N Project data, focused on nurses who had either attended research conferences or purchased books containing research-based knowledge that had been transformed for use in practice. In these groups, Crane found that cosmopoliteness and opinion leadership both had moderate positive correlations (r=.25-.36) with use of research methods in practice and research utilization activities. Generalized use of new knowledge was significantly related to opinion leadership (r=.40) but not to cosmopoliteness (r=.16). Neither cosmopoliteness nor opinion leadership showed a significant relationship with behavioral or cognitive use of new knowledge. These findings seem to indicate that communication behaviors may be differentially associated with different types of research utilization.

Inclination of the Individual Toward Change

Rogers (1983) notes that early adopters are more likely than late adopters to have a positive attitude toward change, science and education and to be better able to cope with uncertainty and risk. Conceptually, Rogers (1983) views these factors as aspects of personality and therefore as stable and unamenable to influence.

Resistance may be conceptualized as a negative attitude toward change and difficulty in coping with risk and uncertainty. Hunt (1981) suggests that resistance to change may be a major factor underlying the apparent reluctance of nurses to incorporate research into practice.

Crane (1989) conceptualized individual change factors not as stable personality factors, but rather as amenable to influence. She found, however, in a sub-sample of the RU-N Project data, that individual change factors (i.e., readiness, resistance, need, and resources) had little association with any of the research utilization outcomes measured.

Past Experience and Present Situation of the Individual

Several researchers have examined the relationship of various aspects of past experience and present situation to research utilization by nurses. Table 1 summarizes the findings of that literature.

Crane (1989), of all these researchers, looked most exhaustively at the contribution of past experience to several different measures of research utilization. Her sample consisted of nurses who had either attended a research conference or purchased a book containing research that had been transformed for application to practice. Among these nurses, position-related change experience and position-related research experience contributed significantly to the explained variance in several of the research utilization outcomes. However, none of the variables measuring past experience demonstrated a significant relationship with behavioral use of new knowledge.

Table 1

Previous Research Studies that Investigated Relationships of Past Experience and Current Position to Research Utilization

Author	Research Class	Research Experience	Change Experience	Currently in School
Brett (1987)	ns	ns	N/A	ns
Champion & Leach (1989)	ns[a]	N/A	N/A	ns
Coyle & Sokop (1990)	ns	N/A	N/A	ns
Crane (Cognitive) (1989)	N/A	.37 **	.10 ns	N/A
Crane (Behavioral) (1989)	N/A	.06 ns	.14 ns	N/A
Crane (Research Methods) (1989)	N/A	.39 ***	.29 *	N/A
Ketefian (1975)	0 [b]	N/A	N/A	N/A

[a] Taking a graduate research course was not related to RU. Taking an undergraduate research was positively related to attitude toward research which in turn was positively related to RU (Champion & Leach, 1989)

[b] Ketefian had no measure specifically of research courses, but did measure coursework since graduation, which had no relationship to RU (Ketefian, 1975).

N/A Not assessed.

* $p<.05$ ** $p<.01$ *** $p<.001$

Other nursing studies have, for the most part, examined only one or two antecedent variables and their relationship to research utilization. None found significant relationships among these variables and research utilization (Champion & Leach, 1989; Coyle & Sokop, 1990; Ketefian, 1975; Kirchhoff, 1982; Miller & Messenger, 1978). Most of these researchers defined research utilization as behavioral use of research-based information.

Baldridge and Burnham (1975), studying teachers, found that administrative positions and roles were positively associated with the involvement of an individual in the innovation process. In this study, demographic factors were not associated with innovation. Thus, as with demographic variables, there is a pattern of either mixed support or non-support for the hypothesis that past experience and current position have an association with research utilization.

Summary of Individual Characteristics

Variations among individuals, then, are among the factors believed to influence the readiness to receive and use new knowledge. The variables of predisposition toward change, socioeconomic status, cosmopoliteness, and opinion leadership have all received support as being positively correlated with adoptive behavior. Demographic factors, past experience, and present position have mixed support for their relationship to innovation.

It would seem that the construct of individual characteristics is complex, including aspects that are both fixed and malleable. Nor can the characteristics

be viewed as necessarily belonging fully to the individual. As Rogers (1983) pointed out, opinion leaders in a conservative organization tend to be conservative while those in a change-oriented organization tend to be change-oriented. Thus, opinion leadership, though usually discussed and measured as an individual characteristic, may in fact be a characteristic that is best thought of as a characteristic of an individual only within the context of a given organization or situation. Cosmopoliteness as well seems to be dependent in part on organizational influence. Organizational support to attend conferences, provide a well-stocked library, or pay professional membership dues can serve to enhance cosmopoliteness among its staff. Research and change experience may also be considerably influenced by one's professional role within an organization. It is important to keep this interaction of individual and organizational characteristics firmly in mind in attempting to understand the effects of both on innovation.

Organizational Characteristics Influencing Research Utilization

"There is widespread support for the belief that organizations in general ... are not predisposed to change," (Johnston & Oman, 1990, p. 268). In spite of this, the pressures on organizations to change are constant. Pointing up this fact is the spate of books published in the 1980's holding up innovative organizations as exemplars of excellence, and exhorting all organizations to change to keep up. The body of literature describing organizational characteristics that influence research utilization is, as might be expected, extensive.

Organizational factors include structure, norms, values, roles, goals, and climate (Glaser, Abelson, & Garrison, 1983a; Havelock, 1973; Rothman, 1980). They include such variables as size and complexity of the organization, formality of the organization, and organizational supports for change efforts. Based on all these factors, organizations, like individuals, may be seen broadly as inclined or not inclined toward innovation. Organizational factors are thought to work in combination with individual factors to influence the behavior of individuals within organizations. That is, individual adoption of innovations is not simply a matter of who the individual is, but also of the nature of the organization within which the individual works. The organizational factors used as variables in this study will include organizational resources, readiness, and need for change, and resistance to change (combined to form a single organizational change variable), and organizational context. The relevance of each of these factors is supported in both the general and the nursing literature.

Organization Size (Resources)

Although much evidence has been found to indicate that size of the organization is positively correlated with innovation (Hage & Aiken, 1967; Mansfield, 1963; Mohr, 1969; Rogers, 1962), the data are far from consistent. Rogers and Agarwala-Rogers (1976) have proposed that size may simply be a surrogate measure for institutional resources, both total and available, organizational structure, and other variables. Included in the general concept of resources are all manner of what might be called tangible supports for change, including money, libraries, specialists within the organization, outside

consultants, and so forth. In general, high levels of institutional resources are positively associated with innovation within the institution (Rogers, 1983).

Brett (1989) describes a related concept she labels organizational integrative mechanisms. These mechanisms include hospital reimbursement of expenses for travel to attend conferences, paid outside speakers, support of research activities, committee structure, departmental and hospital libraries, and so forth. Clearly these factors can also be viewed as resources, although the reconceptualization of the activities as integrative mechanisms focuses attention on the use of resources rather than on the quantity of resources. Brett found that only small hospitals in her sample showed a positive correlation of integrative mechanisms with nurses' adoption of research findings. For medium-sized hospitals, there was no significant relationship and in large hospitals, all of the integrative mechanism categories were negatively correlated with adoption of innovations. However, overall, large hospitals had the highest mean adoption score, followed by small and medium hospitals. These findings suggest that the relationships of size, organizational integrative mechanisms, resources and individual adoption of innovations is one which needs further exploration.

Some questions arise about the validity of Brett's findings for several reasons. First, all instruments used were immature. They were developed for this study, were untested and many of the subscales had very low internal consistency reliability. Second, although analysis of variance was the selected means of analyzing the data, the real differences between groups on the independent variable (organizational integrative mechanisms) were potentially a single point on an immature scale. Thus, a single 'no' answer on one integrative mechanism could result in a hospital being classified as low rather

than medium (or medium rather than high) on organizational integrative mechanisms. Third, in this day of highly specialized nursing units, it is not clear that all or even the majority of the innovations measured on the NPQ were ones that the nurses surveyed should have used. For instance, several of the identified innovations referred to preoperative teaching and/or preparation of patients. For nurses working on medical units, nursing research related to preoperative care is not clinically relevant. Only a subset of the innovations could be truly said to be applicable across all medical-surgical units. Finally, since Brett does not report the possible range of the NPQ scale (her measure of the dependent variable of research utilization), the practical significance of the differences she found are difficult to assess. Thus, although provocative, Brett's study contributes more questions than answers to the field.

Structural Characteristics of the Organization

Structure is an even more quixotic variable. Structure includes such factors as complexity, degree of centralization versus decentralization, the informal versus the formal structure, organizational openness, and how structure is used to legitimize innovativeness (Hage & Aiken, 1970; Horsley & Crane, 1986; Reynolds & Haller, 1986; Zaltman, Duncan, & Holbek, 1973). Structure as it affects change, is expressed, from the point of view of the employee in the organization, as need and readiness for change. The structure of an organization may also indicate resistance to change and innovation, as may the organizational climate.

Zaltman, Duncan, and Holbek (1973) viewed centralization as a key issue in organizational innovation. In the context of an organization,

centralization refers to the locus of authority and decision-making in the organization. A high degree of centralization translates to less participation in decision-making and, often, restricted channels of communication, both of which may adversely affect initiation of innovation. Rogers (1983) contended that centralized organizations are better at implementation while decentralized organizations are better at initiation of innovation. Shepherd (1967) supported Rogers by noting that at the implementation stage, more centralization may actually be useful because of the more specific line of authority and responsibility. Lawrence and Lorsch (1967) suggested that structure may not be organization-wide but rather work-group specific. They note that within organizations, basic research groups tend to have the least formal structure while production groups have the greatest structure.

Baldridge and Burnham (1975), in their study of school districts, found that structural characteristics of the organization, such as size and complexity, were strongly associated with the organization's innovative behavior. Horsley and Crane (1986) identified structure as one of three iey organizational factors (along with size and goals) that impact organizational innovativeness. In general, then, there seems strong support for structure as a key element to consider in assessing organizational potential for innovation.

Organizational Context

Organizations express their values in many ways. Taken together, the expression of values on an organization-wide level may be conceptualized as organizational context. One very concrete way in which organizations may articulate values is through their goals. An organization that values innovation

and change will reflect those values in their goals and objectives. Horsley and Crane (1986) noted that clear goals that do not specify the "how to" of doing the work tend to be the most supportive of change. Restrictions on ways to achieve goals tend to limit innovation (Aiken & Hage, 1968).

Conversely, goals that are too vague and never related to outcomes may fail to give sufficient direction to change. Policy is one way in which organizations express their goals. Indeed, Ruscoe & Miller (1991) defined policy as "a plan of action developed to accomplish a given outcome" (p.187). They further note that policies supportive of a specific change are essential if the change is to be accomplished on an organization-wide basis.

Interaction of Organizational and Individual Variables

The interaction of organizational and individual variables has been too little studied, although often commented upon. Mohr's (1969) study of health departments found individual and organizational factors to be highly interrelated in their impact on innovativeness. Hage and Aiken (1970), and Rogers (1983) concluded that both organizational and individual factors have impact on innovation and that, of the two, organizational factors are the more powerful.

Argyris (1958), in studying organizational climate in a bank, identified three interrelated systems of variables, all of which he viewed as contributing to organizational climate. The three systems were (1) the formal policies, procedures, and positions of the organization; (2) personality factors of members of the organization including individual needs, values, and abilities; and (3) variables associated with the efforts of the individual to accommodate

his own needs with those of the organization. This conceptualization points out clearly the difficulty in attempting to sort out the "individual" from the "organizational" when, in fact, organizations are composed of varying numbers of individuals.

In a study of organizational innovation in school systems, Baldridge and Burnham (1975) found that individual characteristics seemed to have little impact on individual involvement in the change process, although formal position in the organization was related to participation in change. In addition, they found that structural characteristics of the organization (e.g., size and complexity) and outside input (from community and other organizations) both strongly impacted the innovation behavior of organizations.

Crane (1989) carried out a regression analysis of factors associated with use of new knowledge by nurses. The predictor variables in her equation included education, cosmopoliteness, opinion leadership, position-related change experience, position-related research experience, individual change factors, and organizational change factors. She found that, for use of new knowledge in patient care, organizational change factors (readiness, resources, resistance, and need) explained more of the variance (R^2 Change = .08) than any other factor tested, although taken together, the factors studied accounted for a total R^2 of only .18 (Adjusted R^2 = .09). Generalized use of new knowledge (using principles to guide practice and to stimulate an innovative approach to practice) and use of research methods in practice showed little association with organizational change factors but significant association with combinations of individual characteristics. For generalized use of new knowledge, total R^2=.32 (Adjusted R^2=.25) while for use of research methods, total R^2=.46 (Adjusted R^2=.40).

Characteristics of the Innovation

Much early theoretical and research work in the area of research utilization gave short shrift to the issue of the characteristics of the innovation itself. The theoretical model was what might be described as an engineering model (Bulmer, 1981). That is, it was linear and focused on applied research as problem-solving. The assumption was that, once the problem was "solved" by researchers, the engineers (or farmers or physicians or nurses) would adopt the solution. The "better mousetrap" was assumed to be instantly usable by practitioners. This is, by and large, the view that explains why universities focus on the production of knowledge but give little attention to knowledge utilization (Loomis, 1985). However, Larsen (1986) expressed the more current viewpoint when she pointed out that utilization is situation-specific rather than generalizable. That is, knowledge that is used in one situation may have little usefulness or relevance to another. She also noted that characteristics of innovations that are associated with utilization (and with non-utilization) have been well identified in the literature across several disciplines.

In more recent years, the issue of what sorts of innovations are likely to be adopted has gained increasing attention. Nurse researchers (Brett, 1987; Buckwalter, 1985; Crane, 1985; Haller & Reynolds, 1986; Horsley & Crane, 1986; Ketefian, 1980; Reynolds & Haller, 1986; Stetler & Marram, 1976) have been especially interested in this issue, pointing out that much published research is neither appropriate nor intended for implementation in practice. Haller, Reynolds, & Horsley (1979) proposed standards as a basis for evaluating the appropriateness of research-based information for

implementation in practice. These standards have been widely accepted and are often quoted in other studies of nursing research utilization (Brett, 1987; Coyle & Sokop, 1990; Firlit, Walsh, & Kemp, 1987; Stetler, 1985). Often discussion of the limitations of published research as an impetus to research utilization is included in a discussion of barriers to research utilization (Brooten, 1982; Butts, 1982; Friedman & Farag, 1991; Funk et al., 1991; Hefferin, Horsley, & Ventura, 1982; Hodgman, 1979; Hunt, 1981; Hunt, 1987; Janken, Dufault, & Yeaw, 1988; Ketefian, 1980; Lindeman, 1984; Mercer, 1984; Miller & Messenger, 1978; Vaz, 1986) since traditional research reports are viewed by many practicing nurses as inaccessible and incomprehensible.

Stetler and Marram (1976) proposed a three-phase model (validation, comparative evaluation, decision making) of decision making related to research utilization. The model stresses evaluation of the innovation as part of the process; specifically, examining the proposed research for substantiating evidence and to determine whether it can in fact be used as a basis for practice.

Some characteristics of innovations that lead to adoption are identified repeatedly by nurses and non-nurses alike. These characteristics, originally identified by Rogers (1962) and Glaser (1973) include (1) relative advantage; (2) complexity; (3) compatibility; (4) trialability, and (5) observability (Crane & Horsley, 1983; Fliegel & Kivlin, 1966; Haller et al., 1979; Horsley & Crane, 1986; Johnston & Oman, 1990; Ketefian, 1980; MacGuire, 1990; Rothman, 1980; Sadowsky & Kunzel, 1986; Seidel, 1981; Stetler & Marram, 1976). In this schema, an innovation most likely to be successfully adopted would display a clear advantage over current practice, would be relatively simple to understand and implement, would be compatible with existing values and norms, could be pre-tested in a limited fashion, and would produce observable results.

One common thread, whether the discussion is of accessibility or of evaluation of research for practice, is that to be used, research must first be understood and the potential for application must be both present and appreciated. Funk et al. (1991) listed five reasons given by practicing nurses for non-use of research findings:

"1. They do not know about them.

2. They do not understand them.

3. They do not believe them.

4. They do not know how to apply them.

5. They are not allowed to use them," (p. 192).

The first four of these reasons reference issues that could be addressed by the process variously described as transformation (Havelock, 1969; Havelock, 1973) or conversion (Rothman, 1980; Rothman, 1986). Put simply, conversion or transformation is the process by which the knowledge produced by researchers is translated into a format and idiom easily understood by practitioners. Items two and four have a clear direct relationship to transformation of findings. Items one and three are more indirect in their relationship to transformation, but it is probable that nurses will not "know about" research that they cannot understand and that their belief in the findings may also be affected by their inability to understand published research reports. There are, of course, other plausible explanations for items one and three, but not understanding and not knowing how to apply research findings are clearly issues that can be addressed by transformation of findings.

Transformation is one of the three major knowledge processes described by Havelock: generation, verification, and transformation (Havelock, 1969; 1973). Crane (1989) noted that there is extensive support in both nursing and

non-nursing literature for the importance of practice-relevant transformation of research-based knowledge.

Both CURN and NCAST had transformation of research-based knowledge as a major goal. Before diffusion efforts were initiated, the selected new knowledge was translated into language and format appropriate to practitioners. In addition, the translations were accompanied by clear guidelines for implementation of the knowledge in practice settings. The CURN Protocols (CURN Project, 1980-1983), published as an outgrowth of the CURN Project, were developed to provide practitioners with an easily accessible transformation of practice-relevant research findings. Each book takes a single body of research (e.g. structured preoperative teaching) and provides the practitioner with a description of the research and research findings along with clear information on how to implement and evaluate the research in the clinical setting.

Characteristics of an innovation whether in its original or transformed state, then, may in and of themselves influence the likelihood that the innovation will be adopted. These characteristics may interact with the characteristics of individuals and organizations in influencing adoption behavior. Although characteristics of an innovation are of clear significance to the field of research utilization, they will not be included in the present study. The nurses in the sample were asked to identify a research-based innovation that they had in fact used or to state that they had adopted no new knowledge in the last year. Measurement of the characteristics of the innovations was therefore impractical. Also, given that the innovations identified had by definition been adopted by the user, it would have been reasonable to expect that the innovation had already passed through some sort of screening process prior to adoption. However,

inability to account for variability in research utilization related to differences in innovation characteristics is a potential weakness in the current study.

Assessment of the Literature Base

The literature base for this study has both great strengths and serious limitations. The field of knowledge utilization is rich with both theoretical and research-based writing. Theorists and researchers represent a wide variety of disciplines, a fact that strengthens the field as a whole. If studies of farmers and teachers and nurses and bankers conducted by sociologists, political scientists, social psychologists, and nurses reveal similar findings, then the validity of those findings is vastly enhanced. However, the source of richness and strength also contributes to some of the limitations of the literature base.

In spite of its breadth, the field has some notable limitations in the research base. Each researcher has used a new design and new instruments. In the field of knowledge utilization, there is no universally or even broadly accepted way to measure the outcome variable. For that matter, there is little consensus on a definition of the outcome variable or of most of the antecedent variables. Therefore, to some extent, each study is unique and can be related to other studies only inferentially.

In nursing, although much has been written about research utilization, most of the writing is theoretical. The relative paucity of empirical studies of the phenomenon means that much of our "knowledge" of the field is drawn from studies by other disciplines or other populations. We hope that these can be generalized to nursing but we have little real evidence that such generalization is warranted, or for that matter, not warranted.

Empirical studies in nursing suffer the same problems as studies in the field in general. Some nursing studies have identified one or two specific pieces of research and attempted to measure use (Ketefian, 1975; Kirchhoff, 1981). These studies have limited generalizability because of the narrowness of their outcome measures and, in the case of Kirchhoff (1981), because her study was limited to nurses employed in coronary care units.

Outcome measures in nursing research utilization are problematic. There have been few replications in this research area as in most others (Haller & Reynolds, 1986; Reynolds & Haller, 1986). To date, there are only three published reports that have used the same outcome measure (Brett, 1987; Brett, 1989; Coyle & Sokop, 1990) and of these, the two by Brett (1987, 1989) are reports of a single study. An additional problem with outcome measures in nursing concerns the issue of choice. Several of the outcomes measured in various studies related to the utilization of research findings that have been widely adopted by nursing organizations and formalized in policy and procedure manuals. Nurses reporting use of these innovations, then, were simply reporting complying with organizational policy rather than a result of decision making on her/his part. These are clearly two very different issues and the difficulty in distinguishing choice from compliance in most nursing studies is a serious methodological flaw.

Some nursing studies have measured only behaviors thought to lead to use, such as the reading of professional literature (Vaz, 1986). Such studies are of limited utility, especially as studies that do measure actual use of research have found little support for the association of use with reading of professional literature or most other proposed antecedents of research utilization.

What then, do we know about this field? We know that the use of research by practicing nurses is variable. We know that some research-based knowledge is used by some nurses some of the time. We know that in other fields, use is more predicted by the type of knowledge than by either organizational or individual factors as we have so far been able to measure them. We know that most nurses work in organizations and we believe it is therefore reasonable to hypothesize that organizational as well as individual factors will influence all manner of behavior, of which use of research is one example.

We do not know what nurses consider to be use of nursing research. We also do not know what factors (individual, organizational, and innovation) influence nurses in their use of nursing research, although we have some beginning knowledge in this area. We do not know how to measure research utilization in a way that has validity and can be replicated across many populations of nurses, although the instruments developed and used in the RU-N Project may fulfill this need over time. We also do not have mature measures for most of the individual, organizational, and innovation characteristics thought to be associated with use of research. Lastly, we do not know the characteristics of high versus low utilizers of nursing research.

Relationships of Interest in the Current Study

In light of all that we do not know, there are obviously many questions that need to be answered. The research questions in this study are best described in a table presenting proposed relationships. Ultimately, the questions may be summarized as: Are there differences in the characteristics

and/or antecedent experiences of high versus low utilizers of nursing research? Specifically, Table 2 displays the variables to be examined for each type of research utilization outcome.

The next chapter specifies aims, research questions, and hypotheses of the study. The rationale for the relationships depicted in Table 2 is also described.

Table 2

Relationships to be Tested Between High- and Low-User Groups

Predictors / Antecedents of Use	Types of Use				
	Cognitive Use	Behavioral Use	Admin. Use	Use of Research Methods	Research Utilization Activities
Education	X	X	X	X	X
Change Experience		X	X	X	X
Research Experience	X	X	X	X	X
Cosmopoliteness	X	X	X	X	X
Opinion Leadership		X	X	X	X
Individual Change Factors	X	X	X	X	X
Organizational Change Factors		X	X	X	X
Organizational Context		X	X	X	X

Research utilization (RU) outcome measures (columns) by predictor/ antecedents of RU. NOTE: Education has mixed support in the literature as a predictor variable. However, because of the importance of education as an issue in nursing these relationships will be tested. All other Xs indicate that there is reasonable support in the literature to expect differences between high and low utilizers on these measures. The differences should all be in the direction of high users>low users.

CHAPTER 3

METHODOLOGY

This study explored the differences between high and low users of research on the variables of age, individual change factors, organizational change factors, organizational context, cosmopoliteness, opinion leadership, education, position-related research experience, and position-related change experience.

