New Evidence on Instrumental, Conceptual, and Symbolic Utilization of University Research in Government Agencies

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This article addresses three questions: What is the extent of instrumental, conceptual, and symbolic use of university research in government agencies? Are there differences between the policy domains in regard to the extent of each type of use? What are the determinants of instrumental, conceptual, and symbolic use of university research? Based on a survey of 833 government officials, the results suggest that (1) the three types of use of research simultaneously play a significant role in government agencies, (2) there are large differences between policy domains in regard to research utilization, and (3) a small number of determinants explain the increase of instrumental, conceptual, and symbolic utilization of research in a different way.

Keywords: *research utilization; instrumental use; conceptual use; symbolic use; ordered logit*

This article addresses three questions that have been recurring in this journal: What is the extent of instrumental, conceptual, and symbolic use of university research in government agencies? Are there differences between the policy domains in respect to the extent of instrumental, conceptual, and symbolic use? What are the determinants of instrumental, conceptual, and symbolic use of university research? In many countries, the transfer and the

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uptake of university research have become a "hot topic" for major research funding agencies. In fact, it seems that there is a growing consensus on the need for a revised "social contract" between university research on one hand and the state on the other hand (Gibbons et al. 1994; Guston and Keniston 1994; Martin 2003; Rich 2002). The revised social contract implies that researchers and universities should produce more and more research targeting the needs of society while devoting less energy to the production of knowledge "for its own sake" (Martin 2003). The process of revising the social contract of publicly funded research breathes new life into the old discussion between science and policy, which is "much in vogue in some Western countries, most noticeably in Britain and North America" (Berridge and Stanton 1999, 1133). In these countries, there is a growing number of scholarly papers in which authors investigate the process of research transfer and/or research uptake.

One of the main questions that authors in the field of knowledge uptake/knowledge transfer are addressing is how and for what purpose research knowledge is used in public or private organizations (Caplan 1980; Knorr 1977; Pelz 1978; Weiss 1980; Weiss and Bucuvalas 1980). In the past, some authors like Merton (1949) and Williams (1953) identified many social research functions, but the main discussion in the field remains centered around the following three types of research use: the instrumental use, conceptual use, and symbolic use (Anderson et al. 1999; Beyer 1997; Innvaer et al. 2002; Lavis et al. 2003).

There is still a debate in the field on the purpose for which university research is used in organizations located outside the scholarly community. This debate can be traced back to the end of World War II, when program evaluators started to complain about the fact that their recommendations were carrying no concrete impact on policy decisions (Caplan 1980; Weiss 1986). As Weiss (1986) pointed out, "Programmes that evaluators had found relatively ineffective . . . were continued and even expanded, [and] programmes that evaluators had found effective . . . were cut back" (p. 216). At that time, expectations of program evaluators and university researchers were that decisionmakers would have made direct use of their research results and that policy decisions should always be based on research evidence. In other words, researchers were expecting that their findings would be used instrumentally by decisionmakers. In the 1970s and the 1980s, some

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researchers began to challenge the instrumental view of research utilization (Caplan 1980; Cohen and Garet 1975; Feldman and March 1981; Knorr 1977; Lindblom and Cohen 1979; Pelz 1978; Rich 1975, 1977; Weiss 1979, 1980; Weiss and Bucuvalas 1980), arguing that university research may, in fact, be useful for other purposes, such as for general enlightenment (conceptual use) and/or for legitimating and sustaining predetermined positions (symbolic use). Whether such types of research utilization occur frequently, whether their occurrence varies among different policy domains, and whether these types of research utilization are predicted by the same determinants, however, have not yet been studied systematically. This article seeks to respond to the need for such a systematic study.

The remainder of this article is organized into six sections. In the next section, we define the instrumental, conceptual, and symbolic types of research utilization. A review of empirical studies that deal with the types of research utilization is presented in the second section. The third section presents the categories of factors that allow explaining the intensity of research use in government agencies. The fourth section presents and describes the data used in this study. The results of the statistical analysis are presented in the fifth section. The final section summarizes and discusses the results and their limits, and it derives implications for future research and policy makers.