Chapter 3 includes a description of the Research Utilization-Nursing (RU-N) Project, the larger study of which the current study was a part. This chapter is organized with descriptions of the RU-N Project methodology (sample selection, procedures, study design, data collection instruments and measures) followed by descriptions of the same elements of the current study. Definitions of terms used in this and in the RU-N Project are also included in this chapter.

Study Design

Design of the Research Utilization - Nursing (RU-N) Project

The RU-N Project was designed as a correlational study using survey methodology. Specific aims of the study are listed in Chapter 1. Overall, the RU-N Project sought to test the theoretical relationships among the elements of the conceptual framework in Figure 1. This framework was drawn from the existing theory base in research utilization and relies heavily on the work of Havelock (1986) as well as other theorists.

RU-N Project Conceptual Framework

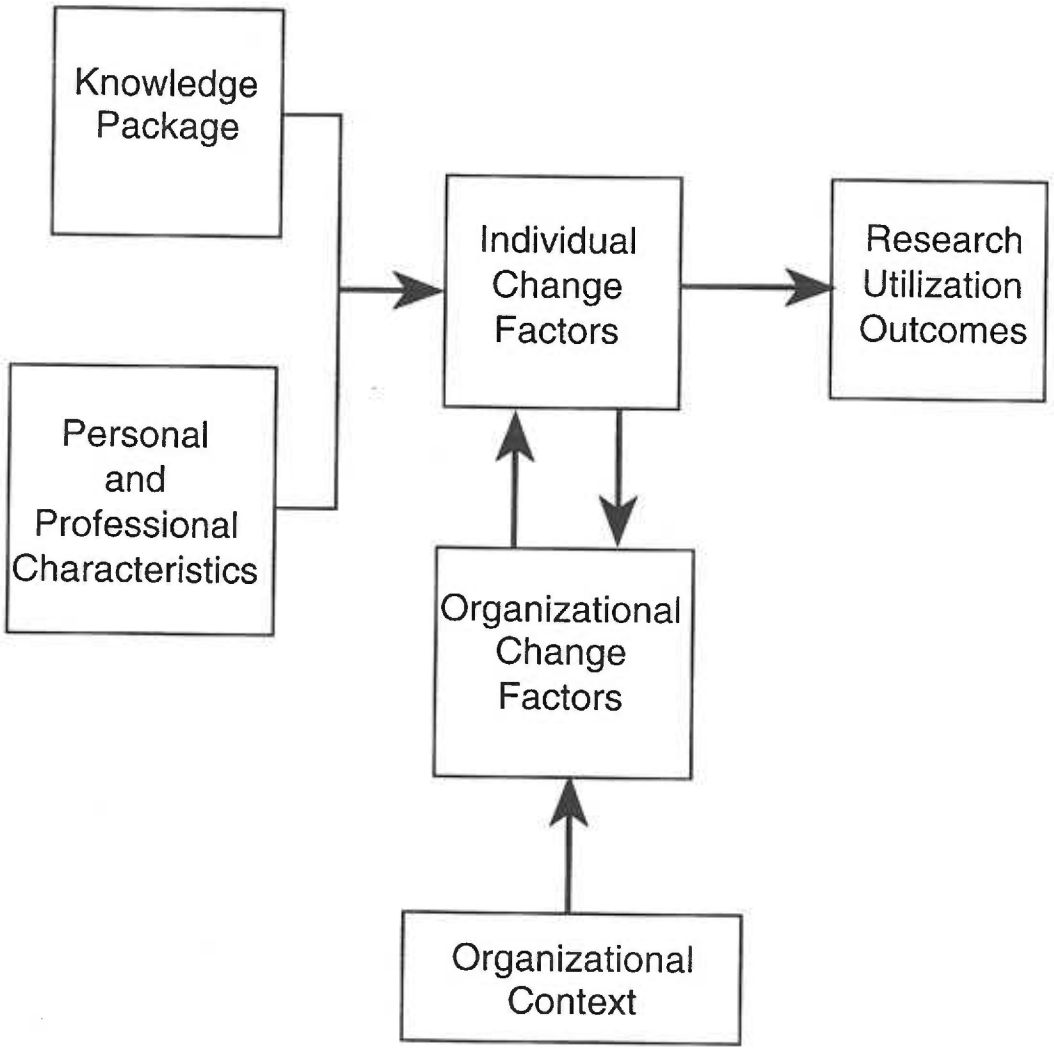

Figure 1. Conceptual framework of variables associated with research utilization in nursing (RU-N Project).

Conceptual Framework of the Current Study

The current study was limited to a specific subset of the variables studied in the RU-N Project. These variables include a set of outcome variables (types of research utilization) and a set of predictor variables. The predictor variables were drawn from most of the major conceptual areas included in the RU-N Project but notably do not include variables describing the specific knowledge used by the nurses. This fact constitutes a limitation of the study. However, items measuring the specific knowledge were not included in the survey for the time frame of interest in the current study. The conceptual framework for this study is shown in Figure 2. Predictor variables are grouped into two sets that will be discussed further throughout this dissertation. The sets are used in the development of hypotheses. Briefly, one set of predictor variables (Set A) are seen as reflecting resources available to the individual for assessing and changing his/her own practice (without reference to others). This group of variables includes education, individual change factors, position-related research experience, and cosmopoliteness. A second set of predictor variables (Set B) is associated with the resources available to the individual to change the practice of others. These variables include opinion leadership and position-related change experience as well as organizational change factors and organizational context. All types of research utilization should be positively associated with high scores on Set A variables. Only those research utilization activities requiring change of others should demonstrate a positive association with high scores on Set B variables. The rationale for the relationships depicted are described further in the section of this chapter dealing with hypotheses.

Conceptual Framework

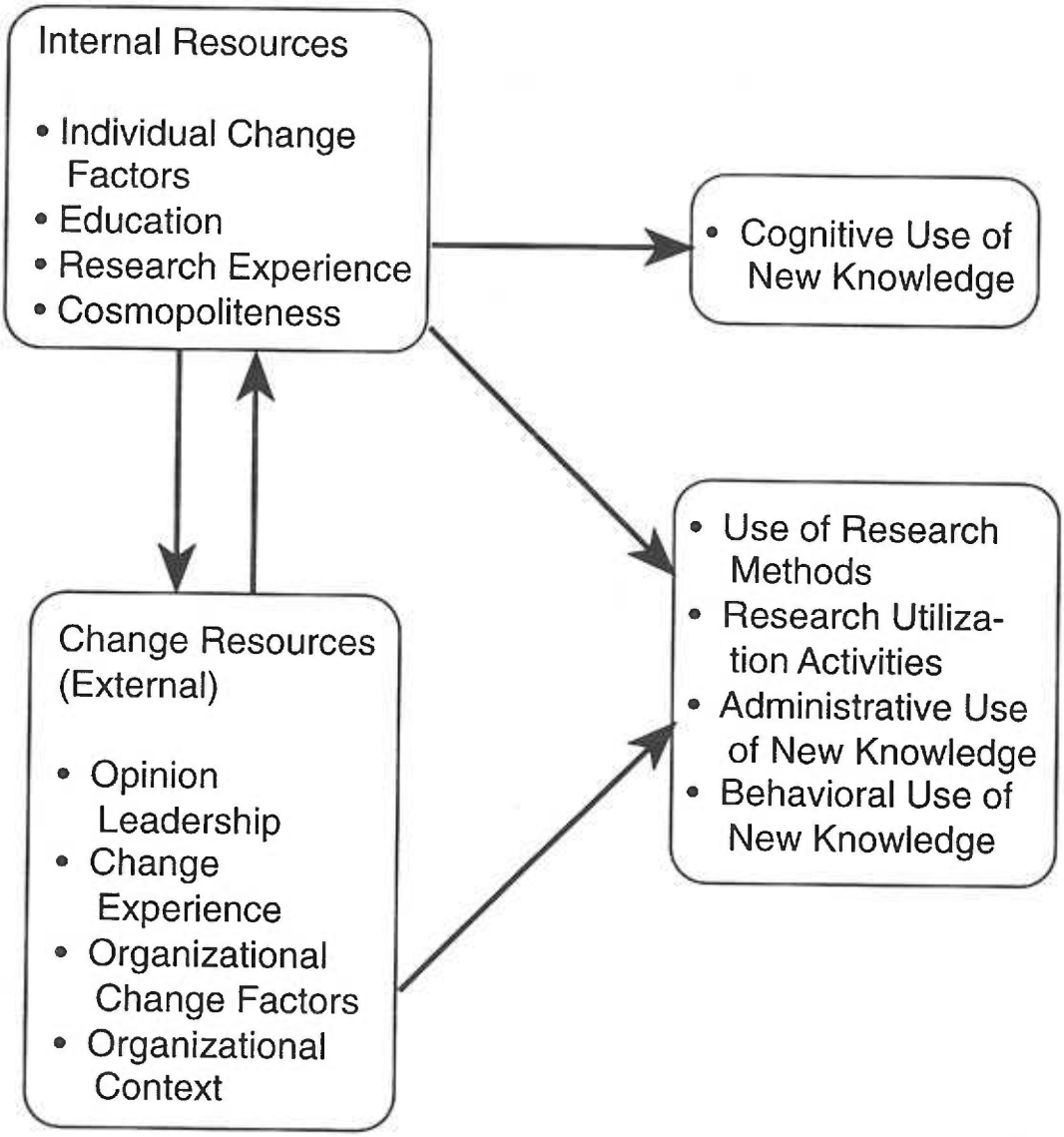

Figure 2. Conceptual framework of individual and organizational variables predicting research utilization in nursing.

The current study built upon the work done previously in nursing and specifically in the RU-N Project. The purpose of the current study was to increase our understanding of the differences between nurses who use nursing research and those who do not. For this study, use of nursing research may be cognitive, behavioral, or administrative. Use of research methods and participation in research utilization activities are also defined as types of research utilization. Specific aims of this study were:

1. To determine whether there are organizational and individual differences that distinguish high users of nursing research from low users of nursing research for each of the five types of research use.
2. To identify the combination of individual and organizational variables that best predicts high versus low use of nursing research for each of the five types of research use.
3. To determine whether the pattern of significant predictors of high versus low research use is similar or different across the five types of research use.
4. To compare the extent to which nurses with intermediate levels of research utilization resemble high versus low users of each of the five types of research use.

Specific research questions and analytical approaches are described in a later section of this chapter.

Sample Selection and Data Collection Procedures

The RU-N Project Sample

The RU-N Project included as subjects eight groups of nurses: five groups of nurses who had participated in earlier research utilization projects (treatment programs), a group who had attended research conferences (research conference group), a group who had purchased published transformations of research literature (CURN books group) (CURN Project, 1980-83), and a comparison group of nurses who had not been exposed to any of the treatments of the other seven groups. The final sample included 362 nurses.

The five research utilization projects, the research conferences, and the CURN books were all conceptualized as different types of treatments relative to research utilization. Eligibility requirements for participation for all subjects included: (1) subject recall of participation in the relevant treatment; (2) no prior participation in any of the other projects or conferences; (3) at least 50% employment in a nursing clinical position at the time of treatment; (4) employment in a nursing position (not necessarily clinical) at the time of the RU-N Project or within the previous six months.

The five groups that formed the bulk of the sample were nurses who had participated in one of several earlier research utilization projects. These projects were the Western Interstate Commission of Higher Education (WICHE) Regional Program for Nursing Research (Krueger, et al, 1978), the Conduct and Utilization of Research in Nursing (CURN) Project (Horsley et al., 1978), the

Nursing Child Assessment Satellite Training Project (NCAST-I) (King et al., 1981) and two subsequent related projects (NCAST-II and NSTEP-P).

The three original programs (WICHE, NCAST-I, and CURN) all originated in the mid to late 1970s in response to the growing concern in nursing that research was not being used in practice. Each of the programs, beginning from somewhat different theoretical frameworks, provided a systematic intervention intended to facilitate the movement of research findings into practice. The three principal investigators in these earlier projects collaborated in the RU-N Project to follow up on the research utilization activities of the original participants 3 to 10 years after their participation in the programs. The principal investigator of the NCAST-I Project was also the principal investigator for the NCAST-II and NSTEP-P Projects. Thus, a total of five research utilization projects were represented by the three investigators.

For these five groups, lists of participants were available as the principal investigators of the original programs were co-investigators of the RU-N Project. Of this population, the samples were selected in different ways. For WICHE, CURN, and NSTEP-P, the total number of nurses who had participated was small. Therefore, the entire group of participants who could be located, were eligible, and agreed to participate formed the sample. For NCAST I and NCAST II, a random selection of subjects was made from the population of participants.

Three other groups were also included in the RU-N Project, each representing other levels of "treatment" related to research utilization. The first group consisted of nurses who had attended a regional research reporting conference of either the Midwest Nursing Research Society or the Western Society for Research in Nursing in 1981 or 1982. These years were

contemporaneous with the time frames of the original research utilization projects. The population was identified from published lists of conference attendees. The research conference attendees were included in the study as representative of one of the traditional methods of research dissemination, e.g., formal presentation of findings at a research conference. All attendees who could be located, were eligible, and agreed to participate were enrolled in the study.

The second group of subjects had read specific publications of transformations of research-based information (CURN books) (CURN Project, 1980-1983) and indicated their willingness to participate in research by returning a card included as an insert in the books. These cards were returned to the CURN Project principal investigator who was also the principal investigator for the RU-N Project. This subject list was thus also available. As with most of the other treatment groups, all subjects who could be located, were eligible, and agreed to participate were enrolled as subjects.

The CURN book group can be considered as an intermediate type of treatment between the passive diffusion that occurs while hearing a research presentation or reading an original article in a research journal and participation in a structured research utilization project. The intermediate nature of the treatment comes from the nature of the CURN books. The books contain specific research-based information on an aspect of nursing practice, but the research findings have been transformed into a guide for implementation. One of the books contains no specific research knowledge but is instead a guide to utilizing research in practice.

The final group of subjects was the comparison group. A subsample of subjects from the first 7 groups were asked to identify a peer whose education

and career path had been similar to their own. Screening calls to these potential subjects verified that they had not participated in any of the original treatment programs or the research conferences. This group is the only one that can be considered to be untreated.

The final sample size for the RU-N Project was 362. Table 3 contains a breakdown of the sample by treatment group and includes response rates for each group.

Table 3

RU-N Project Sample Size and Response Rates by Treatment Group

	Number of Participants*	Response Rate**
CURN	61	86%
NCAST I	45	62%
NCAST II	56	50%
NSTEP-P	23	100%
WICHE	44	90%
CURN Books	40	77%
Research Conference	34	87%
Comparison	59	88%

* Participants are those subjects investigators were able to contact and who did participate in the RU-N Project.
** Response rate is calculated based on the number of subjects able to be contacted rather than on the number of original participants. Some original participants were unable to be located or had died or did not meet screening criteria for eligibility.

Once nurses were identified as potential subjects, an elaborate system of tracking was undertaken to locate the identified subjects (Call, Otto, & Spenner, 1982). This process was necessary because the lists of participants in some of the projects were up to ten years old. Initial attempts were made to locate subjects at their last available address and phone number. When that failed, telephone calls were made to past places of employment, and in some cases, to state boards of nursing in an attempt to locate the subjects. In addition, other participants in the same project who were contacted were queried as to whether they had knowledge of the whereabouts of the missing subjects. Only when these efforts failed were subjects dropped from the potential sample and replaced from the remaining pool of potential subjects. This exhaustive system was instituted in part in recognition of the age of the available information on subjects, but also to avoid any sort of systematic bias that might result from a sample unrepresentively loaded with non-mobile nurses.

RU-N Project researchers used questionnaire design and subject recruitment methods described by Dillman (1978) to maximize response rate. Participants were initially contacted by letter to introduce them to the project and inform them they would be contacted by phone. Interviewers then telephoned prospective participants to determine eligibility, invite participation, and collect demographic data. If subjects met eligibility criteria and agreed to participate, an appointment was made for a subsequent telephone interview. Telephone interview methodology, rather than a mail survey, was used to decrease missing data. Prior to the appointment for the telephone interview, subjects were mailed copies of the Research Utilization Survey (RUS), the questionnaire used in the interview. Subjects were asked to review the RUS prior to the appointment for the telephone interview so that they might have time to think

about their answers and to recall events that occurred when they participated in the original research utilization projects/activities. Initial recruitment telephone calls usually required 10 to 20 minutes. Telephone calls to complete the RUS required from 40 to 90 minutes to complete, depending on subject response. Average time for completing the RUS was one hour.

Sample for the Current Study

The sample for the current study was taken from the larger sample of the RU-N Project. The subsample of interest for this study were those nurses who identified at least part of their role as being either direct or indirect care at the time of the interviews. Direct care is defined as being involved in doing patient care or teaching. Indirect care includes subjects who were responsible for supporting other staff in direct care roles, e.g., doing staff education, consultation, or facilitating clinical research. Subjects who were involved in none of the above activities at the time of the interview are excluded from the present study. Examples of subjects excluded include full-time faculty members and directors of nursing. Table 4 shows the subjects per group who met that criterion.

Table 4

Sample for the Current Study Compared to Original Study Groups

	Number of Participants in RU-N Project*	Number in Sample for Current Study	Percent Included
CURN	61	52	85%
NCAST I	45	42	93%
NCAST II	56	51	91%
NSTEP-P	23	23	100%
WICHE	44	38	86%
CURN Books	40	37	93%
Research Conference	34	25	74%
Comparison	59	50	85%

* Participants are those subjects investigators were able to contact and who did participate in the RU-N Project.

Instruments and Measures

The RU-N Project Instruments

The RU-N Project developed and tested two instruments used in data collection. The first of these was called the Research Utilization Tracking and Demographic Instrument (RUTADI). This instrument was used in the initial telephone call to subjects to recruit them for the study. At that time, eligibility was determined and some baseline data was collected regarding demographic information, current employment situation, and position-related research and change experience. The Research Utilization Survey (RUS) was much longer (a total of 360 items) and included scales addressing all of the other concepts included in the conceptual framework for the study. Both the tracking instrument and the RUS were individualized to the specific treatment group from which the subject was drawn. Thus, subjects who had participated in the CURN Project were asked, "At the time you were in the CURN Project..." while subjects who had attended a research conference were asked, "At the time you attended the conference, ...".

Questions covered three time frames: (1) prior to participation in the given treatment program, (2) after participating in the treatment program, and (3) the time of the interview. As much as possible, full sets of data were collected on all subjects. The only systematic exception was the comparison group. Since that group had participated in no treatment program, they were not asked questions about the treatment program. They were, however, given a date to use in responding to other types of questions framed in the past tense. The date given them corresponded to the time frame of the other projects in the

study so that the subjects in the comparison group were responding regarding events at a similar distance chronologically.

The data collection instruments used in the RU-N Project were developed expressly for that study. Scales were developed to measure all of the major constructs in the conceptual framework. With the exception of a scale measuring research utilization activities, all measures used were new. In spite of this relative immaturity, however, there is good cause to have confidence in the measures, as all measures were subjected to rigorous tests of validity and reliability, including substantial pretesting of the instruments with subsequent revisions.

Scales Used in the Current Study

The current study used a subset of scales from the RU-N Project. Table 5 presents psychometric data for those scales. Appendix A contains the items making up the scales used in this study.

Table 5

Descriptive Statistics and Psychometric Characteristics for Scales Measuring Predictor and Outcome Variables (n=318)

OUTCOME VARIABLES

Scale Name	No. Items	Potential Range	Mean	SD	Cronbach's Alpha
Cognitive Use of New Knowledge	4	0 - 2	1.20	.83	.88
Behavioral Use of New Knowledge	4	0 - 2	.93	.75	.76
Administrative Use of New Knowledge	4	0 - 2	.88	.83	.86
Use of Research Methods	9	0 - 5	2.08	1.17	.85
Research Utilization Activities	6	0 - 3	1.24	.73	.85

PREDICTOR VARIABLES

Scale Name	No. Items	Potential Range	Mean	SD	Cronbach's Alpha
Education	1	1 - 8	4.53	1.66	N/A
Individual Change Factors (Global Scale)	24	Varies	Z-scores	Z-scores	.84
Research Experience	1	1 - 4	2.31	1.01	N/A
Change Experience	1	1 - 4	2.93	.93	N/A
Cosmopoliteness	5	0 - 5	3.24	1.14	.79
Opinion Leadership	4	1 - 5	3.63	.64	.80
Organizational Change Factors (Global Scale)	26	Varies	Z-Scores	Z-Scores	.94
Organizational Context	6	1 - 6	4.21	1.20	.86

Definitions of Outcome and Predictor Variables

This section addresses the current study only. A total of five outcome variables and eight predictor variables were selected from the RU-N Project measures. These variables were selected based on theory and match of the variables with the theoretical relationships of interest. The outcome variables include use of new knowledge (cognitive, behavioral, and administrative), use of research methods, and participation in research utilization activities. Predictor variables include education, position-related research experience and position-related change experience, cosmopoliteness, opinion leadership, individual change factors, organizational change factors, and organizational context.

Outcome Variables

Five outcome variables were used in the study. The five outcomes are different types of research use. Use of new knowledge is broken down into three different outcomes: cognitive use of new knowledge, behavioral use of new knowledge, and administrative use of new knowledge. The other two outcome variables are use of research methods and participation in research utilization activities.

Use of New Knowledge. Three of the outcome variables are types of use of new knowledge. Cognitive Use of New Knowledge describes a change in the way one thinks about practice. Behavioral Use of New Knowledge occurs when one makes a change in the way one actually carries out practice. Administrative Use of New Knowledge occurs when changes are made in

policies and procedures regarding practice. These are three types of use clearly identified in the literature and each impacts practice differently. As a group, these variables represent the consequences of using research-based new knowledge to change nursing practice.

Use of Research Methods. Even if actual findings of research are not incorporated into practice, research methods themselves may find a place in practice. This variable includes items that measure various aspects of use of research methods, including establishing interrater reliability or testing the validity of an assessment tool.

Participation in Research Utilization Activities. This measure evaluates the extent to which nurses participate in the specific processes of research utilization as opposed to direct use of a specific research product. Examples include testing a tool for reliability or evaluating a research study to determine its value for practice.

Predictor Variables

Predictor variables for this study were drawn from the broad categories described in the review of literature as individual and organizational variables. However, as noted in that review, it can be difficult to designate any variable as purely individual or purely organizational as the individual and the organization are highly interactive. Also, in this study, all items are measured by self-report of individuals; no objective measures are available for the organization. These issues and others identified in the review of literature led to the conceptualization of the variables as depicted in Figure 2. Briefly, the variables are seen as reflecting either resources available to the individual for assessing

and changing his/her own practice (without reference to others) or resources available to the individual to change the practice of others. The first group of variables include education, individual change factors, position-related research experience, and cosmopoliteness. The second group of variables includes organizational change factors, position-related change experience, opinion leadership, and organizational context.

Education. Although there is little empirical support for education as a useful predictor of research utilization in nursing, it is included because of its widespread use in the broad research utilization literature. Also, education remains an important issue for the nursing profession. Education is defined as the highest level of education attained by the nurse at the time of data collection. Relationships of education to all research utilization outcomes is expected to be generally positive.

Individual Change Factors. This variable is made up of the attitudes and behaviors that comprise an individual's propensity for change. Included are need (the subject's assessment of the need for change), readiness (general readiness to proceed with the change required by a research-based innovation), resources (perceived personal resources and the ability to access external resources), and resistance (unwillingness to set aside old behaviors and beliefs--coded in reverse from other subscales). It is hypothesized that high utilizers of research will have higher scores on individual change factors than will low utilizers. This difference should be seen on all outcome variables.