Instrumental, Conceptual, and Symbolic Use of Research

In a recent essay, J. M. Beyer (1997) summarizes the three types of research use in the following way:

> Research on the utilization of research findings has revealed three types of use: instrumental, conceptual, and symbolic. Instrumental use involves applying research results in specific, direct ways. Conceptual use involves using research results for general enlightenment; results influence actions but more indirectly and less specifically than in instrumental use. Symbolic use involves using research results to legitimate and sustain predetermined positions. (P. 17)

The debate on the frequency of these three types of research use has been largely influenced by the way researchers conceptualize the decision-making process (Albaek 1995; Weiss 1979). In the first place, "direct, demonstrable, *instrumental use* of the research to solve clearly predefined problems, is predicated on the actual existence of a rational decision-making process" (Albaek 1995, 85). This conception of research utilization has also been called the problem-solving model (Weiss 1979). In this model,

> the decision drives the application of research. A problem exists and a decision has to be made, information or understanding is lacking either to generate a solution to the problem or to select among alternative solutions, research provides the missing knowledge. With the gap filled, a decision is reached. (Weiss 1979, 427)

The instrumental view of research utilization, which was dominant in the early stage of the field, has been severely criticized for its lack of realism. In their study on the utilization of social science knowledge in policy decisions at the U.S. national level, Caplan, Morrison, and Stambaugh (1975) found that 40 percent of the use was instrumental. Such findings suggest that research evidence may on occasion lead to direct concrete impact on policy decisions. In fact, the main argument that is promoted by the critics of the instrumental view of research use is that university research may also perform other functions in the decision-making process (Weiss and Bucuvalas 1980).

An alternative way to conceptualize the decision-making process and the role that university research performs in it is to refer to the garbage-can model of decision-making (Albaek 1995; Cohen, March, and Olsen 1972). This model makes the assumption that the decision-making process is more often anarchic and unpredictable than well ordered and predictable as the rational decision-making model predicts. In contrast with the rational model, the garbage-can model supposes that "problems, solutions and choice opportunities are conceptually separate from the actors in an organization, and can be analyzed independently of them" (Albaek 1995, 84). As a consequence, actors who are involved in the decision-making process are not always able to guide the process in the way they want. According to the garbage-can model, decisionmakers will use university research in a diffuse and indirect way rather than in an instrumental and direct way. Contrary to what has been found in the private sector (Deshpande 1983), it is now widely assumed that social science research is more often used conceptually than instrumentally in government agencies (Lindblom and Cohen 1979; Rich 1977; Weiss 1979, 1980, 1986; Weiss and Bucuvalas 1980). For example, Caplan, Morrison, and Stambaugh (1975) found that 60 percent of decisionmakers used research evidence conceptually.

Besides the instrumental and conceptual use of research, some authors have stressed the fact that decisionmakers can also use research symbolically, which is for confirming the programs that they wish to promote (Beyer 1997; Beyer and Trice 1982; Feldman and March 1981; Knorr 1977; Lavis et al. 2003; Pelz 1978). As with the instrumental and conceptual use, *symbolic use* of research can also be linked to a decision-making theory. In this case, we may refer to the *bargaining-conflict model* of decision making (Albaek

1995) or to the *political model*, which describes situations in which research is used as *political ammunition* (Weiss 1979). Some authors support the view that the symbolic use of information "reflects bad use of knowledge, while instrumental and conceptual use reflects distinct but nevertheless 'good' applications of information" (Souchon and Dianmantopoulos 1994, 67). Without entering into this debate, it can be pointed out that the symbolic use of university research seems to coexist with instrumental and conceptual uses. Thus, the three types of research utilization must be considered as complementary rather than as contradictory dimensions of research utilization. Depending on the decision-making situations, policy makers will use research instrumentally, conceptually, and/or symbolically.