Position-related Research Experience. Utilizing research requires, as a base, the ability to access and comprehend relevant research findings. Nurses who have had responsibility for research-related activities in their professional roles may be expected to have had, as a consequence, experience in doing

and supporting research-related activities. These individuals should therefore find accessing and understanding research reports easier than nurses who have had no previous research experience. It is hypothesized, therefore, that higher levels of position-related research experience will be seen among high utilizers than among low utilizers. This difference should be greatest in those areas of utilization which draw most strongly on knowledge of research methods; that is, use of research methods and research utilization activities. However, because of the hypothesized impact of previous research experience on the nurses' ability to access and understand research-based knowledge, it is anticipated that higher levels of position-related research experience will be seen with high research utilization than with low research utilization for all types of research utilization.

Cosmopoliteness. Cosmopoliteness is the extent to which an individual has connections beyond the local area or organization and thus a diversity of sources of new ideas and information. It reflects an interaction, often, of individual inclination and organizational support. It is hypothesized that higher levels of cosmopoliteness will be seen among high users of research than among low users. This relationship should be seen for all types of research utilization.

Organizational Change Factors. Organizations, as individuals, have varying degrees of propensity for change. The factors identified as individual change factors have parallels in organizations. Organizational change factors therefore include need, readiness (or climate), resources, and resistance. These factors may represent an overall state of the organization (as perceived by the subjects) or the attitudes and behaviors of a few key individuals. It is hypothesized that high utilizers of research will perceive their organizations as

being more supportive of change (having higher organizational change factor scores) than will low utilizers. This difference should be seen on all outcome variables, but may be smaller for cognitive use of new knowledge than for other types of research use.

Position-related Change Experience. Many nurses, as part of their professional roles, have significant responsibility for planning and implementing change in relation to a variety of issues. Since research utilization involves change, it is hypothesized that higher levels of change experience will be seen among high utilizers than among low utilizers. The difference should be greatest with those aspects of research utilization that require change beyond the individual; that is, all types of research utilization except cognitive use.

Opinion Leadership. Opinion leadership refers to the extent to which an individual is viewed by others as a source of ideas and information. Opinion leaders are often cast in the role of change agents. Opinion leadership, like cosmopoliteness, is a variable subject to both individual and organizational influence. One must have the inclination to speak out to be an opinion leader, but one must also be to some extent congruent with one's organization to function effectively as an opinion leader. It is hypothesized that higher levels of opinion leadership will be seen among high users of research than among low users of research. The differences between high and low users are expected to be most marked for those outcome variables requiring change beyond the individual level (behavioral and administrative use of new knowledge, use of research methods, and research utilization activities).

Organizational Context. Organizational context includes those factors that are generally more enduring (e.g., mission and goals) and less subject to influence by small groups within the organization such as those that might be

involved in a nursing practice change. As with organizational change factors, it is hypothesized that high utilizers of research will perceive their organizations as having a context more conducive to change than will low utilizers. This difference should be seen on all outcome variables, but may be smaller for cognitive use of new knowledge than for other types of research utilization.

Overview of Research Questions and Analysis Plan

The original RU-N Project measured several types of research utilization, but all scales used were ordinal to interval level and generally Likert-type in format. However, since the focus of this study is to differentiate high from low utilizers of nursing research on a number of predictor variables, the analyses used were those that require a categorical dependent variable. Specifically, the study used t-tests and discriminant function analysis. Both t-tests and discriminant function analysis are ways of testing differences between known groups (e.g., men and women, children who have been in Head Start and those who have not, etc.). As noted, none of the RU-N Project scales are categorical in nature. One obvious solution would have been to use a correlational or multiple regression approach to the study. However, examination of the sample data relating to research utilization across types demonstrates that nurses in the sample tended generally to score in a given range (high, middle, or low) and that, therefore, conceptualization of subjects as high, moderate, or low users was reasonable.

The ability to distinguish among these groups of users is potentially useful for nursing administrators and educators. For this study, therefore, the groups for the dependent variables (outcome variables) will be formed by

designating specific ranges of scores as high, middle or low on each outcome variable. It is acknowledged that this is an artificial means of establishing groups and that a potential weakness of the study is inferring discrete differences based on scores on continuous variables.

Research Questions and Hypotheses

Research questions were addressed by forming groups of high, middle and low users for each outcome variable using frequency distributions of the outcome variables as a guide to determine appropriate cutoffs for scores in each group. For the purpose of development of hypotheses, predictor variables were divided into two types as described briefly earlier in this chapter. First, one set of predictor variables (Set A) are seen as reflecting resources available to the individual for assessing and changing his/her own practice (without reference to others). This group of variables includes education, individual change factors, position-related research experience, and cosmopoliteness. A second set of predictor variables (Set B) is associated with the resources available to the individual to change the practice of others. These variables include opinion leadership and position-related change experience as well as organizational change factors and organizational context. All types of research utilization should be positively associated with high scores on Set A variables. Only those research utilization activities requiring change of others should demonstrate a positive association with high scores on Set B variables.

Aim 1. To determine whether there are organizational and individual differences that distinguish high users of nursing research from low users of nursing research for each of the five types of use of research.

Research Question 1. On what predictor variables do nurses who score high versus low on each type of research utilization differ from one another?

Hypothesis A. Nurses who demonstrate higher levels of cognitive use of new knowledge will have higher scores on Set A predictor variables than will nurses who score low on cognitive use of new knowledge. Rationale: Cognitive use of new knowledge is individually based and does not necessarily require change efforts beyond the individual. Set B predictor variables are not seen as necessary to cognitive use of new knowledge; any differences seen on these variables should therefore be of less magnitude than those seen on Set A predictor variables.

Hypothesis B. Nurses who demonstrate higher levels of behavioral and administrative use of new knowledge, use of research methods, and participation in research utilization activities will have higher scores on all predictor variables (Sets A and B) than nurses who have low levels of these four types of research utilization. Rationale: Behavioral use of new knowledge may be either individually or organizationally based. Behavioral use in this study was operationalized as adoption of a specific tool for assessment or a specific intervention for use with a patient population. This type of use must usually occur with some support from the organization. Therefore, scores on both Set A and Set B variables should be higher for nurses with high scores on behavioral use of new knowledge than for nurses with low scores on behavioral use of new knowledge. Administrative use of new knowledge, use of research methods, and participation in research utilization activities, as operationalized in this study, all require interaction with and change of others as well as individual resources and

predisposition to change; therefore, differences in Set B variables should be seen along with differences on Set A predictor variables.

Research question one was addressed by the use of t-tests. T-tests were used to test for significant differences between the means of the high and low utilizers on the predictor variables, following the analysis plan presented in Table 2 and Hypotheses A and B.

Research questions two through four also relate to group differences between high and low users of nursing research. However, these questions were answered using discriminant function analysis to determine what unique combination of predictor variables best predicts membership in a high versus low user group.

Aim 2. To identify the combination of individual and organizational variables that best predicts high versus low use of nursing research for each of the five types of research use.

Research Question 2. What groups of predictor variables best predict high versus low scores of nurses for each of the five types of research use?

Hypothesis C. For cognitive use of new knowledge, the predictor variables contributing to individual resources for research utilization (Set A) will be most influential in predicting group differences.

Hypothesis D. For all other outcome variables (behavioral and administrative use of new knowledge, use of research methods, and participation in research utilization activities), the predictor variables contributing to the climate and skills of the individual for change of others (Set B) and those contributing to individual resources for research utilization (Set A) will be equally influential in predicting group differences.

Research Question 2 was addressed by carrying out discriminant function analyses for each of the five types of research utilization outcomes. While t-tests allow group differences on each predictor variable to be described independently, discriminant function analysis results in an equation based on the weighted scores of those variables that, taken together, best predict group differences. In an ideal situation, the classification of subjects based on their scores on the resulting equation would be 100% accurate with no misclassifications. Such discrimination is rare and was not expected in this study. Misclassifications were assumed to be equally costly whether a high user was misclassified as a low user or vice versa. Proportions of subjects accurately classified by the discriminant function equations for each type of research use were computed.

Discriminant function analysis allows for all predictor variables to be entered into the equation either in a stepwise (e.g., data-driven) progression or in hierarchical progression. Because the predictor variables are viewed as relating differently to different outcomes, hierarchical discriminant function was used as outlined below for the initial analyses. Stepwise discriminant function was also done in the interests of probing for the most parsimonious model for predicting each outcome variable.

For cognitive use of new knowledge, Set A predictor variables (individual change factors, position-related research experience, cosmopoliteness, and education) were entered first into the equation as a group. Set B predictor variables (opinion leadership, organizational change factors, organizational context, and change experience) were then entered as a group. The rationale for this order is discussed in Hypothesis A above.

For all other outcome variables, Set B predictor variables were entered first followed by Set A predictor variables. This ordering was chosen because of the interest of the researcher in isolating and examining the influence of Set B variables on these four outcome measures. However, it should be remembered that the analyses expected to discriminate best for this group of outcomes were those with all eight predictors in the equation, based on Hypothesis D above.

For all outcomes, stepwise discriminant function equations were also carried out. For cognitive use of new knowledge, the final stepwise equation was expected to contain only Set A variables. For all other outcomes, the stepwise equation was expected to contain variables from both Set A and Set B.

Aim 3. To determine whether the pattern of significant predictors of high versus low research use is similar or different across the five types of research use.

Research Question 3. What are the differences and similarities across the five types of research use of the significant predictors of high versus low use?

Aim 3 was addressed by comparing the combinations of predictor variables for each outcome variable with one another, using both t-tests and discriminant function analyses. For the purposes of parsimony of the model, the stepwise discriminant function equations were used in addressing this research question. Only those predictors that loaded significantly ($p \leq .05$) for each type of research use were retained in the equation. Comparisons took into account the variables loading significantly on each outcome as well as the relative

weights of predictors across outcomes. This comparison is primarily descriptive in nature.

Aim 4. To compare the extent to which nurses with intermediate levels of research utilization resemble high versus low users for each of the five types of research use.

Research Question 4. Do nurses who display intermediate levels of research use more closely resemble high or low users in terms of their mean scores derived from the stepwise discriminant function analyses?

Research Question 4 was addressed by comparing the means for each group (high, middle, and low) on each discriminant function equation for each type of research utilization outcome. This provided a basis for describing in what ways middle group users resemble high or low users for each type of research use.

Limitations of the Current Study

As noted in the summary of the literature base for this study, there are no mature measures of research utilization outcomes or of organizational or individual characteristics thought to be associated with research utilization. The scales used in this study, with the exception of the research utilization index were all developed for the RU-N Project. Therefore, most have not been used previously and therefore deserve to be treated with the caution due all new measures.

Since the data for this study were all self-report, a word of caution is also needed about the organizational data. The scales are measures of facets of the employing organizations as seen through the eyes of the nurse subjects of the

study. Most of the items in the scales leave considerable room for bias on the part of the respondent to influence the scores. The scales may be expected to be affected by the nurse's own awareness and perception of the organization. Therefore, for this study, these scales are seen not as measures of any sort of objective reality of the organization, but rather of the perceptions of the subjects regarding their organizations.

Finally, since the present study was part of the RU-N Project, it was limited by the data available from that study. While hindsight based on analyses from that study and work done in the field since might suggest either additional variables of interest or different ways of operationalizing the ones studied in the RU-N Project, neither of those variations was possible.

CHAPTER 4

RESULTS OF THE STUDY

This study was undertaken to describe the differences between high and low utilizers of nursing research on a set of eight key predictor variables derived from the literature and theory base in research utilization. Chapter 4 reports on the results of the study and characteristics of the study sample. Findings are organized by the original research questions and hypotheses proposed for the study.

The outcome variables for the study were measured using an average of multiple items with dichotomous or Likert-type response options. To answer the research questions posed for the study, the outcome variables were transformed into variables having three ordinal categories. For each outcome, scores were recorded as indicating low, moderate or high use (1, 2, or 3) by examining the frequency distributions of the original scales. The recorded values were assigned to approximate one-third splits of the sample. Specific group sizes varied from variable to variable depending on the frequency distributions. Since subjects were classed as high, moderate, or low users separately for each type of use, the membership of the groups changed from variable to variable. Thus, a given subject might show up in the high user groups for two outcome variables, in the low user group for two others, and in the moderate user group for the fifth. In fact, 77 subjects had scores in each of the three groups; 58 subjects had the same scores (high, moderate, or low) across all five outcome measures. Of the remaining subjects, 96 had four identical scores and one that varied (e,g., scored low on four outcomes and high on the fifth, etc.). For most of these scores (87 versus 8), the varying score

was a single point away from the score for the other four outcomes. For example, if a subject scored low on four outcomes, their fifth score was likely to be a moderate as opposed to a high. This same pattern held for subjects with three scores in one range (e,g., three low scores) and two in a second range (e,g., three low scores and two moderate). Of these subjects, 77 had all scores in the combination of low-moderate or moderate-high. Only 10 subjects had scores that were in the low-high combination. Thus, subjects tended to be high, moderate, or low users in a general way, but there were some subjects who did not fit this pattern and whose scores were varied across the five measures.

Sample Characteristics

The sample for this study was drawn from all eight of the original Research Utilization-Nursing (RU-N) Project groups. Educational level of the subjects ranged from associate degree to doctoral degree. The average age of the subjects was 42, with a range from 20 to 58. Most of the subjects were white with the remainder from several ethnic groups. Table 6 summarizes educational levels and Table 7 contains a breakdown of the ethnicity of the subjects.

One of the criteria for participation in the study was current employment in nursing. Subjects were asked about their current employment situation, both the type of position and the employing agency. Tables 9 and 8 present a summary of this information.

Table 6

Educational Levels of Subjects in Sample

Level of Education	n of Subjects	% of Subjects
Associate Degree in Nursing	13	4.1
Diploma in Nursing	41	12.9
Bachelor's in Another Field	22	6.9
Bachelor's in Nursing	107	33.7
Master's in Another Field	20	6.3
Master's in Nursing	101	31.8
Doctorate in Another Field	5	1.6
Doctorate in Nursing	9	2.8
Total	318	100

Table 7

Ethnic Backgrounds of Subjects in Sample

Ethnicity	n of Subjects	% of Subjects
White	279	87.0
Black	19	6.0
Asian	11	3.5
Native American	3	.9
Hispanic	2	.6
Mixed Race	3	.9
Missing Data	1	.3
Total	318	100.0

Table 8

Professional Roles of Subjects in Sample

Position	n of Subjects	% of Subjects
Staff Nurse	34	10.7
Public Health Nurse	34	10.7
Supervisor	34	10.7
Asst./Assoc. Administrator	30	9.4
Nurse Manager	24	7.6
Clinical Nurse Specialist	24	7.6
Nurse Practitioner/CNM	22	6.9
Staff Development	20	6.3
Team Leader/Asst. Head Nurse	13	4.1
Patient Educator	11	3.5
Director of Nursing	9	2.8
School Nurse	8	2.5
Nurse Researcher	6	1.9
Faculty	4	1.3
Office Nurse	3	0.9
Other	42	13.2
Total	318	100.0

Table 9

Primary Organizational Affiliation of Subjects in Sample

Organization	n of Subjects	% of Subjects
Hospital (Inpatient)	132	41.5
Community/Public Health Agency	86	27.0
Ambulatory Care Center	15	4.7
Hospital (Outpatient)	9	2.8
School (Public or Private)	9	2.8
Home Health Care Agency	8	2.5
College or University School of Nursing	2	0.6
Other	57	17.9
Total	318	100.0

Overview of Analytic Methods

This study employed two major approaches to analysis of data. The first research question was answered using t-tests, perhaps the simplest and most common inferential approach to comparing means. The t-tests were used to compare the means on each predictor variable for high and low user groups in each of the five types of research utilization. This resulted in a total of 40 t-tests, normally a rather large number. The major risk in carrying out such a number of t-tests is that it increases the risk of Type I error. That is, carrying out a large number of statistical procedures increases the likelihood that one or more will be significant by chance rather than as a reflection of true statistical difference between the two reference groups. To minimize this possibility, alpha for the t-tests was specified at .01 rather than the more conventional .05 level. That is, to be assessed as significant for this study, a t-test would have to reach $p \leq .01$ indicating that there is only 1 chance in 100 of the significance being due to chance rather than to true statistical difference between the two groups.

T-tests are used to examine single relationships. A t-test can answer the question, do these two groups have means that are significantly different on a specified variable? For this study, the purpose of the t-tests was to answer the questions about the differences between the high and low user groups for each type of research utilization on each of the predictor variables. T-tests stand alone. The fact that a series of t-tests are significant offers no information about the way in which a group of variables may work together to differentiate two groups.

Discriminant function analysis was the second method of analysis employed in this study. Discriminant function analysis allows the researcher to

answer several questions simultaneously about a group of variables. First, it tests to what extent the scores on a defined set of predictor variables will permit a group of subjects in two or more groups to be correctly classified into their appropriate groups. In general, subjects from two groups will be correctly classified by chance alone 50% of the time; subjects from 3 groups 33% of the time, etc. Thus, one area of interest is the difference between chance and the classification based upon the equations derived in the discriminant function analysis.

A second type of information is also available from the discriminant function analyses. For each predictor variable entering the equation, as well as for the final discriminant function equation, Wilks' Lambda is computed. Wilks' Lambda is the criterion for inferring population differences on the basis of sample data (Tabachnick & Fidell, 1983). A significance level is given for Wilks' Lambda indicating the likelihood that the obtained Wilks' Lambda is the result of chance rather than real differences between groups. The variance in the discriminant function equation (linear combination of predictor variables) due to group membership may be approximated by the formula 1–Wilks' Lambda.

In approaching a discriminant function analysis, the predictor variables may be entered in one of three ways. If there is no theoretical basis for believing that some predictors are more central to discriminating between groups than others or that some predictors predate others with reference to the outcome, then there are two options for entering the predictor variables into the analysis. If the researcher has no particular interest in parsimony or believes all variables to be equally valuable and has a small number of predictor variables, then the entire set may be entered at one time. The equation produced will include all of the predictor variables. If, on the other hand, the researcher is

interested in parsimony, then a stepwise approach may be used. This approach is data-driven. The researcher in essence allows the statistical program to select those predictor variables which contribute most at each step of the analysis. If two predictor variables are highly correlated, the one that enters first may prevent the second from entering at all. The stepwise analysis ends when none of the variables remaining unentered in the equation contributes significantly to discriminating between the defined groups.

The third alternative to discriminant analysis is a hierarchical approach. In this approach, predictor variables are entered into the equation based upon theory or some other compelling rationale. The researcher determines the order and number of predictor variables entered into the equation. The strength of the theoretical basis for selection and ordering of predictors will determine the predictive strength of the final discriminant function equation.

In this study, both hierarchical and stepwise analyses were carried out for each outcome measure for both the two-group and three-group conditions. The rationale for the hierarchical analysis is described in Chapter 3. The stepwise analyses were exploratory in nature. Eight is a rather large number of variables to be practical. Any means of arriving at a more parsimonious model seemed justified. The stepwise analyses were used as a reference point in most of the reporting of results and discussion that follow in the next two chapters. This was done because of the advantages of more parsimonious models and because in virtually all cases the stepwise analyses proved to be as effective as any other analysis in producing group membership. In cases where the results of the stepwise analyses seem contradicted by other analyses, that evidence is described.

Research Question 1

On what predictor variables do nurses who score high versus low on each type of research utilization differ from one another?

Hypothesis A. Nurses who demonstrate higher levels of cognitive use of new knowledge will have higher scores on Set A predictor variables (education, individual change factors, cosmopoliteness, and research experience) than will nurses who score low on cognitive use of new knowledge .

Hypothesis B. Nurses who demonstrate higher levels of behavioral use of new knowledge, administrative use of new knowledge, use of research methods, and participation in research utilization activities will have higher scores on all predictor variables (Set A plus Set B) than nurses who have low levels of these four types of research utilization.

Tables 10 through 14 contain the results for the t-tests performed to test these two hypotheses. High user groups scored significantly higher on all of the predictor variables than low user groups for all measured types of research utilization (cognitive, behavioral, and administrative use of new knowledge, use of research methods, and participation in research utilization). Differences between the high and low user groups on all predictor variables were significant at least at the $p \leq .01$ level; most (34 out of 40 comparisons) were significant at $p \leq .001$.

Hypothesis A, relating to the expected pattern of predictor variables for cognitive use of new knowledge, was partially supported in that four of the five highest t-values were for predictor variables in Set A, the group of variables

hypothesized to show the largest differences in mean scores for high and low users groups on cognitive use of new knowledge. Hypothesis B also received support in that high and low user groups on behavioral and administrative use of new knowledge, use of research methods and participation in research utilization activities were significantly different on all predictor variables.

Table 10

Differences Between High and Low User Groups for Cognitive Use of New Knowledge

	Low Users			High Users			
Predictors	Mean	SD	n	Mean	SD	n	t
Education	3.60	1.48	85	4.74	1.65	135	5.32**
Individual Change Factors [a]	-.24	.60	85	.10	.50	135	4.47**
Research Experience	1.82	.85	85	2.57	.98	135	6.01**
Cosmopoliteness	2.52	1.07	85	3.53	.99	135	7.03**
Organizational Change Factors [a]	-.18	.70	85	.11	.63	134	3.09*
Change Experience	2.74	.93	85	3.23	.87	135	3.04*
Opinion Leadership	3.35	.66	85	3.78	.56	135	4.96**
Organizational Context	3.91	1.14	85	4.45	1.20	135	3.30*

* $p \leq .01$

** $p \leq .001$

[a] Scale scores in z-score format.

Table 11

Differences Between High and Low User Groups for Behavioral Use of New Knowledge

	Low Users			High Users			
Predictors	Mean	SD	n	Mean	SD	n	t
Education	3.76	1.57	98	4.59	1.60	117	3.86**
Individual Change Factors [a]	-.26	.60	98	.17	.47	117	5.78**
Research Experience	1.94	.93	98	2.46	.96	117	4.00**
Cosmopoliteness	2.64	1.13	98	3.54	1.05	117	5.97**
Organizational Change Factors [a]	-.17	.65	98	.17	.57	115	3.88**
Change Experience	2.81	.94	98	3.15	.86	117	2.78*
Opinion Leadership	3.41	.67	98	3.80	.57	117	4.59**
Organizational Context	3.90	1.14	96	4.47	1.23	117	3.50**

* $p \leq .01$

** $p \leq .001$

[a] Scale scores in z-score format.

Table 12

Differences Between High and Low User Groups for Administrative Use of New Knowledge

	Low Users			High Users			
Predictors	Mean	SD	n	Mean	SD	n	t
Education	3.93	1.58	124	4.54	1.63	87	2.72*
Individual Change Factors [a]	-.19	.57	124	.20	. 45	87	5.54**
Research Experience	2.00	.94	124	2.59	.92	87	4.52**
Cosmopoliteness	2.72	1.11	124	3.59	.89	87	6.34**
Organizational Change Factors [a]	-.17	.70	124	.19	.56	87	4.25**
Change Experience	2.81	.92	124	3.32	.76	87	4.42**
Opinion Leadership	3.40	.64	124	3.88	.56	86	5.72**
Organizational Context	3.90	1.21	122	4.52	1.15	87	3.75**

* $p \leq .01$

** $p \leq .001$

[a] Scale scores in z-score format

Table 13

Differences Between High and Low User Groups for Use of Research Methods

	Low Users			High Users			
Predictors	Mean	SD	n	Mean	SD	n	t
Education	4.06	1.52	105	4.85	1.76	113	3.57*
Individual Change Factors [a]	-.32	.55	105	.25	.43	113	8.46*
Research Experience	1.83	.87	105	2.69	.98	113	6.86*
Cosmopoliteness	2.60	1.11	105	3.77	.98	113	8.20*
Organizational Change Factors [a]	-.25	.69	105	.22	.58	113	5.37*
Change Experience	2.60	.91	105	3.23	.80	113	5.44*
Opinion Leadership	3.28	.63	104	3.95	.56	112	8.23*
Organizational Context	3.74	1.27	103	4.52	1.19	113	4.61*

* $p \leq .001$ [a] Scale scores in z-score format

Table 14

Differences Between High and Low User Groups for Participation in Research Utilization Activities

	Low Users			High Users			
Predictors	Mean	SD	n	Mean	SD	n	t
Education	3.64	1.48	94	5.02	1.60	119	6.51**
Individual Change Factors [a]	-.29	.60	94	.22	.45	119	6.84**
Research Experience	1.74	.82	94	2.79	.94	119	8.71**
Cosmopoliteness	2.39	1.00	94	3.84	.92	119	10.92**
Organizational Change Factors [a]	-.16	.65	94	.15	.62	119	3.49**
Change Experience	2.66	.90	94	3.25	.83	119	4.90**
Opinion Leadership	3.37	.60	92	3.86	.61	119	5.85**
Organizational Context	3.99	1.19	92	4.45	1.23	119	2.78*

* $p \leq .01$

** $p \leq .001$

[a] Scale scores in z-score format.

Table 15

Summary of Differences between High and Low User Groups for Five Types of Research Use on Eight Predictor Variables

Predictors	Cognitive Use	Behavioral Use	Administrative Use	Research Methods	RU Activities
Education	5.32**	3.86**	2.72*	3.57**	6.51**
Individual Change Factors	4.47**	5.78**	5.54**	8.46**	6.84**
Research Experience	6.01**	4.00**	4.52**	6.86**	8.71**
Cosmopoliteness	7.03**	5.97**	6.34**	8.20**	10.92**
Organizational Change Factors	3.09*	3.88**	4.25**	5.37**	3.49**
Change Experience	3.04*	2.78*	4.42**	5.44**	4.90**
Opinion Leadership	4.96**	4.59**	5.71**	8.23**	5.84**
Organizational Context	3.30*	3.50**	3.75**	4.61**	2.78*

* $p \leq .01$
** $p \leq .001$

Research Question 2

What groups of predictor variables best predict high versus low scores of nurses for each of the five types of research use?

Hypothesis C. For cognitive use of new knowledge, the predictor variables contributing to individual resources for research utilization (Set A) will be most influential in predicting group differences.

Hypothesis D. For all other outcome variables (behavioral and administrative use of new knowledge, use of research methods, and participation in research utilization activities), the predictor variables contributing to the climate and skills of the individual for change of others (Set B) and those contributing to individual resources for research utilization (Set A) will be equally influential in predicting group differences.

Research Question 2 was addressed using discriminant function analyses for each of the five types of research utilization outcomes. Predictor variables were classified into two groups. Set A predictor variables (individual change factors, research experience, cosmopoliteness, and education) are viewed as those that relate to the internal resources of the individual. They increase the opportunity of the individual to become aware of and evaluate new knowledge. Set B predictor variables (opinion leadership, organizational change factors, organizational context, and change experience) are conceptualized as those relating to the climate and resources for change. Standardized canonical discriminant function coefficients for all predictors on all outcomes were positive.

For cognitive use of new knowledge, Set A predictor variables were entered into the equation as a group. Set B predictor variables were then entered as a group. For all other outcome variables, Set B predictor variables were entered first and Set A predictor variables were entered second. This ordering was used because cognitive use of new knowledge is the one type of research use that can occur with little reference to others. All of the other outcome variables (behavioral and administrative use of new knowledge, use of research methods, and participation in research utilization activities) were operationalized in such a way that change of others was implicit in the measurement. Therefore, for those types of research utilization, Set B predictor variables (in addition to Set A predictor variables) are expected to be significant in predicting group membership. They are entered first in the discriminant function analyses in order to test the strength of the Set B variables (separate from Set A variables) in prediction of group membership.

It should be noted that the sample sizes for the groups of high and low users changed not only between the outcome measures but also across the various analyses for each outcome measure. The first difference, between outcome measures, occurred because the high and low user groups were computed separately for each outcome, as noted in the last chapter. The second difference occurred because of missing data. For discriminant function analysis, a subject with missing data on any predictor in the equation is not used in the analysis. Thus, as more variables enter the equations, the subject pool for that equation may shrink slightly. This fact also accounts for the slight differences in subject numbers noted between the t-tests and the discriminant function analyses.

Two tables are presented for each outcome measure. The first table for each outcome reports the standardized canonical discriminant function coefficients and Wilks' Lambdas for the predictor in each of a series of discriminant function analyses. The standardized coefficients give information about the relative weights of each of the predictor variables in the equation. The Wilks' Lambda is a measure of the significance of the equation as a whole or, in the case of the stepwise analysis, the significance of each step. A lower Wilks' Lambda indicates a more significant equation or variable. As noted previously, variance accounted for may be approximated by subtracting Wilks' Lambda from 1.00.

The analyses in the first table in each pair are ordered as described below. For cognitive use of new knowledge, Set A predictors were entered first as a group, followed by an analysis forcing all variables (Sets A and B) into the equation. In the third analysis, Set B variables were entered alone as a group. The final analysis was the stepwise analysis, done to push the data for a more parsimonious model. For the remaining four outcome variables, the order of analyses was: Set B only, Sets A and B together, Set A only, and then stepwise. This order was in keeping with the relationships predicted in Hypotheses D and with the researcher's interest in probing the contribution of Set B variables for these outcomes.

The second table produced for each outcome describes the predictive power of the various analyses. It is to be expected that the equation with the lowest Wilks' Lambda in the preceding tables will be the equation with the best overall predictive power. For each equation, the predictive power for high versus low users is reported along with the overall predictive power of the equation. On cognitive use of new knowledge, for instance, the best overall

prediction was about 72% accurate. For high users, the predictive accuracy of the equations ranged from 66% (Set A variables only in the equation) to 79% (stepwise analysis) while for low users, the predictive accuracy of the equations ranged from 59% (Set A variables only in the equation) to 76% (all variables in the equation). Normally, these rates of accuracy are described but not tested statistically.

In general, some caution should be exercised in reviewing these results, especially those produced by the stepwise discriminant function analyses. Discriminant function analysis, as most other sophisticated statistical analyses, is profoundly affected by the scores of the sample. Stepwise analysis, being data-driven, should be viewed with particular caution. Ideally, all analyses would have been cross-validated with a second sample, but such an undertaking was not within the scope of this study.

Cognitive Use of New Knowledge

The scale measuring cognitive use of new knowledge was scored from 0 to 2. Eighty-three subjects were identified as demonstrating low use (score of 0) and 134 were identified as demonstrating high use (score = 2). The results of the hierarchical discriminant function analysis for cognitive use of new knowledge are displayed in Tables 16 and 17.

First, Set A variables were entered as a group, yielding a Wilk's Lambda of .749, indicating that the four Set A variables accounted for approximately 25% of the variance in cognitive use of new knowledge. Adding Set B predictor variables decreased the Wilk's Lambda to .729, indicating that all eight

predictor variables together accounted for about 27% of the variance in cognitive use of new knowledge.

A stepwise discriminant function analysis, carried out to probe for the most parsimonious model, resulted in a discriminant function equation containing four predictors entered in the following order: cosmopoliteness, research experience, education, and opinion leadership. Of these, the first three are Set A (individual resource) variables, thus providing partial support for Hypothesis C. Wilks' Lambda for this analysis was .736, indicating that about 26.4% of the variance in the combined four predictors could be explained by membership in the high versus low cognitive use group.

One important aspect of the strength of a discriminant function equation is its ability to accurately predict group membership. With Set A variables alone in the equation, accuracy of group prediction was 63.6%. Adding Set B variables increased the accuracy of prediction to 71.9%. The stepwise analysis, using only four of the eight total predictor variables, yielded an equation that accurately predicted group membership 71.7% of the time.

Although overall group membership could be predicted 72% at best, there were marked differences in the prediction of high versus low use. The best prediction overall was obtained with the stepwise analysis although that prediction was only .2% better than the prediction offered with all eight predictors forced into the equation. With stepwise analysis, high use was accurately predicted for 79% of the subjects while low use was accurately predicted in only 60% of the cases. The best prediction of low use was found with all eight predictors forced into the equation. In that analysis, low use was accurately predicted for 76% of the cases. Prediction of high use was 70% in that equation.

Table 16

Cognitive Use of New Knowledge: Standardized Canonical Discriminant Function Coefficients and Wilks' Lambdas for Predictor Variables.

Variable	Set A Std.Coef.[a]	Set A+B Std.Coef.[a]	Set B Std.Coef.[a]	Stepwise Std.Coef.[a]	Stepwise Wilks' Lambda
Education	.31	.33	--	.33	(3) .75*
Individual Change	.22	.08	--	--	--
Research Experience	.34	.30	--	.35	(2) .77*
Cosmopoliteness	.55	.42	--	.46	(1) .81*
Organizational Change	--	.07	.09	--	--
Change Experience	--	.09	.28	--	--
Opinion Leadership	--	.24	.72	.33	(4) .74*
Organizational Context	--	.07	.29	--	--
Wilks' Lambda (Overall)	.75*	.73*	.86*	.74*	

[a] Standardized canonical discriminant function coefficients.

* $p \leq .0001$

Numbers in parentheses in the last column indicate the order in which the variable entered the equation for the stepwise analysis.

Table 17

Predicted and Actual Group Membership of High versus Low User Groups for Cognitive Use of New Knowledge

Actual Group	n of Cases	Predicted Low Group	Predicted High Group
Set A Only			
Low Group	83	49 (59.0%)	34 (41.0%)
High Group	134	45 (33.6%)	89 (66.4%)
Total: 63.59%			
Sets A & B			
Low Group	83	63 (75.9%)	20 (24.1%)
High Group	134	41 (30.6%)	93 (69/4%
Total: 71.89%			
Stepwise			
Low Group	83	51 (60.0%)	33 (40.0%)
High Group	134	28 (20.9%)	106 (79.1%)
Total: 71.69%			

Behavioral Use of New Knowledge

The scale measuring behavioral use of new knowledge was scored from 0 to 2. Ninety-eight subjects were identified as demonstrating low use (score of 0) and 117 were identified as demonstrating high use (score $\geq$ 1.5). The results of the hierarchical discriminant function analysis for behavioral use of new knowledge are described in Tables 18 and 19.

First, the Set B variables were entered as a group, yielding a Wilks' Lambda of .853, indicating that the four Set B variables accounted for approximately 15% of the variance in behavioral use of new knowledge. Adding Set A predictor variables decreased the Wilks' Lambda to .767, indicating that all eight predictor variables together accounted for about 23% of the variance in behavioral use of new knowledge.

A stepwise discriminant function analysis, carried out to probe for the most parsimonious model, resulted in a discriminant function equation containing three predictors entered in the following order: individual change factors, cosmopoliteness, and organizational change factors. Of these three predictor variables, the only one (organizational change factors) is a Set B (climate and skills for change) variable. The presence of both Set A and Set B predictor variables in the equation provides support for Hypothesis D. Wilks' Lambda for this analysis was .785, indicating that about 23% of the variance in the combined three predictors could be explained by membership in the high versus low behavioral use group.

With Set B variables alone in the equation, the discriminant function equation for behavioral use of new knowledge predicted group membership accurately 67.3% of the time. Adding Set A variables increased the accuracy of

prediction to 72.5%. The stepwise analysis, using only three of the eight total predictor variables, yielded an equation that accurately predicted group membership 74.9% of the time.

There were marked differences in the prediction of high use and low use separately, both within and across equations. The best prediction overall and for high use was obtained with the stepwise analysis. With stepwise analysis, high use was accurately predicted for 83% of cases while low use was accurately predicted in only 65% of the cases. The best prediction of low use was found with all eight predictors forced into the equation. In that analysis, low use was accurately predicted for 75% of the cases. Prediction of high use was 70% in that equation.

Table 18

Behavioral Use of New Knowledge: Standardized Canonical Discriminant Function Coefficients and Wilks' Lambdas for Predictor Variables.

Variable	Set B Std.coef.[a]	Set A+B Std.coef.[a]	Set A Std.coef.[a]	Stepwise Std.coef.[a]	Wilk's Lambda (Stepwise)
Education	--	.22	.22	--	--
Individual Change	--	.41	.54	.50	(1) .85*
Research Experience	--	.17	.18	--	--
Cosmopoliteness	--	.33	.46	.52	(2) .80*
Organizational Change	.41	.31	--	.35	(3) .79*
Change Experience	.23	.04	--	--	--
Opinion Leadership	.63	.12	--	--	--
Organizational Context	.16	.01	--	--	--
Wilks' Lambda (Overall)	.85*	.77*	.79*	.79*	

[a] Standardized canonical discriminant function coefficients.

* $p \leq .0001$

Numbers in parentheses in the last column indicate the order in which the variable entered the equation for the stepwise analysis.

Table 19

Predicted and Actual Group Membership of High versus Low User Groups for Behavioral Use of New Knowledge.

Actual Group	n of Cases	Predicted Low Group	Predicted High Group
Set B Only			
Low Group	96	63 (65.6%)	33 (34.4%)
High Group	115	36 (31.3%)	79 (68.7%)
Total: 67.30%			
Sets A & B			
Low Group	96	72 (75.0%)	24 (25%)
High Group	115	34 (29.6%)	81 (70.4%)
Total: 72.51%			
Stepwise			
Low Group	98	64 (65.3%)	34 (34.7%)
High Group	117	20 (17.1%)	97 (82.9%)
Total: 74.88%			

Administrative Use of New Knowledge

The scale measuring administrative use of new knowledge also was scored from 0 to 2. One-hundred-twenty-two subjects were identified as demonstrating low use (score of 0) and 86 were identified as demonstrating high use (score = 2). The results of the discriminant function analysis for administrative use of new knowledge are described in Tables 20 and 21.

To begin, the Set B variables were entered as a group, yielding a Wilks' Lambda of .790, indicating that the four Set B variables accounted for approximately 21% of the variance in administrative use of new knowledge. Adding Set A predictor variables increased the Wilks' Lambda to .732, indicating that all eight predictor variables together accounted for about 27% of the variance in administrative use of new knowledge.

The stepwise discriminant function analysis resulted in a discriminant function equation containing four predictors entered in the following order: cosmopoliteness, organizational change factors, individual change factors, and change experience. Of these, the first two are Set A variables while the last two are Set B variables, supporting Hypothesis D that both types of predictor variables would be involved in prediction of administrative use of new knowledge. Wilks' Lambda for this analysis was .754, indicating that about 25% of the variance in the combined four predictors could be explained by membership in the high versus low administrative use group.

With Set B variables alone in the equation, the discriminant function equation for administrative use of new knowledge predicted group membership accurately 69.2% of the time. Adding Set A variables increased the accuracy of prediction to 71.6%. The stepwise analysis, using only four of the eight total

predictor variables present at Step 2, yielded an equation that accurately predicted group membership 70.6% of the time.

The best overall prediction of high versus low use for administrative use of new knowledge was 72%, obtained with the stepwise analysis. Stepwise analysis also provided the best prediction of low use, accurately predicting a low score on administrative use of new knowledge for 76% of the cases, but was only 63% accurate in predicting high scores on administrative use of new knowledge. The best equation for predicting high scores on administrative use of new knowledge was the equation with only Set B predictors. That equation accurately predicted high administrative use of new knowledge for 74% of the cases. Low use in that equation was predicted accurately for 66% of cases.

Table 20

Administrative Use of New Knowledge: Standardized Canonical Discriminant Function Coefficients and Wilks' Lambdas for Predictor Variables.

Variable	Set B Std.coef.[a]	Set A+B Std.coef.[a]	Set A Std.coef.[a]	Stepwise Std.coef.[a]	Wilks' Lambda (Stepwise)
Education	--	.05	.00	--	--
Individual Change	--	.25	.49	.38	(3) .78*
Research Experience	--	.24	.33	--	--
Cosmopoliteness	--	.32	.54	.49	(1) .85*
Organizational Change	.15	.16	--	.35	(2) .81*
Change Experience	.47	.30	--	.36	(4) .75*
Opinion Leadership	.61	.25	--	--	--
Organizational Context	.31	.19	--	--	--
Wilks' Lambda (Overall)	.79*	.73*	.79*	.75*	

[a] Standardized canonical discriminant function coefficients.

* $p \leq .0001$

Numbers in parentheses in the last column indicate the order in which the variable entered the equation for the stepwise analysis.

Table 21

Predicted and Actual Group Membership of High versus Low User Groups for Administrative Use of New Knowledge.

Actual Group	n of Cases	Predicted Low Group	Predicted High Group
Set B Only			
Low Group	122	80 (65.6%)	42 (34.4%)
High Group	86	22 (25.6%)	64 (74.4%)
Total: 69.23%			
Sets A & B			
Low Group	122	86 (70.5%)	36 (29.5%)
High Group	86	23 (26.7%	63 (73.3%)
Total: 71.63%			
Stepwise			
Low Group	124	94 (75.8%)	30 (24.2%)
High Group	87	32 (36.6%)	55 (63.2%)
Total: 70.62%			

Use of Research Methods

The scale measuring use of research methods contained nine items scored from 0 to 5. Scale scores were a mean of responses to all scale items. One-hundred-two subjects were identified as demonstrating low use (score $\leq$ 1.33) and 111 were identified as demonstrating high use (score $\geq$ 2.44). The results of the discriminant function analysis for use of research methods are described in Tables 18 and 19.

First, Set B variables were entered as a group, yielding a Wilks' Lambda of .656, indicating that the four Set B variables accounted for approximately 34% of the variance in use of research methods. Adding Set A predictor variables decreased the Wilks' Lambda to .562, indicating that all eight predictor variables together accounted for about 44% of the variance in use of research methods.

A stepwise discriminant function analysis, carried out to probe for the most parsimonious model, resulted in a discriminant function equation containing six predictors entered in the following order: individual change factors, research experience, opinion leadership, organizational change factors, change experience and cosmopoliteness. Of these, three are Set A variables and three are Set B variables. This discriminant function analysis, therefore, supports Hypothesis D in that both Set A and Set B variables contribute to predicting use of research methods. Wilks' Lambda for this analysis was .563, indicating that about 44% of the variance in the combined six predictors could be explained by membership in the high versus low use of research methods group.

With Set B variables alone in the equation, the discriminant function equation for use of research methods predicted group membership accurately 73.8% of the time. Adding Set A variables increased the accuracy of prediction to 80.8%. The stepwise analysis, using six of the eight total predictor variables present at Step 2, yielded an equation that accurately predicted group membership 79.6% of the time.

Use of research methods was best predicted overall by the equation containing all eight of the predictor variables (81%). Unlike cognitive and behavioral use of new knowledge, that equation also provided the best prediction of high use (86% accurate) and of low use (76% accurate). For all three equations (Set B only, all eight predictors, and stepwise), low scores were less well predicted than high scores on use of research methods.

Table 22

Use of Research Methods: Standardized Canonical Discriminant Function Coefficients and Wilks' Lambdas for Predictor Variables.

Variable	Set B Std.coef.[a]	Set A+B Std.coef.[a]	Set A Std.coef.[a]	Stepwise Std.coef.[a]	Wilk's Lambda (Stepwise)
Education	--	-.05	-.10	--	--
Individual Change	--	.35	.57	.34	(1) .74*
Research Experience	--	.38	.47	.36	(2) .65*
Cosmopoliteness	--	.25	.43	.24	(6) .56*
Organizational Change	.28	.27	--	.30	(4) .59*
Change Experience	.38	.21	--	.22	(5) .57*
Opinion Leadership	.69	.29	--	.29	(3) .61*
Organizational Context	.19	.03	--	--	--
Wilks' Lambda (Overall)	.66*	.56*	.63*	.56*	

[a] Standardized canonical discriminant function coefficients.

* $p \leq .0001$

Numbers in parentheses in the last column indicate the order in which the variable entered the equation for the stepwise analysis.

Table 23

Predicted and Actual Group Membership of High versus Low User Groups for Use of Research Methods for Set B.

Actual Group	n of Cases	Predicted Low Group	Predicted High Group
Set B Only			
Low Group	102	72 (70.6%)	30 (29.4%)
High Group	112	26 (23.2%)	86 (76.8%)
Total: 73.83%			
Sets A & B			
Low Group	102	77 (75.5%)	25 (24.5%)
High Group	112	16 (14.3%)	96 (85.7%)
Total: 80.84%			
Stepwise			
Low Group	104	76 (73.1%)	28 (26.9%)
High Group	112	16 (14.3%)	96 (85.7%)
Total: 79.63%			

Participation in Research Utilization Activities

The scale measuring participation in research utilization activities contained six items scored from 0 to 3. Scale scores were a mean of responses to all scale items. Ninety subjects were identified as demonstrating low use (score $\leq$ .67) and 119 were identified as demonstrating high use (score $\geq$ 1.50). The results of the discriminant function analyses for participation in research utilization activities are described in Tables 20 and 21.

To begin, the Set B variables were entered as a group, yielding a Wilks' Lambda of .786, indicating that the four Set B variables accounted for approximately 21% of the variance in participation in research utilization activities. Adding Set A predictor variables decreased the Wilks' Lambda to .513, indicating that all eight predictor variables together accounted for about 49% of the variance in participation in research utilization activities.

A stepwise discriminant function analysis, carried out to probe for the most parsimonious model, resulted in a discriminant function equation containing four predictors entered in the following order: cosmopoliteness, research experience, individual change factors, and change experience. Of these, all except the last, change experience, are Set A variables. This equation, then, supports Hypothesis D in that predictors from both Set A and Set B enter the equation. However, participation in research utilization activities seems to be primarily predicted by those variables identified as reflective of individual resources with those predictors indicative of climate and skills for change contributing only a small amount to prediction. Wilks' Lambda for this analysis was .522, indicating that about 48% of the variance in the combined

four predictors could be explained by membership in the high versus low participation in research utilization activities groups.

With Set B variables alone in the equation, the discriminant function equation for participation in research utilization activities predicted group membership accurately 69.9% of the time. Adding Set A variables increased the accuracy of prediction to 82.8%. The stepwise analysis, using four of the eight total predictor variables, yielded an equation that accurately predicted group membership 81.7% of the time.

Participation in research utilization was best predicted overall by the equation containing all eight of the predictor variables (83%). Accuracy rates for high and low users separately were highest for the stepwise equation. That equation accurately predicted high scores on participation in research utilization activities for 86% of cases and low scores for 77% of cases. High scores (75% accuracy) were also more accurately predicted by the equation with only Set B variables than were low scores (63% accuracy). With all eight predictors in the equation, this order was reversed. That equation accurately predicted low scores for 75% and high scores for only 70% of cases.

Table 24

Participation in Research Utilization Activities: Standardized Canonical Discriminant Function Coefficients and Wilks' Lambdas for Predictor Variables.