Empirical Studies Pertaining to the Types of Research Use

Although the discussion on instrumental, conceptual, and symbolic use of research is still an important theoretical issue in the field, few empirical studies have systematically addressed the question. Table 1 reports some major empirical studies that have dealt, mostly indirectly, with the roles that social science research perform in organizations. Firstly, it is important to mention that only a few of these empirical studies have concerned the instrumental, conceptual, and symbolic use altogether. In fact, the three types of research use are included altogether in only four out of nine empirical studies that are presented in Table 1 (Knorr 1977; Sunesson et al. 1989; Van de Vall and Bolas 1982; Whiteman 1985). In these four empirical studies, types of research use are measured in a different way. For example, Van de Vall and Bolas (1982) have built an index that includes the three types of research use, whereas Whiteman (1985) has used a typology in which instrumental and conceptual use are contrasted with substantive, elaborative, and strategic (symbolic) use. Overall, we have not been able to find a single study that permits a systematic assessment of the extent to which university research is used instrumentally, conceptually, and symbolically in government agencies.

Secondly, Table 1 shows that most empirical contributions are case studies in which the number of observations is quite low. Although case study results can and are routinely subject to analytical generalization to other units, places, and times, this type of results cannot be subject to statistical generalization. Despite the fact that the case studies reported in Table 1 have produced useful results for the theoretical development of the field, they do not permit any systematic generalization about the extent of instrumental, conceptual, and symbolic use of research knowledge as would be possible with larger surveys.

TABLE 1
Major Empirical Studies That Have Dealt with Instrumental, Conceptual, and Symbolic Utilization of University Research

Authors	*Country*	*Data Collection*	*Number of Observations*	*Main Goal(s) of the Study*
Caplan et al. (1975)	United States	Interviews	204 persons holding important positions in various departments, major agencies, and commissions of the executive branch of government	To learn more about what information gets used by whom, for what purposes, and with what impact
Rich (1975)	United States	Interviews	35 individuals who were involved in research dissemination and utilization experiments	To examine why policy makers made the decision to continue to receive information from a statistical agency and to identify the kind of use that was made of the information received
Patton et al. (1977)	United States	Interviews	Number of persons interviewed is not reported	To examine the nature and the degree of utilization of federal evaluation research
Knorr (1977)	Austria	Interviews	70 medium-level decisionmakers employed in federal and municipal government agencies	To examine the purposes for which government officials had initiated or sponsored research projects as well as the purposes for which they had used the research
Weiss and Bucuvalas (1980)	United States	Interviews	155 upper-level positions in federal, state, and local agencies	To report empirical evidence on decisionmakers' criteria for accepting or rejecting the results of the research
Deshpande (1981)	United States	Interviews and mail survey	92 managers in private firms	To examine if managers in private organizations use research in an instrumental manner to make decisions rather than only to provide enlightenment about policy

Van de Vall and Bolas (1982)	Netherlands	Analysis of research reports and interviews	120 projects of applied social research; the number of interviews is not known	To analyze and evaluate structural features of social research utilization and to describe the main functions of social policy research in organizational decision making
Whiteman (1985)	United States	Interviews and analysis of research reports	59 interviews with the staff of one Senate committee and one Congress committee	To demonstrate the importance of strategic (symbolic) use and substantive (concrete) use of two research projects
Sunesson et al. (1989)	Sweden	Interviews	77 interviews with administrators, social workers, and local politicians, and a few additional interviews with top national civil servants and politicians	To examine the link between characteristics of research reports and their perceived usefulness as well as to explore the different functions of research

Finally, none of the studies reported in Table 1 has tried to identify the determinants of the different types of research use. The aim of the present study is, in part, to fill all of these gaps. Our study is based on a large sample of professionals and managers in the Canadian and provincial government agencies, and research utilization is not tracked by referring to the use of specific research studies but rather by asking respondents about their general and day-to-day use of university research. Furthermore, building on previous empirical studies (Landry, Amara, and Lamari 2001a, 2001b; Landry, Lamari, and Amara 2003), we will test the major research utilization explanatory models for each type of research use. Thus, we will be able to assess whether instrumental, conceptual, and symbolic uses of research are predicted by the same factors. Before presenting the method and results of the study, we now briefly review the relevant literature related to the determinants of research utilization.