Variable	Set B Std.Coef.[a]	Set A+B Std.Coef.[a]	Set A Std.Coef.[a]	Stepwise Std.Coef.[a]	Wilk's Lambda (Stepwise)
Education	--	.17	.12	--	--
Individual Change	--	.33	.31	.31	(3) .54*
Research Experience	--	.36	.41	40	(2) .56*
Cosmopoliteness	--	.55	.59	.60	(1) .61*
Organizational Change	.21	.09	--	--	--
Change Experience	.54	.25	--	.23	(4) .52*
Opinion Leadership	.64	-.01	--	--	--
Organizational Context	.02	-.19	--	--	--
Wilks' Lambda (Overall)	.79*	.51*	.56*	.52*	--

[a] Standardized canonical discriminant function coefficients.

* $p \leq .0001$

Numbers in parentheses in the last column indicate the order in which the variable entered the equation for the stepwise analysis.

Table 25

Predicted and Actual Group Membership of High versus Low User Groups for Participation in Research Utilization Activities.

Actual Group	n of Cases	Predicted Low Group	Predicted High Group
Set B Only			
Low Group	90	57 (63.3%)	33 (36.7%)
High Group	119	30 (25.2%)	89 (74.8)
Total: 69.86%			
Sets A & B			
Low Group	96	72 (75.0%)	24 (25.0%)
High Group	115	34 (29.6%)	81 (70.4%)
Total: 82.78%			
Stepwise			
Low Group	94	72 (76.6%)	22 (23.4%)
High Group	119	17 (14.3%)	102 (86.7%)
Total: 81.69%			

Research Question 3

Are the patterns of significant predictors of high versus low research utilization similar or different across the five types of use of research?

This question was addressed using the t-tests and discriminant function analyses carried out in answering the preceding research questions. For ease of cross comparisons as well as parsimony, the stepwise discriminant function analyses are used as the basis for comparisons across the outcome measures. Table 26 displays the standardized canonical discriminant function coefficients derived from the stepwise discriminant function analyses of each of the five types of use of research as well as the percent of variance accounted for and the percent of subjects correctly classified by each stepwise equation. Table 27 is derived from the results of the t-tests and displays the variance accounted for in each outcome variable by each predictor.

Of the predictor variables, only cosmopoliteness appears in the final discriminant equation for each of the types of use of research. Cosmopoliteness is also the variable that accounts for the greatest proportion of variance in four out of five outcome measures. Only organizational context fails to appear in any of the final equations. In terms of amount of variance accounted for, organizational context is always last or next to last among the eight predictor variables.

Individual change factors appears in equations for four of the five types of research use, while research experience, change experience, and organizational change factors appear in three equations each. Table 27

reveals that of these four variables, position-related research experience and individual change factors are consistently among the top four predictors in terms of variance accounted for in each outcome. Position-related change experience and organizational change factors do not appear in the top four for any of the five types of research utilization.

Opinion leadership is a factor in predicting two types of research use while education appears in only a single equation. Although education does not enter the top four predictors for any of the outcomes, opinion leadership appears in that group for all of the outcomes except participation in research utilization activities.

Examined from the point of view of the outcome variables, the discriminant function equations are each unique. The number of predictor variables entering the equations ranges from three (behavioral use of new knowledge) to six (use of research methods). The amount of variance accounted for by the final equation of predictor variables is 22% to 27% for the three types of use of new knowledge. For use of research methods and participation in research utilization activities, the equations account for 44% and 48% of the variance respectively.

The proportion of subjects correctly classified by the discriminant function analyses also varied although within a tighter range. For the three types of use of new knowledge, subjects correctly classified ranged from 70.6% for administrative use of new knowledge to 74.9% for behavioral use of new knowledge. As with the proportion of variance explained, the proportion of subjects correctly classified was higher for use of research methods (79.6%) and participation in research utilization activities (81.7%).

It appears that of the eight predictor variables, cosmopoliteness is the most useful. Not only does it appear in the final equations for all five types of research use, it is the first to enter the equations in all except use of research methods. Individual change factors is the second most useful predictor variable. It enters four of the equations and is the first or second predictor to enter the discriminant function analysis in three of those.

As regards the outcome variables, high versus low use of research methods and participation in research utilization activities are predicted to a greater extent by the eight predictor variables than are the three types of use of new knowledge. High versus low participation in research utilization activities is the outcome that explains the most variance in the predictor variables entering the equation for the stepwise discriminant function analysis.

In examining the predictors with the outcomes across the five types of research use, some interesting patterns emerge. The predictors in the stepwise discriminant function analysis for the behavioral and administrative use of new knowledge are quite similar, sharing three of four predictors. The discriminant function analysis for cognitive use of new knowledge appears quite different from the other two types of use of new knowledge. However, in reviewing the variance accounted for by predictor for each type of use of new knowledge (Table 27), seven of the eight predictors perform very similarly across the three outcomes. Only education looks markedly dissimilar for administrative use compared to behavioral and cognitive use.

Use of research methods and participation in research utilization activities also display some interesting patterns. First, in terms of total variance accounted for by the predictors and the proportion of subjects correctly classified, use of research methods and participation in research utilization

resemble each other more than they resemble the other three outcomes. Second, the patterns of amount of variance accounted for by the individual predictors (Table 27) is almost reversed. Education, position-related research experience, and cosmopoliteness (all Set A variables) each account for substantially more variance in participation in research utilization activities than in use of research methods. This pattern is reversed for organizational change factors, opinion leadership, and organizational context, all Set B variables.

Table 26

Standardized Canonical Discriminant Function Coefficients for Those Predictor Variables Retained in the Final Step of Stepwise Discriminant Function Analysis for Each Outcome Variable

Predictor	Cognitive Use	Behavioral Use	Admin. Use	Use of Methods	RU Activities
Education	.33	--	--	--	--
Ind. Change	--	.50	.38	.34	.31
Research Exp.	.35	--	--	.36	.40
Cosmopoliteness	.46	.52	.50	.24	.60
Org. Change	--	.35	.35	.30	--
Change Exp.	--	--	.36	.22	.23
Opin. Leader	.33	--	--	.29	--
Org. Context	--	--	--	--	--
Variance Explained	27%	21%	25%	44%	48%
% Subjects Accurately Classified	71.7%	74.9%	70.6%	79.6%	81.7%

Table 27

Variance Accounted for in Each Outcome by Each Predictor Variable

Predictor	Cognitive Use	Behavioral Use	Admin. Use	Use of Methods	RU Activities
Education	11%	10%	3%	5%	17%
Ind. change	10%	11%	13%	26%	21%
Research Exp.	14%	12%	9%	18%	26%
Cosmopoliteness	19%	18%	15%	24%	39%
Org. Change	5%	6%	8%	14%	6%
Change Exp.	5%	5%	9%	13%	12%
Opin. Leader	11%	11%	13%	25%	15%
Org. Context	5%	6%	6%	10%	3%

Research Question 4

In what ways do nurses with intermediate levels of research utilization resemble and differ from nurses with high and low levels of research utilization?

For Research Question 4, the stepwise discriminant functions for each outcome variable were repeated with three groups (high, intermediate, and low) rather than the high and low scoring groups used in answering Research Questions 1, 2 and 3. Table 28 summarizes the results of the discriminant analyses with three groups as Table 26 summarized the results using two groups.

Like the two-group analyses, all five discriminant function equations discriminated between high and low users of nursing research at a greater than chance (33% for three groups) level. Although the variances accounted for by the three-group analyses is consistently lower than for the two-group analyses, the values (17% to 37%) are still significant ($p \leq .001$) The predictors entering the equations for each of the outcome measures are similar but not identical to those entering the stepwise discriminant function equations for the two-group analyses.

For cognitive use of new knowledge, cosmopoliteness and research experience appear in both two-and three-group analyses; in the three-group analysis, they are the only predictors in the equation while in the two-group analysis education and opinion leadership also enter the equation.

Behavioral use of new knowledge shares three predictors between the three- and two-group analyses: individual change factors, cosmopoliteness,

and organizational change factors. In addition, education enters the equation for the three-group analysis.

For administrative use of new knowledge, the three- and two-group analyses share two predictors in common: cosmopoliteness and change experience. In the two-group analysis, these two predictors are joined by individual change factors and organizational change factors in the final equation. For the three-group analysis, opinion leadership enters the final equation. Thus, between the two separate discriminant function equations, five of the eight predictors enter into one of the two stepwise discriminant function equations.

The stepwise discriminant function equation for use of research methods (two-group analysis) contained six of the predictor variables, the most for any of the stepwise analyses. Four of these also entered the stepwise equation for the three-group analysis: individual change factors, research experience, organizational change factors, and opinion leadership. Cosmopoliteness and change experience were the two predictors present in the two-group analyses but not present in the three-group analysis.

For participation in research utilization activities, four variables entered the two-group stepwise discriminant function analysis: individual change factors, cosmopoliteness, research experience, and change experience. Of these, only change experience did not enter the stepwise discriminant function equation with three groups.

There is, then, some consistency across the two sets of analyses for the five outcomes. The prediction equations do not vary widely from the two-group to the three-group analyses, generally differing by only one or two variables with the two-group equations generally (with the exception of the equations for

behavioral use of new knowledge) containing more predictors than the three-group analyses.

Table 29 contains a report of the variance accounted for in each outcome by each predictor variable, repeating the structure of Table 27. The pattern seen for this three-group analysis is very similar to that seen in the two-group analysis. Cosmopoliteness again accounts for the largest proportion of variance in all outcomes except use of research methods. Research experience, individual change factors, and opinion leadership all emerge as powerful predictors of research utilization. Other predictor variables account for less variance in most outcomes. In general, the three-group analysis, as compared to the two group analysis, shows predictors accounting for less variance in the outcome measures.

Table 30 displays the canonical discriminant function means for the three groups produced by these analyses. Results are shown only for Function 1 of the three group discriminant function analysis. Function 2 failed to discriminate between groups in any of the analyses. This table shows that subjects with moderate scores on the outcome measures generally fall close to the midpoint between the high and low user groups. While this outcome was not unexpected, it could have happened that the moderate user group would have been closer to one of the other groups (high or low users) on some combination of the outcome variables. These results confirm that that is not the case.

Table 28

Standardized Canonical Discriminant Function Coefficients (Function 1) for Predictor Variables Retained in the Final Step of Stepwise Discriminant Function Analysis for Each Outcome Variable Using Three Groups

Predictor	Cognitive Use	Behavioral Use	Admin. Use	Use of Methods	RU Activities
Education	--	.27	--	--	--
Ind. Change	--	.49	--	.37	.34
Cosmopoliteness	.71	.45	.55	--	.61
Research Exp.	.49	--	--	.46	.46
Org. Change	--	.26	--	.32	--
Change Exp.	--	--	.32	--	--
Opin. Leader	--	--	.49	.47	--
Org. Context	--	--	--	--	--
Variance Explained	17%	20%	17%	33%	37%
% Subjects Accurately Classified	49.4%	54.1%	48.1%	55.7%	55.7%

Table 29

Variance Accounted for in Each Outcome by Each Predictor Variable (Three-group Analysis)

Predictor	Cognitive Use	Behavioral Use	Admin. Use	Use of Methods	RU Activities
Education	9%	7%	6%	4%	12%
Individual Change	7%	11%	8%	19%	15%
Research Experience	10%	5%	6%	13%	20%
Cosmopoliteness	13%	11%	11%	18%	28%
Organizational Change	4%	6%	6%	11%	5%
Change Experience	3%	3%	6%	11%	8%
Opinion Leadership	8%	7%	10%	20%	11%
Organizational Context	4%	5%	4%	8%	3%

Table 30

Group Means on First Canonical Discriminant Function Equations for All Outcome Variables Using Stepwise Discriminant Function Analysis

Outcome	Low	Moderate	High
Cognitive	-.69	.04	.40
Behavioral	-.64	.10	.44
Administrative	-.48	.10	.55
Use Methods	-.87	-.02	.81
RU Activities	-1.1	-.10	.85

CHAPTER 5

DISCUSSION, LIMITATIONS, AND IMPLICATIONS

This study has provided the opportunity to test the relative usefulness of eight predictor variables in differentiating between high and low users of nursing research across five types of research use. The results of the study were presented in Chapter 4. In this chapter, the implications of those findings for nursing theory, practice, research, and education are discussed. The discussion is organized by the major variables in the study rather than more traditionally by research questions. Some findings relating to each of the major variables were obtained in answering each of the research questions. Reordering the discussion section by major variables offers an opportunity to consider the findings in a more coherent and cohesive fashion. An overview of the study is presented first.

Overview of the Study

Research utilization is of interest to nursing because nursing is an applied discipline based, at least in part, on the new knowledge discovered and validated through research. There has been considerable evidence accumulated through numerous empirical studies that indicates that nurses, like professionals in many other applied disciplines, do not readily accept and use new information. A variety of reasons have been proposed for nurses' failure to utilize research, including limited availability of quality, clinically-focused research findings; published reports of research that are nearly

incomprehensible to the non-researcher; inadequate organizational support for using new knowledge; and resistance to change.

The research and theory base in research utilization offers support for several types of utilization. Five of these types of use were identified as appropriate outcome measures for this study: cognitive, behavioral, and administrative use of new knowledge, use of research methods, and participation in research utilization activities. All of these types of use have relevance to the clinical practice of nursing.

Many factors have been proposed as influencing the use of research in practice. Of the factors proposed in the literature, eight were selected as predictor variables for this study. They were selected for two main reasons. First, the eight were among those variables measured in the larger study (Research Utilization-Nursing Project) of which this study is a part. Second, seven of the eight identified predictors were ones that received strong support in the literature for their relevance to research utilization. These predictors were individual change factors, position-related change experience, position-related research experience, cosmopoliteness, opinion leadership, organizational change factors, and organizational context. The final predictor variable, education, has received some support in the non-nursing literature, although little in the nursing literature. It is included because the issue of education remains one of interest to the profession.

Most other studies of research utilization in nursing have conceptualized research utilization as an activity occurring on a continuum, ranging from no utilization to high utilization. The studies have therefore used correlational and regression approaches to exploring the relationships between research utilization and a number of other variables. The data presented in Chapter 2

concerning the tendency of subjects to demonstrate similar levels of use across different types of use gives credence to the idea that people may function generally as high or low users of nursing research. Therefore, for this study users were categorized as high, moderate or low for each type of research utilization.

The relationships between the predictor and outcome variables were the subject of four research questions. The relationships were tested using two methods of analysis: t-tests and discriminant function analysis. The results of these analyses were described in Chapter 4. The remainder of this chapter is a discussion of the implications and limitations of the findings. The discussion begins with the eight predictor variables and proceeds to the five outcome variables.

Limitations of the Study

There are several limitations of this study that must be discussed. These limitations fall in three major areas: psychometric limitations; limitations related to variables not measured in the study (notably characteristics of the innovation); and limitations related to information regarding how the subjects identified the innovations they used.

Three of the outcome measures in this study (cognitive, behavioral, and administrative use of new knowledge) were measured using scales composed of four items, each having dichotomous response options. Two of the predictor variables (position-related research experience and change experience) were measured with single items. For all five of these variables, therefore, there was limited ability to discriminate among subjects because of the restriction of range

inherent in the measurement of the variables. Such restriction of range commonly results in dampening the magnitude of associations with other variables.

The second major limitation of this study is that it does not include variables relating to the characteristics of the innovations used by the nurses. Many other studies of research utilization in nursing began with identified innovation(s) (Ketefian, 1975; Kirchhoff, 1982; Brett, 1987; Coyle & Sokop, 1990). This allowed identification of at least some of the characteristics of the innovations. Several of the studies (Brett, 1987; Coyle & Sokop, 1990; Firlit, Walsh, & Kemp, 1987; Stetler, 1985) used the CURN Project criteria (Haller, Reynolds, & Horsley,1979) to select the innovations for inclusion in the study so that, in these studies, even more was known about the innovations. However, because the innovations in all these studies were selected *a priori* by the researchers, little can be inferred from these studies about the ways in which the characteristics of the innovations influenced adoption.

Some characteristics of innovations that lead to adoption are identified repeatedly by nurses and non-nurses alike. These characteristics, originally identified by Rogers (1962) and Glaser (1973), include: (1) relative advantage; (2) complexity; (3) compatibility; (4) trialability; and (5) observability (Crane & Horsley, 1983; Fliegel & Kivlin, 1966; Haller et al., 1979; Horsley & Crane, 1986; Johnston & Oman, 1990; Ketefian, 1980; MacGuire, 1990; Rothman, 1980; Sadowsky & Kunzel, 1986; Seidel, 1981; Stetler & Marram, 1976). These characteristics have consistently been cited as those that make an innovation most appropriate and feasible to adopt.

Another characteristic of innovations, also not measured in this study, is the extent to which the information regarding the innovation is transformed from

the original research report into a form more usable by the target population. Transformation of knowledge is mentioned repeatedly in the literature as one way of encouraging utilization. At its most basic, transformation may simply mean translation into the language and idiom of the target population. However, transformation may go as far as the work done for the CURN Project in which research based knowledge was packaged in clinical protocols that provide interested nurses with explicit guidelines for implementing and testing the innovations in their own practice settings (CURN, 1980-1983).

In the present study, nurses were simply asked to describe briefly one or two research-based innovations they had used in the past year. This means that there is no way to measure the innovations on the criteria described above, and, in fact, each nurse was potentially referencing a different innovation, although there were some duplications. The nurses also were not asked to describe the characteristics of the innovation in any depth or in any consistent way. However, the limitation is perhaps less costly than it seems at first consideration because the nurses were asked to identify a piece of research-based new knowledge that they had in fact used. It may therefore be presumed, with some caution, that the new knowledge had passed some sort of screening. That is, the knowledge can be assumed to have been available, relevant, and usable, or the subjects would not have used it.

The caution required relates to the third major limitation of this study. That is the fact that, given the method of measurement, there is no way to know whether nurses chose to adopt the innovation on their own or were forced to adopt by administrative decree. Since the absence of information leaves open the possibility that the adoption did in fact occur by administrative decree, it is

possible that all other relationships measured for the three outcomes relating to use of new knowledge appear weaker than might actually be the case.

Predictor Variables

Several hypotheses were made about the relationships among the predictor variables and the outcome variables. For these hypotheses, the predictor variables were classed as members of one of two sets. Set A predictor variables were viewed as being associated with the ability of the individual nurse to access research and change her/his own practice. These variables include individual change factors, position-related research experience, cosmopoliteness and education. The second set of predictor variables (Set B) is associated with the ability of the individual nurse to effect change beyond her/himself; that is, to affect the practice of others. These variables include opinion leadership and position-related change experience as well as organizational change factors and organizational context. The findings in relation to these hypotheses will be discussed in the section of this chapter relating to the outcome variables. However, the hypothesized distinctions are useful to keep in mind as the findings related to the predictor variables are discussed.

Education

Education was conceptualized as a Set A variable, that is, as a variable relating to the internal resources of the nurse relative to accessing new knowledge. Thus, it was expected to be basic to all of the five outcome

measures. Indeed, the t-tests showed that nurses scoring high (versus low) for all five types of research use scored significantly higher on education. This difference was greatest for cognitive use of new knowledge and participation in research utilization activities. The difference was smallest for administrative use of new knowledge. However, education entered only one of the stepwise discriminant function analyses, that for cognitive use of new knowledge.

While somewhat encouraging, given the lack of significance regarding education generally found in other nursing research utilization studies, the data in this study indicate that the association of education with research utilization is not great. Some of the limitations discussed earlier in this chapter may enter into the weakness of this finding. Specifically, the inability to distinguish between research utilization that occurs because of individual choice versus that which occurs because of an administrative decision is a seriously confounding factor. There is no reason to expect education to impact research utilization in which the nurse does not participate in decision making. This limitation extends beyond this study to others in nursing research utilization. The impact of the limitation is probably greatest for behavioral and administrative use of new knowledge, the two types of research utilization most likely to occur as the result of an administrative action. A possible interpretation of the findings, therefore, may be that cognitive use of new knowledge, use of research methods, and participation in research utilization activities provide a more accurate picture of the impact of education on research utilization. However, given the consistency of the finding that research utilization has little association with education across other studies of research utilization in nursing, it may be that nursing education as presently offered simply does not have much impact on research utilization.

Another point worthy of consideration concerns the content of the education received by nurses regarding research and research utilization. Education specifically focused on research utilization may be needed to facilitate use of new knowledge, particularly behavioral and administrative use.

Individual Change Factors

Individual change factors was measured using a composite scale that included items from four separate scales in the original RU-N Project questionnaire. Individual change factors was viewed as a Set A variable relating to the resources of the individual for making changes within him/herself. Openness to change at the individual level was seen as fundamental to all types of research utilization. Indeed, scores on individual change factors were significantly different between high and low user groups for all five types of research use and appeared in the stepwise discriminant function equations for all of the outcomes except cognitive use of new knowledge. It appears, therefore, that the openness of the individual toward change is basic to the types of research utilization measured in this study. This finding supports the contention that research utilization is, fundamentally, a special type of change.

The relationship between cognitive use of new knowledge and individual change factors requires some further consideration. It was hypothesized that individual change factors, along with other Set A variables, would be the most influential of the eight predictor variables in relationship to cognitive use of new knowledge. This, however, was not the case. The possible explanations for this finding are explored in the discussion of the findings relating to cognitive use of new knowledge.

Position-Related Research Experience

Position-related research experience was measured using a single item that asked the extent to which the subject was specifically responsible for research-related activities in her/his current (at the time of data collection) role. Position-related research experience was categorized as a Set A variable; that is, relating to the resources of the nurse to access new knowledge and change his/her own practice.

T-tests comparing the position-related research experience of high and low user groups for all five outcome variables were significant. In addition, position-related research experience entered the discriminant function equations for three of the five outcomes (cognitive use of new knowledge, use of research methods, and participation in research utilization activities). The t-values for levels of position-related research experience between high and low user groups for behavioral and administrative use of new knowledge were higher than for other predictor variables that entered the stepwise discriminant function equations for those two outcome variables. Thus, it appears that position-related research experience is highly predictive of research utilization, both when used separately as a predictor and as a predictor in stepwise discriminant function analyses.

This finding makes a certain pragmatic sense. One of the barriers to research utilization consistently identified by practicing nurses is difficulty in obtaining and understanding published research. Experience in research-related activities may enhance nurses' skills in accessing and interpreting research and therefore increase the range of new ideas available to them. It

should be remembered, also, how position-related research experience was operationalized in this study. Subjects were asked the extent to which they were responsible for research-related activities in their jobs. Having research-related activities legitimized by inclusion in a job description should tend to increase the likelihood that a nurse will develop skill in accessing and using research.

Cosmopoliteness

Cosmopoliteness was considered a Set A predictor variable, that is, a variable that related to the ability of the nurse to access new knowledge and change his/her own practice. Cosmopoliteness was the single most significant predictor variable in this study. Not only were scores for nurses in the high versus low user groups significantly different for all five outcome measures, but the t-values were very large.

Cosmopoliteness also enters the equations for the discriminant function analyses for all of the outcome variables. For all of the outcomes except use of research methods, cosmopoliteness enters the equations first. It is the only predictor variable to be found in all five stepwise discriminant function equations.

As noted in the review of literature, there have been three major types of variables identified as influencing research utilization. These are individual factors, organizational factors, and factors relating to the new knowledge itself. While several of the predictor variables may easily be viewed as relating primarily to the individual or the organization, cosmopoliteness (along with opinion leadership) clearly draws from both domains. Individuals must be

personally inclined, on some level, to participate in the behaviors associated with cosmopoliteness. On the other hand, organizational support is often critical in making it possible for an individual to act on this tendency to be cosmopolite. If an organization does not philosophically and practically support nurses in attending conferences, accessing literature, and networking with others, the nurses are less likely to be cosmopolite than if they are supported. It may be that the power of cosmopoliteness as a predictor variable lies in the fact that it draws from these two critical domains. If a person scores high on cosmopoliteness, it may be assumed that the individual is personally inclined to seek out new ideas and is independently able to support the activities associated with cosmopoliteness and/or is organizationally supported in doing so.

Another issue worthy of exploration is the behavioral focus of the scale used to measure cosmopoliteness. All items were worded in terms of what the nurses actually did. The same was true of all of the outcome measures, but of none of the other predictor measures. One truism in the measurement literature is that having done something in the past is the best predictor of the likelihood of doing it in the future. To expand on this theme, behaviors may be the best predictors of behavior. The items used to measure cosmopoliteness all focused on behaviors that might be seen as first steps in the research utilization process, that is, on behaviors that could result in becoming aware of new ideas and how to use them.

Organizational Change Factors

The concept of organizational change factors was measured using a composite scale that included items from four separate scales in the original RU-N Project questionnaire. As with the other predictor variables, members of the high scoring groups for all five types of research use scored significantly higher on organizational change factors than did members of the low scoring groups. In addition, organizational change factors entered the stepwise discriminant function equations for three of the five outcomes (behavioral and administrative use of new knowledge and use of research methods), although for none of the three was it the first to enter the equation.

Again, a word of caution is needed about this scale. Although the scale is titled organizational change factors, it is measured from the perspective of the individual subject. There is no objective measure of the resources, readiness, resistance, or need for change of the organization in question. It is well documented in the measurement literature (and supported in nursing by Champion and Leach, 1989) that perceptions and reality have a relationship that is fuzzy at best. Thus, it is important in considering the significance of organizational change factors to keep in mind that it is perception and not objective reality that was measured.

That said, it does appear that the way in which an organization is perceived differentiates to some extent between high and low users of research in nursing. This may be explained in one of at least three ways. First, it may be supposed that the perceptions do relate strongly to objective reality. In that case, it appears that organizations that are supportive of change provide fertile ground for individuals similarly inclined. Alternatively, nurses who are inclined

toward change may perceive their organizations as similar to themselves and therefore act on that perception. In a similar vein, but somewhat differently, it may be that a nurse's perceptions of support are sufficient in and of themselves, regardless of objective reality, to encourage her/him in research utilization activities. There is little in the literature or in this study to support one of these three possibilities over the others. All that can be said with any authority is that perceptions of organizational orientation to change do have a relationship to research utilization.

Position-Related Change Experience

Position-related change experience was a single item asking the extent to which nurses had responsibility for planned change as part of their current roles (i.e., their work roles at the time of data collection). Change experience was categorized as a Set B variable; that is, relating to the resources of the nurse to influence others to change their practice.

High and low scoring groups for all five types of research utilization outcomes scored significantly differently on change experience. However, for cognitive and behavioral use of new knowledge, this difference was smaller than for the other three types of research use. As regards the stepwise discriminant function analyses, change experience entered the equations for those three outcomes for which the t-tests were significant at the $p \leq .001$ level (administrative use of new knowledge, use of research methods, and participation in research utilization activities). For all of these, it entered at or near the end of the stepwise process. Thus, from both the t-tests and the discriminant function analyses, it appears that change experience is a modestly

useful variable in predicting research utilization. It should be noted, however, that since change experience was measured using a single-item scale, there are some limits in the ability of the scale to discriminate among subjects. Also, people who score high on the scale, indicating that they have formal responsibility for implementing planned change, may also be expected to score high on some of the other predictor variables, notably individual change factors, cosmopoliteness and opinion leadership, all of which correlate with change experience (r= .27 to .31). These two factors taken together (psychometric limitations of the measure and moderate correlation's with other predictors) would indicate that some caution should be exercised before concluding that position-related change experience is one of the less interesting of the predictor variables. In fact, having formal responsibility for planned change, like having formal responsibility for research activities, may be expected to influence research utilization efforts by the individual. A stronger measure or different analytic approach might give better evidence of this relationship.

Opinion Leadership

The scale measuring opinion leadership was an average of four items with Likert-type response options scored from 1 to 5. The scale measured the extent to which a nurse believed that others viewed her/him as an opinion leader. Again, as with organizational change factors, an element of caution is needed. There was no objective measure of whether or not each nurse's peers actually viewed her/him as an opinion leader. Rather, the scale measured the subject's perception of how s/he was regarded. Opinion leadership was

classed as a Set B variable, relating to the resources of the nurse to influence others to change their practice.

For all five types of research utilization outcomes, high users scored significantly higher on opinion leadership than did low users. Although opinion leadership entered the stepwise discriminant function for only two of the outcomes (cognitive use of new knowledge and use of research methods), the t-values for opinion leadership when used separately as a predictor were higher than the t-values for other predictors that did enter the equations for behavioral use of new knowledge and participation in research utilization activities. Thus, the t-tests give evidence for opinion leadership being more important in understanding research utilization than is indicated by the stepwise discriminant function analyses. Examined across the outcomes, opinion leadership is among the top four predictors in terms of variance accounted for on most of the outcome variables in both the two-and three-group analyses but rarely emerges as one of the top one or two predictors.

As with cosmopoliteness, opinion leadership draws from both the individual and organizational domains. While certain behaviors and personality incline one toward opinion leadership, it is also true that opinion leaders tend to reflect the climate of the organization. Thus, in an innovative organization, opinion leaders tend to be more innovative while in a conservative organization, opinion leaders tend to be conservative. Rogers (1983) places opinion leaders in the early adopter category, a key group with respect to supporting and facilitating use of new ideas within an organization. Some of the strength of opinion leadership as a predictor variable may relate to this duality of influences.

It is somewhat surprising, given all the reasons for the potential strength of opinion leadership as a predictor variable, that, except with use of research methods, the opinion leadership performs modestly in this data set in the discriminant function analyses. This limited showing may be accounted for, in part, by the relatively high correlation of opinion leadership with individual change factors (r=.55) and cosmopoliteness (r=.46). However, the fact remains that even on the t-tests, opinion leadership was only a moderate predictor of high versus low use of research in this sample, although theoretically it should have been a very prominent variable in distinguishing high from low users for all types of research utilization requiring change of others. This may reflect a weakness in the measure. Perhaps it is uncomfortable for subjects to acknowledge that they perceive themselves as opinion leaders. It is also possible that the measure (see Appendix A) provided too much discrimination at the top of the range and too little at the bottom. This would tend to limit the range of scores and perhaps blunt some relationships that might otherwise have been found. Also, as has been mentioned before, the inability in this study to distinguish research utilization by the choice of the subjects versus those made by administrative order can be expected to dilute the relationships among all predictors and the three types of use of new knowledge.

A final possibility concerns the fact that this is a measure of the subjects' perceptions rather than the perceptions of their peers. It is likely that the subjects and their peers would have produced different ratings on opinion leadership for some if not most of the subjects. Many studies that have found opinion leadership to be significant as a predictor of research utilization obtained ratings from peers to assign a score. The different approach to

measurement in this study may not have captured the concept as well as a measure of peer perception might have.

Organizational Context

Organizational context was measured by a scale containing four items, each using a Likert-type response format. Organizational context is a variable oriented toward those more enduring aspects of an organization that may reflect openness to new ideas and practices. Thus, for instance, it contains items regarding organizational mission and goals. It is classed as a Set B variable, relating to the implementation of change beyond the level of the individual nurse.

Organizational context, as with other predictor variables, was significantly different between the high and low user groups for all five outcomes. The t-values were significant at $p \leq .001$ except for the difference between high and low user groups for participation in research utilization activities which was significant at $p \leq .01$.

Organizational context did not enter the stepwise discriminant function equations for any of the outcome variables. Of all the correlation's among the predictor variables, the correlation between organizational context and organizational change factors was the highest (r=.81). Thus, it may be that once organizational change factors entered the equations, much of the variance that might have been associated with organizational context was already accounted for. Alternatively, organizational change factors may provide a clearer picture of how participants in this study viewed their organizations. Although such things as missions, goals, and job descriptions are undoubtedly indicative of the

values of an organization, they may not be the things most readily apparent to people working in an organization. For that reason, this measure may be relatively insensitive in measuring the amount of support for innovation that persons in the organization experience.

Outcome Variables

Cognitive Use of New Knowledge

Cognitive use of new knowledge refers to changes in the way a nurse thinks about or perceives her/his practice based on exposure to new knowledge. It is the least visible of the research utilization outcomes as it may occur silently within the individual nurse. While it is possible that a change in the way a nurse thinks about practice may eventually lead to other changes (e.g., changes in behavior or proposed policies), it may not. This relative isolation may make cognitive use of new knowledge the least interesting of the outcome measures to some readers. However, Rogers (1983) identifies awareness as the building block of all other forms of research utilization. Cognitive use indicates awareness at the very least and probably indicates persuasion about the worth of the new knowledge. The persuasion indicated by a high score on cognitive use of new knowledge is only with regard to the theoretical rather than practical value of the new knowledge. An individual may value a new idea sufficiently to allow it to influence his/her thinking while not being persuaded that the idea is appropriate for implementation. It should be recognized, however, that much more published nursing research deals with

ideas and concepts and theories than deals with assessment tools and interventions ready for implementation.

Nursing has paid little attention to cognitive use of new knowledge in previous studies and theoretical writing. Relating cognitive use to awareness and persuasion, however, highlights the importance of this outcome measure. It is likely that many more nurses use knowledge cognitively than any other way, taking the ideas to which they are exposed and using them quietly in the way they think about their practice. Nursing as a profession has spent considerable energy on distancing the profession from the images of "training" and "vocational" as opposed to science-based and professional. It is certainly a mark of the professional that they constantly incorporate new ideas into their practice.

The results of the discriminant function analysis and t-tests provide some useful information about cognitive use of new knowledge as it was operationalized in this study. As hypothesized, it appears that the internal resources of the individual nurse are highly involved in cognitive use of new knowledge. Predictor variables relating to the climate and skills of the individual for change are less involved. If one views cognitive use of new knowledge as a necessary first step to other sorts of use, then it appears that cognitive use may be supported by developing the resources of the individual nurse. Conversely, it is likely that organizational support of change will have little influence on cognitive use of new knowledge in the absence of the personal resources for accessing new knowledge and a personal predisposition to change.

Two predictor variables did not operate as hypothesized in relationship to cognitive use of new knowledge. First, opinion leadership was not

hypothesized to be involved in cognitive use of new knowledge, but both t-tests and discriminant function analysis provide evidence for its importance. If opinion leaders represent the early adopter group as hypothesized by Rogers (1983) and are therefore more innovative than the majority of members in the organization, then it is logical that they should also be more innovative (e.g., have higher scores on cognitive use of new knowledge) in the ways they think about their practice.

Another point worth considering about opinion leadership has to do with the way it was operationalized for this study. The items in this scale asked nurses to give their ratings of the perceptions of others. Thus, a nurse might be asked how often others in her work setting sought her opinion before making up their own minds on an issue. The items therefore were perception and opinion focused and thus could be said to be more cognitive than behavioral. The scale might have functioned differently had the items been asked of the peers of the subjects or had the items been more behaviorally focused. Nurses could have been asked, for instance, "How often have others accepted a practice change that you initiated on your clinical unit?" or other similarly behavioral items. Had this approach been used in scale development, opinion leadership might have been found to have very different relationships to the outcome variables.

The second finding contrary to the hypotheses relates to individual change factors. That variable is a measure of the openness of the individual to change. Because using new knowledge, even cognitively, requires some change, individual change factors was expected to be significant in predicting cognitive use of new knowledge as well as other types of research utilization. In this analysis, individual change factors did not enter the stepwise discriminant function equation for cognitive use of new knowledge although high and low

groups did show a significant difference (t=4.47, $p \leq$.001) on individual change factors. Thus, there is partial support (rather than no support) for the relationship of individual change factors and cognitive use of new knowledge. Its relative weakness (compared to other Set A variables and to opinion leadership) may simply be a matter of the way in which stepwise discriminant function analysis enters variables into the equation. Once some of the other predictors that accounted for more variance were already in the model, there may have been insufficient variance left associated with individual change factors. Stepwise discriminant function strives for the most parsimonious model and in this analysis, individual change factors simply did not account for enough unique variance to enter the model.

An alternative explanation may involve the way individual change factors was operationalized. The items in individual change factors refer primarily to changes in behavior rather than changes in ways of thinking. Thus, the variable individual change factors may not measure the type of change required to change one's thinking about practice.

Behavioral Use of New Knowledge

Behavioral use of new knowledge was measured using a scale containing four dichotomous items that addressed specific types of behavioral use. The behavioral uses addressed were incorporation into practice of a specific assessment tool or a specific intervention based on new knowledge.

Whether one examines the t-tests or the discriminant function analyses, behavioral use of new knowledge is the variable least well accounted for in this study. High versus low behavioral use of new knowledge is associated with

both Set A and Set B predictor variables, yet not strongly with either set nor any other grouping of predictor variables. This may be an effect of the rather restricted way in which behavioral use of new knowledge was measured both conceptually and psychometrically.

Adoption of an actual assessment tool or intervention is a rather large change in practice. Usually this level of change must occur on an organizational or departmental level. It is reasonable, therefore, that organizational change factors, reflecting the perceptions of the nurse regarding the inclination of the organization toward change, would figure in the stepwise discriminant function analysis. What makes less sense is that it entered third and that it had only the fifth highest (out of eight) t-value. This seems to indicate a less important relationship between behavioral use of new knowledge and organizational change factors than might be expected. Indeed, in all analyses, individual change factors and cosmopoliteness were by far the more important predictor variables for behavioral use of new knowledge. While this seems to imply that the access of the individual to new knowledge and the openness of the individual (versus the organization) to change are the major factors in behavioral use of new knowledge, it may be that organizational change is not measured appropriately to capture its relationship to the outcome variables. The impact of organizational change factors may be difficult to capture outside an experimental or quasi-experimental study that manipulates those very factors in the clinical setting.

The understanding of behavioral use of new knowledge that is possible by analyzing these data may also be seriously hampered by another issue mentioned earlier. Behavioral use of new knowledge, and administrative use of new knowledge, are probably the most likely of the outcomes to be impacted by

the nature of the innovation. This group of missing variables, relating to the characteristics of the innovation and to transformation of the research-based knowledge, may show their influence in these two outcomes more than elsewhere, leaving the remaining relationships ambiguous and less clear than could be hoped. Also, as noted previously, behavioral and administrative use of new knowledge are the two types of use most likely to occur because of a system-wide decision rather than because of individual initiative. Studying the individual to understand these changes may therefore be expected to yield results that are somewhat attenuated. Countering this argument, however, is the fact that cognitive use of new knowledge, undoubtedly an individually-based outcome, performed more similarly to the other types of use of new knowledge (behavioral and administrative use) than to the other two outcome variables (use of research methods and participation in research utilization activities). This finding lends weight to the proposal that the difficulties with the three use of new knowledge scales derive, in large part, from their psychometric properties; specifically, from the restriction of range.

Administrative Use of New Knowledge

Administrative use of new knowledge, like behavioral use of new knowledge, was measured by a scale containing four dichotomous items that were averaged to obtain a scale score. These items measured specific types of administrative use of new knowledge. A relatively large number of subjects (122) reported no administrative use of new knowledge as compared to no cognitive use (83) and no behavioral use (96). However, this finding is reasonable as administrative use was narrowly defined as incorporating new

knowledge into new administrative practices or policies, and many of the subjects were not employed in roles in which these behaviors are expected or even possible.

As with behavioral use of new knowledge, the t-tests and discriminant function analyses for administrative use of new knowledge tell somewhat different stories. Opinion leadership, a variable not entering the stepwise discriminant function analysis, showed the second highest t-value (5.72) of the eight predictors; only cosmopoliteness (6.34) is higher. Likewise, position-related research experience has a higher t-value (4.52) than does position-related change experience (4.42) although research experience did not enter the stepwise equation. Indeed, other than education (2.72) and organizational context (3.75), all of the predictor variables have t-values of 4.0 or greater for differences in means between the high and low user groups. This suggests that administrative use of new knowledge, as behavioral use of new knowledge, is more complex than the stepwise discriminant function analysis would seem to indicate. Hypotheses regarding administrative use of new knowledge are supported to the extent that both Set A and Set B predictor variables play a role in explaining high versus low use, but there is little evidence for suggesting that either set of variables is dominant.

Use of Research Methods

Use of research methods was measured by a scale of nine items scored from 0 to 5 on a Likert-type scale and averaged to obtain a scale score. Highly significant differences ($p \leq .001$) between high and low users were found for all eight predictor variables. In addition, the discriminant function equations

offer support for the near-equal importance of the Set A and Set B predictor variables. Thus, the hypotheses made regarding the relationships of the predictor variables to use of research methods is supported. High use of research methods in nursing requires skills and openness of the nurse to new knowledge (Set A) as well as ability to affect the practice of others (Set B).

Use of research methods as a scale has considerably more range and, therefore, greater ability to discriminate among high and low users compared to the three types of use of new knowledge. This range may account for the relatively high predictive strength and low Wilks' Lambdas found for use of research methods.

One confounding issue with this scale may be the roles of the nurse subjects. The items contained in the scale measure behaviors that are commonly seen among nurses functioning in indirect care roles but perhaps less commonly among nurses involved in direct patient care. The findings related to this scale might be very different if these two groups were analyzed separately.

Participation in Research Utilization Activities

Participation in research utilization activities was the only scale in this study that had been used prior to the RU-N Study with a different population of nurses. It is a process-focused scale that measures the extent to which nurses engage in a variety of research utilization activities and behaviors, such as evaluating a new tool for use in practice or rejecting a practice because of new knowledge.

As with previous outcome variables, the results of the t-tests and discriminant function analyses for participation in research utilization activities provide slightly different pictures. Both sets of findings, however, support Hypotheses B and D to the extent that variables from both sets are significantly different between high and low user groups, although in general, Set A variables are more involved in prediction of this variable than are Set B variables. As with most of the previous outcome measures, cosmopoliteness has the highest t-value and figures prominently in the stepwise discriminant function analyses.

Examination of the scale items shows that, of the six items, five could be carried out independently and without interaction with others in the practice setting, although practically speaking, this would be unlikely. Still, subjects who scored high on this scale did not necessarily carry out activities with others. This may account in part for the fact that the relationship of participation in research utilization activities with Set B variables was less than anticipated.

Summary Outcome Variables

There were five outcomes measured in this study, each a different type of research utilization. There is support in research utilization theory for the idea that research may be used in a variety of ways, but most previous studies in nursing have focused on direct application of research findings in practice.

Use of new knowledge was measured in three ways: cognitive use, behavioral use, and administrative use. It was hypothesized that cognitive use would be more associated with predictor variables relating to individual resources for accessing new ideas (Set A) than with predictor variables relating

to individual and organizational resources and climate for change (Set B). Behavioral and administrative use of new knowledge were expected to show more involvement of Set B predictor variables than was cognitive use of new knowledge. The findings of this study indicate that, for use of new knowledge of all three types, the categorization of variables as relating to either individual resources for accessing new ideas or to individual and organizational resources and climate for change is probably an oversimplification.

Examination of the stepwise discriminant function equations for the three types of use of new knowledge would lead one to conclude that these three types of research utilization have little in common regarding predictor variables other than the significance of cosmopoliteness and the fact that all three types of use are best predicted by a combination of Set A and Set B variables. However, the patterns of variance accounted for by the t-tests (Table 27) reveals that, considered independently, the predictors perform similarly for the most part across all three types of use of new knowledge. The similarities among the three types of use of new knowledge may reflect either actual similarity or the effects of the limitations in measurement associated with these three variables or both. Also, only these three outcomes would be directly affected by the missing variables relating to the characteristics of the innovation. These same issues are relevant to the question of why these three outcomes, while similar to one another in many ways, looked so different in the analyses from use of research methods and participation in research utilization activities. These latter two variables are measured with more complex scales and reflect behaviors less related to characteristics of the innovation.

One interesting pattern emerges when use of research methods and participation in research utilization activities are examined simultaneously.

Comparing the two measures to one another, both the t-tests and the discriminant function analyses show participation in research utilization activities to be more associated with Set A variables while use of research methods is more associated with Set B variables. This pattern is not obvious in the analyses themselves, but only in the comparisons of the two outcomes across all predictors.

The limitations of the study discussed in the beginning of this chapter probably account for some of difficulty in predicting all three types of use of new knowledge. Specifically, the restriction of range in the measures, the confounding impact of the unmeasured variables relating to the characteristics of the innovation, and the difficulty in sorting out individual choice in innovation adoption from administrative decree all may have contributed to the limited ability of the available predictors to explain these outcomes. Additionally, the three types of use of new knowledge require reference to a very specific innovation while use of research methods and participation in research utilization activities are broader and more general measures. Most of the predictors were also measured in language that was non-specific with reference to an innovation. This similarity in the nature of the predictor measures and use of research methods and participation in research utilization activities may contribute to the better prediction noted with those two outcomes as compared to the three types of use of new knowledge.

The best predictive equations (stepwise analyses) are sufficiently different for all five outcomes measured to support the assumption that the outcomes are discrete variables. This finding offers confirmation of the conceptualization of research utilization as a complex variable composed of

several distinct types of utilization. This finding is congruent with those reported by Crane (1989) and with the theories of Rogers (1962,1983) and Weiss (1979).

Although use of research methods and participation in research utilization activities were originally conceptualized as outcomes (Horsley, 1985b), it is arguable that they represent a different type of outcome than do the measures of use of new knowledge. They may, perhaps, be considered intermediate outcomes that measure activities that may lead to the more traditional types of research utilization. That is, they may represent the general activities and behaviors that may result in use of specific new knowledge; they may be thought of as means to an end. However, the behaviors measured by these two scales are themselves types of utilization and are behaviors valued by nursing organizations and the nursing profession. The question is whether as outcomes they are different than the use of new knowledge outcomes. It would be useful to do further analyses with this data using use of research methods and participation in research utilization activities as intermediate outcomes or as predictors of other types of use. Analytically, these two options could be approached similarly; the major difference is in the conceptualization of the variables.

Revised Conceptual Framework

The original conceptual framework for this study, depicted in Figure 2, attempted to make a distinction between outcomes that were individually-based and those that require change of others. Predictors were also then designated as either enhancing the internal resources of the nurse to use research or as relating more to the resources of the nurse to influence others to change their

practice. While this framework was not completely refuted, neither did it adequately account for the findings in the study.

Using the original classification of predictors, all outcomes were associated with both types of predictors. It therefore does not seem useful to distinguish among the outcomes. Additionally, cosmopoliteness, along with opinion leadership, is a variable that relates to the communication styles and behaviors of the nurse. These two variables were originally assigned to different predictor sets. In retrospect, this was an unwise decision as the two variables (cosmopoliteness and opinion leadership) are so closely related conceptually and theoretically.

Based on these issues and concerns, then, Figure 3 displays a revised conceptual framework for future work. In this framework, all predictors ultimately work together to predict research utilization behaviors of the nurse; conceptual distinction are made among the types of predictor variables.

Revised Conceptual Framework

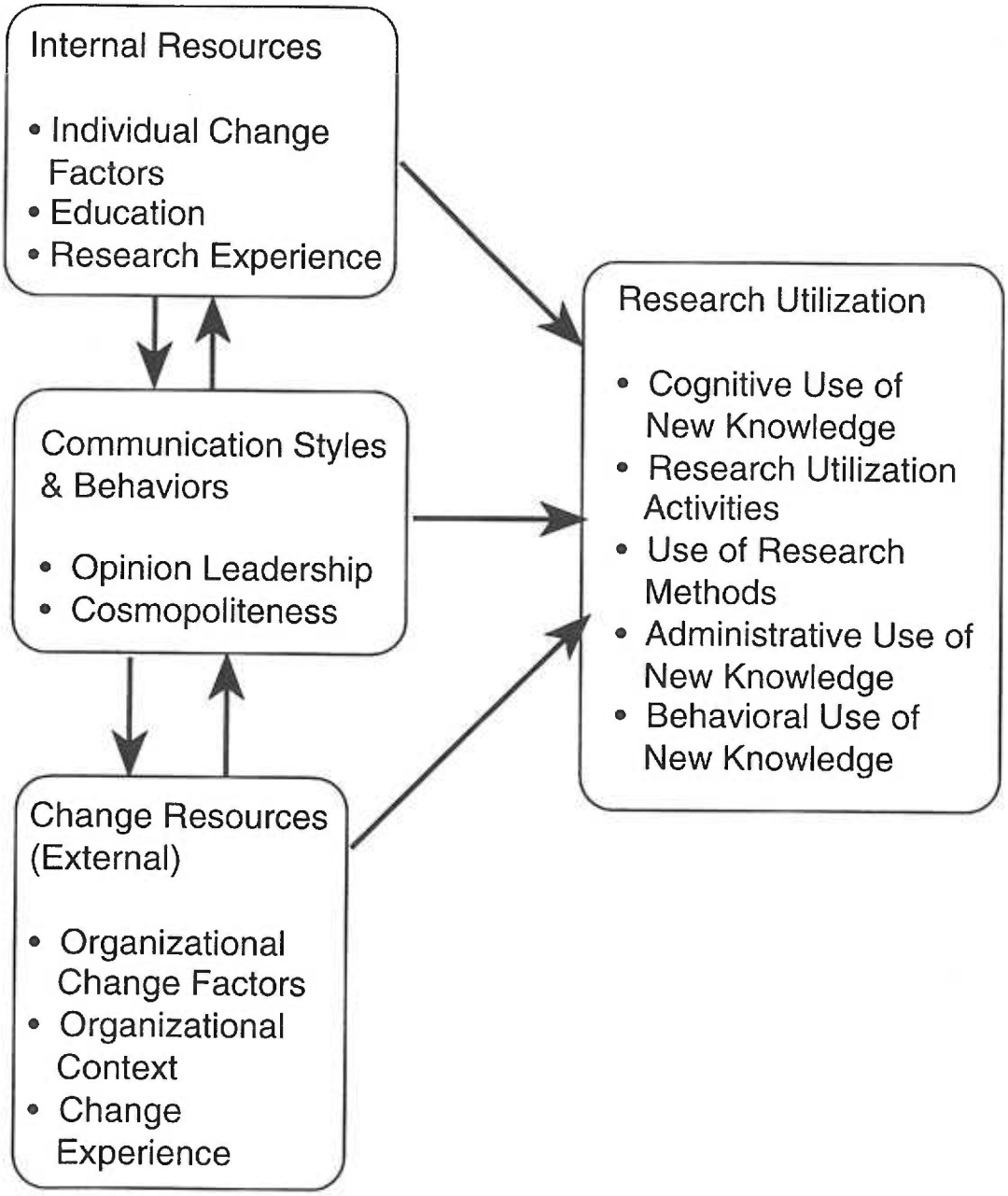

Figure 3. Revised conceptual framework of individual and organizational variables predicting research utilization in nursing.

Implications for Theory

The present study contributes to the existing theory base on research utilization in nursing as well as the broader theory in research utilization generally. The major contribution is the opportunity presented by this study to examine a large group of complex variables related to research utilization. The variations in the predictive equations also give substantial support to the perspective that there are multiple distinct types of research utilization, a theory that has been tested to only a limited extent previously. Other than in previous analyses of the RU-N Project data, this theory has not been tested empirically to such an extent prior to this time.

The analyses also provide evidence of the importance of a number of very different predictor variables. Again, although these variables have all been put forth theoretically as important and have been tested in small sets (e.g., two or three predictors tested in most studies), this study provides an opportunity to examine the utility of a large set of predictors simultaneously. That all were significantly different between high and low user groups contributes substantially to the theory of research utilization.

Accurate prediction of group membership dropped substantially when the attempt was made to categorize the outcome variables into high, moderate and low use rather than into high and low use only. In all likelihood, this is a reflection of the mathematical compromise inherent in transforming scales originally designed to used as a continuum into categorical variables. With high and low user groups only, the compromise was less problematic because the two groups were widely separated on their scores. In moving to three groups,

members of each group were separated from the adjacent group by mere tenths of a point.

The strong predictive power of cosmopoliteness across the five outcomes is another potential contribution to the theory base in research utilization. That finding was so consistent and of such magnitude that it gives substantial evidence for a beginning appraisal of the relative power of the predictors tested in this study. Heretofore, predictors have tended not to be ranked but rather considered as equally important. Clearly the findings of a single study are not sufficient to overturn this model, but they do indicate that it may be time to move on to refinement of the model with regard to the relative contributions of various predictors of research utilization.

Implications for Practice

Nursing practice must change as the research basis for practice changes. The sample for this study was a subset of nurses from the Research Utilization-Nursing Project. Because of this author's interest in clinical practice, the subsample contained only those nurses who, at the time of data collection, identified their primary professional role as including either direct or indirect clinical practice.

This study provides ample support for research utilization being a complex, multifaceted variable. It is clear from the findings that nursing organizations wishing to support research utilization must first define what they mean by utilization in clear terms. Efforts to support utilization can then be designed appropriately to the type of utilization targeted. There is no quick fix for supporting research utilization in an organization.

A better understanding of the factors predicting research use by nurses has the potential to lead to interventions in the practice setting that can enhance research utilization in at least two ways. First, an understanding of factors predicting research use by nurses may lead to better targeted efforts to support research utilization in the clinical setting. Nurses in management, staff development, clinical specialist or clinical research roles may find such an understanding useful in targeting their efforts to encourage research utilization once they have clearly defined the type of utilization they wish to support. Second, if sufficiently strong prediction can be attained, those responsible for hiring and evaluating nursing staff may find it possible to target their employment practices and employee counseling to support research utilization.

Although the results from this study do not yet provide prediction at the level that would be needed to justify making decisions about individual nurses, it has provided some direction for those wishing to encourage research utilization within an organization. Cosmopoliteness has emerged as a highly significant predictor for all types of research utilization. Organizations may be able to actively encourage research utilization through such straightforward approaches as supporting attendance at clinical and research conferences, insuring that copies of appropriate professional journals are readily accessible to nursing staff, and encouraging journal clubs; in short, support of any activities aimed at networking and sharing of ideas. A word of caution is needed here, however. Organizational support of cosmopoliteness is unlikely to be sufficient to result in research utilization in the absence of other active, tangible organizational support.

A second caution is also needed. The literature suggests that cosmopoliteness is to some extent a facet of personality. Therefore,

encouraging cosmopoliteness will be most effective with that group of nurses who already tend toward cosmopoliteness and, in all likelihood, toward utilization of nursing research. The strategies suggested will likely have the effect, therefore, of enhancing the opportunities to use research for nurses who are already inclined in that direction.

Other predictor variables also offer opportunity for nursing administrators to encourage research utilization. Position-related research and change experience were both variables that figured prominently in predicting some types of research utilization. Remembering that both of these variables were operationalized as having accountability for these activities in one's job (i.e., accountability for research-related activities and for planned change), these aspects of practice should be formalized in job descriptions and clinical ladder programs. As preliminary steps to accountability, nurses can be offered opportunities and can be expected to participate in research-related activities at whatever level is appropriate for their education, interest, and experience. Likewise, participation in change efforts should be made available to any who desire to participate, rather than reserving the opportunity to those in the roles traditionally responsible for change in the organization. Research utilization should be recognized as an important aspect of both research and change.

Organizational change factors is an interesting variable to consider from the point of view of an administrator. It should be remembered that this variable reflects the perceptions of nurses about their employing organizations. It would be unwise to assume that merely putting in place organizational supports and systems for positive change will have an impact on how nurses perceive the organization. However, the items contained in the scale measuring organizational change factors are derived from the research and theory base

regarding effective change. A nurse administrator could do worse than to use the items as a guide for the sorts of supports and systems that will support change efforts in the organization, keeping in mind that nurses must also be helped to learn how to use these supports effectively and appropriately. Since research utilization requires change on many levels to be successful, supporting change is an important condition for supporting research utilization.

One potential direction for further research concerns the different roles of the participants in the study. It may be that stronger models can be developed by studying direct and indirect care providers separately. These two groups may be sufficiently different in their use of research that some relationships between the predictors and the outcomes are obscured. For instance, one might suppose that administrative use of new knowledge is a behavior primarily exhibited by nurses in indirect care roles while behavioral use of new knowledge is primarily exhibited by nurses in direct care. If this is true, a re-examination of the data focusing on specific groups of users might yield useful information.

Implications for Education

Perhaps the most directly relevant finding in this study for nurse educators relates to the findings regarding education as a predictor of research utilization. Although previous studies in nursing found little or no relationship, this study provides evidence that education is positively, though weakly, associated with research utilization. Because this finding is contrary to that identified by other researchers, it needs to be substantiated with further empiric evidence, but it is an encouraging finding. Educators have always believed that

higher levels of education prepared nurses for research utilization. This study offers some support for that belief. However, that support is only slight.

The relative weakness of the association between education and research utilization may have its roots in traditional nursing curricula. Research utilization is a distinctly different activity from the conduct of research. However, most nursing curricula stress the conduct of research if they include research at all. Research utilization theory and skills should be emphasized in educational programs. We do not expect nurses to conduct research without training and mentoring. Students also cannot be expected to synthesize the wide range of knowledge and gain the skills needed for research utilization without guidance from people experienced in the field.

Nurse educators, as nurse administrators, may wish to take note of this study in considering the structuring of nursing curricula. One perpetual question in nursing is the level of education at which nurses should begin to participate in research. The findings related to the relative predictive power of having responsibility for research-related activities versus level of education would seem to indicate that the former is of more importance in predicting most types of research use. There seems to be a direction implied for both educators and administrators in this finding.

Educational programs should provide more research-related experience that is similar to that which will be expected of graduates of the program. In a masters' program with an administrative focus, the research coursework might be directed toward quality improvement activities. In an undergraduate program, coursework could be aimed at identifying clinical questions and accessing the research-based literature to obtain answers. In all cases, a part

of the research coursework should be directly concerned with research utilization rather than only with conduct of research.

Directions for Further Research

Although the earlier discussion has alluded to several possibilities for future research, this section will focus on two. These involve further development of the measures used in the study, and testing of the variables included in the study with other populations.

While many of the measures in this study functioned as expected, some appear to be in need of additional refinement. The scales measuring position-related research and change experience are single-item scales and, therefore, have limited ability to discriminate among subjects. Both scales could be expanded by including items that would probe the scope, range, and types of research and change experience referenced in the items. For instance, a scale measuring position-related research experience might contain items regarding whether the subject was responsible for quality improvement programs, conduct of actual research studies, or utilization of research. Similarly, a scale focusing on position-related change experience might probe whether that responsibility extended to a few or many others, whether the responsibility was for support of change efforts or was actual accountability for ensuring that change occurred, and whether the responsibility for identifying the need for change was part of the role. Obviously, while this type of scale revision could enhance the psychometric qualities of the scales, it would make them less useful to non-researchers. A scale containing a single item has great appeal to clinicians and administrators.

The measurement of use of new knowledge might also be addressed in further scale development. In the current form, the scales are weak in terms of both ability to discriminate among subjects and in the range of uses of research measured. Refinement of these scales would proceed in a similar vein to that described for position-related research and change experience. It would be useful to consider whether a broader range of response options might be used with these scales as well. Currently, each item is dichotomous with only yes and no as possible responses. Moving to a Likert-type response format would be costly in terms of the current clarity of the items, but might be something that could be accomplished with careful planning and testing of the new scales. Obviously, any revision of scales would require testing of the new scales, not only for their psychometric qualities but for validity.

The final measurement issue concerns the characteristics of the innovation. While it is undoubtedly useful and more "real" to allow nurses to identify research they have used, it weakens the overall study not to be able to measure relevant aspects and characteristics of the innovation. Development of items to address this issue would be a challenge as the items would have to work across many different types of research findings. However, unless information regarding characteristics of the innovation can be obtained, researchers can only speculate about how those characteristics might have affected the use of the innovation. Included in the characteristics of the innovation should be some indication of whether the subject chose an innovation themselves or whether it was chosen by others in the organization. Perhaps this item should be the basis for placing subjects into two different groups. At least in nursing, we need both people who will seek out new ideas, and people willing to adopt new ideas that are handed to them with instructions

to implement. It may be that these two types of adoption are so different that they should not be studied together. Alternatively, when research utilization occurs in an organizational setting, perhaps these two types of use should be viewed as existing on a continuum rather than as distinctly different.

The second broad area that might be addressed with further research concerns testing of the model both within and beyond the discipline of nursing. Replication of the study with the refinements suggested above would strengthen the evidence of the findings. It would also be useful to do more analyses with nurses with different professional roles.

Although the scales used in this study were developed specifically for use with nurses, the concepts measured are far more universal. It would add greatly to the knowledge base in research utilization if the concepts measured in this study could be measured in other applied disciplines. Many of the scales could be easily adapted to be discipline-neutral. Testing of the relationships explored in this study in social work, medicine, education, clinical psychology, agriculture, and so on, offers the opportunity to move the theory base in knowledge utilization to a new level.

Finally, it is perhaps time in nursing to consider further intervention studies of research utilization in specific organizational settings. The theory base is sufficiently mature to justify such an undertaking. Some of the predictors identified in this study have the potential for direct manipulation or may potentially be affected by manipulation of other factors. Research utilization is of such importance to nursing as a profession that it well behooves us to identify ways in which it may be encouraged and supported in the organizational settings in which so much of nursing practice takes place.

APPENDIX A

ITEMS AND SCALES USED IN THIS STUDY

Research Utilization-Nursing Project

Oregon Health Sciences University

Portland, Oregon

1986

Selected items from the RESEARCH UTILIZATION TRACKING AND DEMOGRAPHIC INSTRUMENT and the RESEARCH UTILIZATION SURVEY which were used in the current study. Used with permission.

Items and Scales Used in Measuring
Predictor Variables

Education

Q34. We'd like to know what educational degrees you've completed. As I read the list, let me know which one(s) apply to you and in what year you completed the program.

Code

1. Associate degree in nursing.....[ ] 19____
2. Diploma in nursing.....[ ] 19____
3. Bachelor's with a major in nursing.....[ ] 19____
4. Bachelor's in another field.....[ ] 19____
   (please specify _____)
5. Master's with a major in nursing.....[ ] 19____
6. Master's in another field.....[ ] 19____
   (please specify _____)
7. Doctorate in nursing.....[ ] 19____
8. Doctorate in another field.....[ ] 19____
   (please specify _____)

Position-Related Change Experience and Research Experience

As you answer the next few questions, think about your current position.

Q10. To what extent are you specifically responsible for implementing planned changes in nursing practice?

1. NOT AT ALL
2. A LITTLE
3. SOMEWHAT
4. A GREAT DEAL

Q11. To what extent do you current responsibilities specifically include research related activities?

1. NOT AT ALL
2. A LITTLE
3. SOMEWHAT
4. A GREAT DEAL

Individual Change Factors

Q19. Now we are interested in knowing how you decide there is a need for change in your practice. To what extent do the statements on the left describe what you do at this time?

		[(please circle your answer)]				
		1	2	3	4	5
B	When I recognize a practice problem, I actively seek a solution to it.	RARELY	SOME TIMES	MOST OF THE TIME	NEARLY ALWAYS	ALWAYS
C	When I learn about a new approach to practice, I try to find out more about it.	RARELY	SOME TIMES	MOST OF THE TIME	NEARLY ALWAYS	ALWAYS
D	When I learn about a new approach to practice, I compare it with my current practice.	RARELY	SOME TIMES	MOST OF THE TIME	NEARLY ALWAYS	AWAYS
E	When I learn about an innovation that will improve my practice, I feel obligated to try it.	RARELY	SOME TIMES	MOST OF THE TIME	NEARLY ALWAYS	ALWAYS
F	When I become convinced that some aspect of nursing practice needs to change, I ry to convince others of that need for change.	RARELY	SOME TIMES	MOST OF THE TIME	NEARLY ALWAYS	ALWAYS

Q20. To what extent do you currenly look for research-based solutions when you identify a practice problem?

1 NOT AT ALL
2 RARELY
3 SOMETIMES
4 FREQUENTLY
5 USUALLY
6 ALWAYS

Q22. Coming back now to the present, we would like to ask you about how you currently respond to new ideas or knowledge.

		[(please circle your answer)]				
		1	2	3	4	5
A	In general, how frequently do you incorprate new ideas into your thinking about clinical practice?	RARELY	SOME TIMES	MOST OF THE TIME	NEARLY ALWAYS	ALWAYS
B	In general, how frequently do you incorporate new ideas into the way you deliver care to patients?	RARELY	SOME TIMES	MOST OF THE TIME	NEARLY ALWAYS	ALWAYS

Q23. Compared to your professional colleagues, how rapidly do you incorporate a new idea into your thinking about practice?

1 ALWAYS FIRST
2 USUALLY FIRST
3 SOMETIMES FIRST
4 USUALLY SECOND OR THIRD
5 MIDDLE OF THE GROUP
6 USUALLY AT END OF GROUP

Q24. Compared to your professional colleagues, how rapidly do you incorporate a new idea into your practice?

1 ALWAYS FIRST
2 USUALLY FIRST
3 SOMETIMES FIRST
4 USUALLY SECOND OR THIRD
5 MIDDLE OF THE GROUP
6 USUALLY AT END OF GROUP

Q28. Assume that you have just learned about an innovation in your specialty area that will necessitate a change in practice.

	How would you rate your current level of knowledge and skill in relation to:	[(please circle your answer) 1	2	3	4	5]
A	Critically reviewing the research reported in the literature?	ESSEN-TIALLY NONE	MINIMAL	SOME BUT NOT ENOUGH	ADE-QUATE	VERY ADE-QUATE
B	Implementing the change in your own professional practice?	ESSEN-TIALLY NONE	MINIMAL	SOME BUT NOT ENOUGH	ADE-QUATE	VERY ADE-QUATE
C	Feeling confident that your interpretation of the innovation accurately repressents the ideas of those who developed it?	ESSEN-TIALLY NONE	MINIMAL	SOME BUT NOT ENOUGH	ADE-QUATE	VERY ADE-QUATE
D	Assisting other nurses to acquire the knowledge and skills necessary to use the innovation?	ESSEN-TIALLY NONE	MINIMAL	SOME BUT NOT ENOUGH	ADE-QUATE	VERY ADE-QUATE
E	Obtaining expert consultation to assist you with your planning?	ESSEN-TIALLY NONE	MINIMAL	SOME BUT NOT ENOUGH	ADE-QUATE	VERY ADE-QUATE
F	Obtaining the approval of various decision makers in your organization who must agree with your plan?	ESSEN-TIALLY NONE	MINIMAL	SOME BUT NOT ENOUGH	ADE-QUATE	VERY ADE-QUATE

Q29. Overall, how would you rate the knowledge and skill you have to carry out a research-based practice change?

1 ESSENTIALLY NONE
2 MINIMAL
3 SOME BUT NOT ENOUGH
4 ADEQUATE
5 VERY ADEQUATE

Q31. Any change has a variety of personal and professional consequences for those affected by it. We are interested in how you typically react to actual and proposed changes in nursing practice.

	[(please circle your answer)]				
	To what extent do the following statements describe you?	1	2	3	4	5
A	When some new idea comes along, you use it for awhile but then you go back to your previous way of doing things.	NOT AT ALL	RARELY	SOME TIMES	NEARLY ALWAYS	ALWAYS
C	You enjoy being involved in changes in practice.	NOT AT ALL	RARELY	SOME TIMES	NEARLY ALWAYS	ALWAYS
D	You are a "doubting Thomas" where change is concerned.	NOT AT ALL	RARELY	SOME TIMES	NEARLY ALWAYS	AWAYS
E	When a change is proposed, you worry that it will affect your role.	NOT AT ALL	RARELY	SOME TIMES	NEARLY ALWAYS	ALWAYS
F	Changes in nursing practice in your organization are difficult for you to accept.	NOT AT ALL	RARELY	SOME TIMES	NEARLY ALWAYS	ALWAYS
G	You resist change because you believe nursing practice is changing too rapidly.	NOT AT ALL	RARELY	SOME TIMES	NEARLY ALWAYS	ALWAYS
H	You worry that proposed changes will cause your current knowledge to become obsolete.	NOT AT ALL	RARELY	SOME TIMES	NEARLY ALWAYS	ALWAYS

Cosmopoliteness

Q33. Nurses use a number of sources to learn about new ideas or innovations.

	[(please circle your answer)]					
	How many times during the past year did you:					
A	Attend professional conferences?	0	1	2	3	4	5 or More
B	Seek out contact with individuals outside your work setting for the purpose of gatherig new ideas?	0	1	2	3	4	5 or More
C	Travel outside your community for professional reasons?	0	1	2	3	4	5 or More

Q34. In the past year, to how many state, regional, and national professional organizations did you belong?

0 NONE
1 ONE
2 TWO
3 THREE
4 FOUR
5 FIVE OR MORE

Q35. How many professional journals do you read on a fairly regular basis?

0 NONE
1 ONE
2 TWO
3 THREE
4 FOUR
5 FIVE OR MORE

Opinion Leadership

Q37. We would like to know about the kinds of informal influence you have in your work setting.

[(please circle your answer)]

	To what extent do the following statements describe you?	1	2	3	4	5
A	Other nurses come to you for information or advice.	NOT AT ALL	RARELY	SOME-TIMES	OFTEN	VERY OFTEN
B	You are able to influence others to change their practice based on your ideas.	NOT AT ALL	RARELY	SOME-TIMES	OFTEN	VERY OFTEN

Q38. To what extent would other nurses in your work setting seek your advice before taking a stand on an issue about which there is disagreement among the staff?

1 NOT AT ALL
2 RARELY
3 SOMETIMES
4 OFTEN
5 VERY OFTEN

Q39. If there were a disagreement among staff members in your work setting, to what extent would other nurses take the same stand you do because you have taken it?

1 NOT AT ALL
2 RARELY
3 SOMETIMES
4 OFTEN
5 VERY OFTEN

Organizational Change Factors

Q42. In this section, several functions are described that an organization might carry out in the process of making changes in nursing practice.

	To what extent does your organization:	[(please circle your answer) 1	2	3	4	5]
A	Use a systematic method for identifying the need for change?	NEVER	RARELY	SOME-TIMES	USUALLY	ALMOST ALWAYS
B	Seek knowledge from external sources about new nursing practices related to identified needs?	NEVER	RARELY	SOME-TIMES	USUALLY	ALMOST ALWAYS
C	Provide ways for nursing staff to learn about new nursing practices?	NEVER	RARELY	SOME-TIMES	USUALLY	ALMOST ALWAYS

43. Now, please think of several new practices or procedures (innovations) which have occurred in your practice setting within the past year.

	To what extent were:	[(please circle your answer) 1	2	3	4	5]
A	Key individuals within the organization convinced of the need for these innovatioins?	NOT AT ALL	A LITTLE	SOME-WHAT	QUITE A BIT	A GREAT DEAL
B	To what extent did the majority of the staff who were affected by the innovations participate in identifying the need for change?	NOT AT ALL	A LITTLE	SOME-WHAT	QUITE A BIT	A GREAT DEAL

Q.46. Returning now to the present time, we would like to know about the climate for change within your current work setting. To what exent do the following statements describe your setting?

		[(please circle your answer)]				
	To what extent do these factors exist?	1	2	3	4	5
A	There is open communication through formal channels	NOT AT ALL	A LITTLE	SOME	QUITE A BIT	A GREAT DEAL
B	There is open communication through informal channels	NOT AT ALL	A LITTLE	SOME	QUITE A BIT	A GREAT DEAL
C	There is administrative support and encouragement for change	NOT AT ALL	A LITTLE	SOME	QUITE A BIT	A GREAT DEAL
D	There is colleague support and encouragement for change	NOT AT ALL	A LITTLE	SOME	QUITE A BIT	A GREAT DEAL
E	There is a history of successful change efforts	NOT AT ALL	A LITTLE	SOME	QUITE A BIT	A GREAT DEAL
F	Members of the organization participate in decision-making	NOT AT ALL	A LITTLE	SOME	QUITE A BIT	A GREAT DEAL
G	When an innovation is implemented, policies and procedures are developed to support the change	NOT AT ALL	A LITTLE	SOME	QUITE A BIT	A GREAT DEAL

Q.48. Now, we would like to find out about the resources available in your current setting.

	To what extent are the following resources available?	[(please circle your answer) 1	2	3	4]
A	Nursing employees who are effective at directing changes in nursing practice	NOT AT ALL	A LITTLE	SOME-WHAT	VERY
B	Funds to hire consultants, if needed, to support innovation projects	NOT AT ALL	A LITTLE	SOME-WHAT	VERY
C	Library resources	NOT AT ALL	A LITTLE	SOME-WHAT	VERY
D	Clinically expert staff members who can assist with nursing practice innovations	NOT AT ALL	A LITTLE	SOME-WHAT	VERY
E	Researchers who can assist with nursing practice innovations	NOT AT ALL	A LITTLE	SOME-WHAT	VERY
F	Funds to send nursing staff members to professional meetings	NOT AT ALL	A LITTLE	SOME-WHAT	VERY
G	Release time for staff participation in change efforts	NOT AT ALL	A LITTLE	SOME-WHAT	VERY

Q.50. Now think about your current work setting and tell us how much you agree or disagree with each statement listed below.

	Statements	[(please circle your answer) 1	2	3	4	5	6]
A	My organization rarely rewards or recognizes its employees for being innovative.	STRONGLY DISAGREE	DISAGREE	SLIGHTLY DISAGREE	SLIGHTLY AGREE	AGREE	STRONGLY AGREE
B	My colleagues rarely reward or recognize their co-workers for being innovative.	STRONGLY DISAGREE	DISAGREE	SLIGHTLY DISAGREE	SLIGHTLY AGREE	AGREE	STRONGLY AGREE
C	Once the administration decides to change something, the change occurs even if the rest of the staff don't want to change.	STRONGLY DISAGREE	DISAGREE	SLIGHTLY DISAGREE	SLIGHTLY AGREE	AGREE	STRONGLY AGREE
D	Key people (administrators and others) in my setting lack interest in identifying better ways of doing things.	STRONGLY DISAGREE	DISAGREE	SLIGHTLY DISAGREE	SLIGHTLY AGREE	AGREE	STRONGLY AGREE
E	When outside experts present new approaches for patient care, staff members usually believe that what they are already doing is as good or better than the new approach.	STRONGLY DISAGREE	DISAGREE	SLIGHTLY DISAGREE	SLIGHTLY AGREE	AGREE	STRONGLY AGREE
F	Activities, procedures and attitudes are cemented in my organization.	STRONGLY DISAGREE	DISAGREE	SLIGHTLY DISAGREE	SLIGHTLY AGREE	AGREE	STRONGLY AGREE
G	Frustration and difficulty are encountered by staff members when they try to change practice.	STRONGLY DISAGREE	DISAGREE	SLIGHTLY DISAGREE	SLIGHTLY AGREE	AGREE	STRONGLY AGREE

Organizational Context

Q.52. We are also interested in knowing about the philosophy and goals of your current work setting. To what extent do you agree or disagree with each of the following statements?

	Statements	[(please circle your answer) 1	2	3	4	5	6]
A	The goals of my organization clearly support innovation and change in relation to nursing practice.	STRONGLY DISAGREE	DISAGREE	SLIGHTLY DISAGREE	SLIGHTLY AGREE	AGREE	STRONGLY AGREE
B	Values supporting change are evident in the decisions in my organization.	STRONGLY DISAGREE	DISAGREE	SLIGHTLY DISAGREE	SLIGHTLY AGREE	AGREE	STRONGLY AGREE
C	The goals of my organization support research activities as they relate to its practice mission.	STRONGLY DISAGREE	DISAGREE	SLIGHTLY DISAGREE	SLIGHTLY AGREE	AGREE	STRONGLY AGREE
D	Job descriptions include statements that make paricipation in practice change efforts a legitimate part of one's work.	STRONGLY DISAGREE	DISAGREE	SLIGHTLY DISAGREE	SLIGHTLY AGREE	AGREE	STRONGLY AGREE

Cognitive, Behavioral, and Administrative Use of New Knowledge

We would like to know whether you have tried to use other research-based information in your practice since you participated in _____. "Other research-based information" refers to innovations that were based on research and that were different from the innovation you learned about at _____; they are referred to here as new knowledge/innovations.

Q62. How many times have you deliberately incorporated <u>new</u> research-based knowledge/innovations in your practice activities since you participated in _____? (Please circle your answer.)

0----------[If 0, please go to Q68.]
1
2
3
4
5 OR MORE

Q63. To the best of your ability, please give a brief description for two of these innovations that you can recall at this time, and tell us where you learned about them. If you can only recall one, please describe it. (Place your answer(s) on the lines below.)

	<u>Description</u>	Source of <u>Information</u>	Year <u>Used</u>
A.	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
B.	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____

Q64. We would like to learn how you used the new knowledge/innovations. We have listed the various ways knowledge/innovations are used and provided two columns for marking the answers. The columns are headed by letters signifying the innovations you listed in Q63. Please place a key word representing each innovation at the head of each column. We promise this is the last time for this question.

Please indiate how you used innovations A and B by circling YES or NO in the appropriate columns for each innovation	Innovation A (key word) 1	Innovation A (key word) 0	Innovation B (key word) 1	Innovation B (key word) 0
A. The knowledge/innovation changed the way you thought about the assessment data you collected on your patients/ clients.	YES	NO	YES	NO
B. The knowledge/innovation changed the way you thought about the nursing interventions you used with your patients/ clients.	YES	NO	YES	NO
C. The knowledge/innovation contained a specific assessment tool(s) that you used when assessing your patients/ clients.	YES	NO	YES	NO
D. The knowledge/innovation contained a specific nursing interventions you used with your patients/ clients.	YES	NO	YES	NO
G. The knowledge/innovation was incorporated in new administrative practices.	YES	NO	YES	NO
H. The knowledge/innovation was incorporated in policies regarding the care of patients/clients.	YES	NO	YES	NO

Use of Research Methods

We would like to know how much you use research process knowledge and skills in your current practice activities. Answer in relation to your work experience only, not activities primarily relating to school/degree requirements. For the purpose of these questions, we would like you to think about the past year only.

Q72. During the past 12 months, how many times have you:

		[(please circle your answer)]					
		0	1	2	3	4	5
A	Identified and selected a new assessment tool for your practice?	0	1	2	3	4	5 or MORE
B	Raised questions regarding the accuracy or reliability of clinical measurement instruments used in your practice setting?	0	1	2	3	4	5 or MORE
C	Raised questions regarding the inter-observer (inter-rater) reliability of clinical observations made by yourself or your colleagues?	0	1	2	3	4	5 or MORE
D	Designed a survey to obtain the opinions/perceptions of staff members or patients?	0	1	2	3	4	5 or MORE
E	Raised questions regarding the accuracy or completeness of clinical data recorded on patient records?	0	1	2	3	4	5 or MORE
F	Assisted with the actual collection of data to evaluate practice?	0	1	2	3	4	5 or MORE
G	Assisted with the analysis of evaluation data?	0	1	2	3	4	5 or MORE
H	Assisted in designing an evaluation of a nursing practice change?	0	1	2	3	4	5 or MORE
I	Assisted in designing a quality assurance study?	0	1	2	3	4	5 or MORE

Participation in Research Utilization Activities

Q84. We are interested in knowing how often you have engaged in the following research activities during the past year. Indicate the number of times you have engaged in each activity in the circles provided in the right-hand column (A-F). Include activities that you did alone or as part of a group; estimate the number if necessary.

	Research Activities	[(times in past year)]			
		0	1	2	3
A	You attended research conferences and heard about new studies.	0	1	2-4	5 or MORE
B	You reviewed research literature in an effort to identify new knowledge for use in your practice.	0	1	2-4	5 or MORE
C	You evaluated a research study to determine its value for practice.	0	1	2-4	5 or MORE
D	You transferred the knowledge included in the results of the research studies into useful practice activities.	0	1	2-4	5 or MORE
E	You planned for the implementation and evaluation of new research-based practices.	0	1	2-4	5 or MORE
F	You discontinued or rejected a practice activity because of knowledge included in the results of research studies	0	1	2-4	5 or MORE

APPENDIX B

Supplementary Tables

Table D–1

Correlations among research utilization outcome measures

	Cognitive	Behavioral	Administrative	Use of Methods	Participation in RU
Cognitive	--	.76*	.62*	.31*	.48*
Behavioral		--	.63*	.31*	.39*
Administrative			--	.36*	.41*
Use of Methods				--	.54*
Participation in RU					--

* $p \leq .0001$

Table D–2

Correlations among research utilization outcome measures and predictor variables

	Cognitive	Behavioral	Administrative	Use of Methods	Participation in RU
Education	.30***	.18*	.16*	.18*	.38***
Individual Change	.27***	.33***	.31***	.45***	.40***
Research Experience	.35***	.23***	.24***	.36***	.47***
Cosmopo-liteness	.37***	.32***	.35***	.43***	.54***
Organizational Change	.19**	.19**	.22***	.34***	.18*
Change Experience	.17*	.16*	.24***	.30***	.26***
Opinion Leadership	.29***	.28***	.33***	.45***	.33***
Organizational Context	.19**	.18*	.19**	.29***	.14*

* $p \leq .01$
** $p \leq .001$
*** $p \leq .0001$

Table D–3

Correlations among predictor variables

	Education	Individual Change	Research Experience	Cosmopo-liteness
Education	—	.24***	.44***	.39***
Individual Change		—	.26***	.42***
Research Experience			—	.43***
Cosmopo-liteness				—
Organizational Change	.12*	.31***	.18*	.25***
Change Experience	.04	.24***	.29***	.25***
Opinion Leadership	.15*	.55***	.22***	.46***
Organizational Context	.14	.30***	.20**	.19**

* $p \leq .01$
** $p \leq .001$
*** $p \leq .0001$

Table D–3

Correlations among predictor variables (continued)

	Organizational Change	Change Experience	Opinion Leadership	Organizational Context
Organizational Change	--	.23***	.27***	.81***
Change Experience		--	.27***	.16*
Opinion Leadership			--	.17*
Organizational Context				--

* $p \leq .01$
** $p \leq .001$
*** $p \leq .0001$

BIBLIOGRAPHY

Argyris, C. (1958). Some problems conceptualizing organizational climate: a case study of a bank. Administrative Science Quarterly, 2(4), 501-520.

Baldridge, J. V., & Burnham, R. A. (1975). Organizational innovation: Individual, organizational, and environmental impacts. Administrative Science Quarterly, 20, 165-176.

Barton, K., Grieshop, J. L., Miyao, G., & Zalom, F. G. (1990). Farmers' personality related to implementation of agricultural innovations. Knowledge: Creation, Diffusion, Utilization, 12(3), 3-13.

Brett, J. L. (1987). Use of nursing practice research findings. Nursing Research, 36(6), 344-349.

Brett, J. L. (1989). Organizational integrative mechanisms and adoption of innovations by nurses. Nursing Research, 38(2), 105-110.

Brooten, D. A. (1982). Is soft sell enough? Nursing Research, 31(4), 195.

Buckwalter, K. C. (1985). Is nursing research used in practice? In J. C. McCloskey & H. K. Grace (Eds.), Current Issues in Nursing (pp. 110-123). Boston: Blackwell Scientific Publications.

Bulmer, M. (1981). Applied social research: a reformulation of applied and enlightenment models. Knowledge: Creation, Diffusion, Utilization, 3(2), 187-209.

Butts, P. A. (1982). Dissemination of nursing research findings. Image, 14(2), 62-65.

Call, V. P., Otto, L.B., & Spenner, K.I. (1982). Tracking respondents: A multi-method approach. Lexington, MA: Lexington.

Champion, V. I., & Leach, A. (1989). Variables related to research utilization in nursing: an empirical investigation. Journal of Advanced Nursing, 14, 705-710.

Coyle, L. A., & Sokop, A. G. (1990). Innovation adoption behavior among nurses. Nursing Research, 39(3), 176-181.

Crane, J. (1985). Research utilization: theoretical perspectives. Western Journal of Nursing Research, 7(2), 261-268.

Crane, J. (1989) Factors Associated with the Use of Research-Based Knowledge in Nursing. Dissertation, University of Michigan.

Crane, J., & Horsley, J. A. (1983). Research innovations in nursing: implications for quality assurance programs. In R. D. Luke, J. C. Krueger, & R. E. Modrow (Eds.), Organization & Change in Health Care Quality Assurance (pp. 171-182). Rockville, MD: Aspen.

Crane, J., Horsley, J. A., Stewart, B., & Shepherd, P. (1992). Evaluation of the research utilization survey: an instrument measuring factors associated with research utilization. Unpublished.

CURN Project (1980-1983). Using Research to Improve Nursing Practice. New York: Grune & Stratton.

Structured Preoperative Teaching (1980)
Reducing Diarrhea in Tube-fed Patients (1981)
Preoperative Sensory Preparation to Promote Recovery (1981)
Preventing Decubitus Ulcers (1981)
Closed Urinary Drainage Systems (1981)
Intravenous Cannula Change (1981)
Distress Reduction through Sensory Preparation (1981)
Pain: Deliberative Nursing Practice (1982)
Mutual Goal Setting in Patient Care (1982)

Clean Intermittent Catheterization (1982)

Firlit, S. L., Walsh, M., & Kemp, M. G. (1987). A survey of research utilization content in master's degree programs. Western Journal of Nursing Research, 9(4), 612-616.

Fliegel, F., & Kivlin, J. E. (1966). Attributes of innovations as factors in diffusion. American Journal of Sociology, 72(3), 235-248.

Friedman, M. A., & Farag, Z. E. (1991). Gaps in the dissemination/knowledge utilization base. Knowledge: Creation, Diffusion, Utilization, 12(3), 266-288.

Funk, S. G., Champagne, M. T., Wiese, R. A., & Tornquist, E. (1991). Barriers to using research findings in practice: the clinician's perspective. Applied Nursing Research, 4(2), 90-95.

Glaser, E. M. (1973). Knowledge transfer and institutional change. Professional Psychology, 4, 434-444.

Glaser, E. M., Abelson, H. H., & Garrison, K. N. (1983a). Factors influencing knowledge utilization and change. In E. M. Glaser, H. H. Abelson, & K. N. Garrison (Eds.), Putting Knowledge to Use (pp. 23-25). San Francisco: Jossey-Bass Publishers.

Glaser, E. M., Abelson, H. H., & Garrison, K. N. (1983b). Personal and social influences. In E. M. Glaser, H. H. Abelson, & K. N. Garrison (Eds.), Putting Knowledge to Use San Francisco: Jossey-Bass Publishers.

Hage, J., & Aiken, M. (1967). Program change and organizational properties: A comparative analysis. American Journal of Sociology, 72, 516-517.

Haller, K. B., & Reynolds, M. A. (1986). A case for replication in nursing -- Part 2. Western Journal of Nursing Research, 8(2), 240-252.

Haller, K. B., Reynolds, M. A., & Horsley, J. A. (1979). Developing research-based innovation protocols: process, criteria, and issues. Research in Nursing and Health, 2, 45-51.

Havelock, R. G. (1969). Planning for innovation through dissemination and utilization of knowledge. Ann Arbor, MI: The Institute for Social Research, The University of Michigan.

Havelock, R. G. (1973). A Change Agent's Guide to Innovation in Education. Englewood Cliffs, NJ: Educational Technology Publications.

Hefferin, E. A., Horsley, J. A., & Ventura, M. R. (1982). Promoting research-based nursing: the nursing administrator's role. Journal of Nursing Administration, 12(5), 34-41.

Hodgman, E. C. (1979). Closing the gap between research and practice: changing the answers to the 'who', the 'where' and the 'how' of nursing research. International Journal of Nursing Studies, 6, 105-110.

Horsley, J. A. (1985a). The current context. Western Journal of Nursing Research, 7(1), 135-139.

Horsley, J. A. (1985b). Grant application: Research Utilization - Nursing. No. Oregon Health Sciences University, Portland, OR.

Horsley, J. A., & Crane, J. (1986). Factors associated with innovation in nursing practice. Family & Community Health, 9(1), 1-11.

Horsley, J. A., Crane, J., & Bingle, J. D. (1978). Research utilization as an organizational process. Journal of Nursing Administration, 8, 4-6.

Huberman, M. (1987). Steps toward an integrated model of research utilization. Knowledge: Creation, Diffusion, Utilization, 8(4), 586-611.

Hunt, J. (1981). Indicators for nursing practice: the use of research findings. Journal of Advanced Nursing, 6, 189-194.

Hunt, M. (1987). The process of translating research findings into nursing practice. Journal of Advanced Nursing, 12, 101-110.

Janken, J. K., Dufault, M. A., & Yeaw, E. M. S. (1988). Increasing student/staff nurse awareness of the relevancy of research to practice. Journal of Professional Nursing, 4(3), 186-191.

Johnston, W. P., & Oman, R. C. (1990). Overcoming resistance to change. Knowledge: Creation, Diffusion, Utilization, 11(3), 268-279.

Ketefian, S. (1975). Application of selected nursing research findings into nursing practice: a pilot study. Nursing Research, 24(2), 89-92.

Ketefian, S. (1980). Using research in practice: selected issues in the translation of research to nursing practice. Western Journal of Nursing Research, 2(1), 429-431.

King, D., Barnard, K. E., & Hoehn, R. (1981). Disseminating the results of nursing research. Nursing Outlook, 164-169.

Kirchhoff, K. T. (1981). An examination of the physiologic basis for "coronary precautions". Heart & Lung, 10(5), 874-879.

Kirchhoff, K. T. (1982). A diffusion survey of coronary precautions. Nursing Research, 31(4), 196-201.

Krueger, J. C. (1978). Utilization of nursing research: the planning process. Journal of Nursing Administration, 8(1), 6-9.

Krueger, J. C., Nelson, R. & Wolanin, M. (1978). Nursing Research: Development, Collaboration, & Utilization. Germantown, MD.: Aspen.

Larsen, J. K. (1980). Knowledge utilization: What is it? Knowledge: Creation, Diffusion, Utilization, 1(3), 421-442.

Larsen, J. K. (1986). Critical variables in utilization research. In G. M. Beal, W. Dissanayake, & S. Konoshima (Eds.), Knowledge Generation, Exchange, and Utilization (pp. 345-367). Boulder, CO: Westview Press.

Lawrence, P. R., & Lorsch, J. (1967). Differentiation and integration in complex organizations. Administrative Science Quarterly, 61.

Lindeman, C. A. (1984). Dissemination of nursing research. Image, 16(2), 57-58.

MacGuire, J. M. (1990). Putting nursing research findings into practice: research utilization as an aspect of the management of change. Journal of Advanced Nursing, 15, 614-620.

Mansfield, E. (1963). The speed of response of firms to new techniques. Quarterly Journal of Economics(May), 293-304.

Mercer, R. T. (1984). Nursing research: The bridge to excellence in practice. Image, 16(2), 47-51.

Miller, J. R., & Messenger, S. R. (1978). Obstacles to applying nursing research findings. American Journal of Nursing, ***(April 1978), 632-634.

Mohr, L. (1969). Determinants of innovation in organizations. American Political Science Review, 63(1), 111-126.

Reynolds, M. A., & Haller, K. B. (1986). A case for replication in nursing -- Part 1. Western Journal of Nursing Research, 8(1), 113-116.

Rich, R. F. (1975). Selective utilization of social science related information by federal policy makers. Inquiry, 13(3).

Rogers, E. M. & Shoemaker, F. F. (1971). Communication of Innovations. New York: The Free Press.

Rogers, E. (1973). ???? .

Rogers, E. M. (1962). Diffusion of Innovations. New York: The Free Press.

Rogers, E. M. (1983). Diffusion of Innovations (3rd ed.). New York: The Free Press.

Rogers, E. M., & Agarwala-Rogers, R. (1976). Communication in Organizations. New York: The Free Press.

Rothman, J. (1980). Social R & D: Research and Development in the Human Services. Englewood Cliffs, N. J.: Prentice-Hall, Inc.

Rothman, J. (1986). The research and development model of knowledge utilization: process and structure. In G. M. Beal, W. Dissanayake, & S. Konoshima (Eds.), Knowledge Generation, Exchange, and Utilization (pp. 151-182). Boulder, CO: Westview Press.

Ruscoe, G. C., & Miller, S. K. (1991). The dilemmas of change. Knowledge: Creation, Diffusion, Utilization, 13(2), 170-192.

Sadowsky, D., & Kunzel, C. (1986). Acquisition of knowledge about innovation in patient management. Knowledge: Creation, Diffusion, Innovation., 7(3), 291-302.

Seidel, A. D. (1981). Underutilized research. Knowledge: Creation, Diffusion, Utilization, 3(2), 233-248.

Shepard, H. A. (1967). Innovation-resisting and innovation producing organizations. Journal of Business, 40(4), 470-477.

Stetler, C. B. (1985). Research utilization: defining the concept. Image, 17(2), 40-44.

Stetler, C. B., & Marram, G. (1976). Evaluating research findings for applicability in practice. Nursing Outlook, 4(9), 559-563.

Tabachnick, B. G. & Fidell, L. S. (1983). Using Multivariate Statistics. New York: Harper & Row.

Vaz, D. (1986). An investigation of the usage of the periodical literature of nursing by staff nurses and nursing administrators. Journal of Continuing Education in Nursing, 17(1), 22-26.

Weiss, C. H. (1979). The many meanings of research utilization. Public Administration Review, 39(5), 426-431.

Zaltman, G., Duncan, R., & Holbek, J. (1973). Innovations and Organizations. New York: John Wiley & Sons.