Explanatory Models of Research Utilization

The determinants of research utilization in government agencies have already been identified in previous studies (Landry, Lamari, and Amara 2003). In one of the few systematic empirical studies regarding the factors predicting research utilization in government agencies, Landry, Lamari, and Amara (2003) identified four major categories of explanations: engineering explanations, organizational interest explanations, *two communities* explanations, and interaction explanations. Following is a review of each of these explanations.

Engineering Explanations

The engineering explanations suggest that the uptake of university research depends on the characteristics of research findings, such as (1) content attributes of research, notably, compatibility, complexity, observability, triability, validity, reliability, and applicability (Dearing, Meyer, and Kazmierczak 1994; Edwards 1991; Lomas 1993; Weiss and Bucuvalas 1980); and (2) types of research: basic-theoretical/applied, general/abstract (Machlup 1980), quantitative/qualitative (Huberman and Thurler 1991), particular/concrete (Rich 1997), and research domains and disciplines (Landry, Amara, and Lamari 2001a; Landry, Lamari, and Amara 2003; Oh 1997; Rich 1997). In their empirical study on research uptake in government agencies, Landry, Lamari, and Amara (2003) found that characteristics of research, such as quantitative products, qualitative products, theoretical

products, and research that focuses on the advancement of scholarly knowledge, have a significant impact on research uptake but not in all of the research domains that were under study. In their empirical study, research uptake was measured by an index reflecting the intensity of research uptake without permitting any distinction to be made among instrumental, conceptual, and symbolic use of research. In the present study, we will attempt to see whether these engineering factors carry the same effect on the three types of research use.

Organizational Interest Explanations

The organizational interest explanations assume that the size of agencies, organizational structures, types of policy domains, needs of organizations, and positions (professionals or managers) may affect the propensity of professionals and managers to utilize or underutilize university research. With respect to organizational needs, the organizational interest explanations hypothesize that the use of university research is increased when the researchers focus their projects on the needs of the users rather than on the advancement of scholarly knowledge (Chelimsky 1997; Frenk 1992; Orlandi 1996; Silversides 1997). The organizational interest explanations also point to the following hypotheses: the use of university research increases as users consider research pertinent, as research coincides with their needs, as users' attitudes give credibility to research, and as results reach users at the right time (Huberman and Thurler 1991; Landry, Amara, and Lamari 2001a; Landry, Lamari, and Amara 2003).

Two Communities Explanations

The two communities explanations assume that a cultural gap between the professionals and the managers in government agencies on one hand and the university researchers on the other hand leads to a lack of understanding between them and, consequently, to low levels of research uptake (Caplan 1979; Frenk 1992; Landry, Lamari, and Amara 2003; Oh and Rich 1996; Rich 1979; Webber 1987). To reduce the cultural gap between the two communities, these explanations lay the emphasis on two factors: the adaptation of research products and the acquisition efforts. With respect to the adaptation of research products, several authors have pointed out the fact that professionals and managers in government agencies usually prefer to read research reports when they are presented in a language they are familiar with (Caplan 1979; Dunn, Holzner, and Zaltman 1980; Rich and Oh 1993; Webber 1987; Weiss 1973). As a consequence, researchers should invest

resources to make reports more readable and easier to understand, to make conclusions and recommendations more specific, to focus on factors amenable to interventions by users, and to make reports more appealing (Huberman and Thurler 1991; Landry, Lamari, and Amara 2003). The second factor that may reduce the cultural gap between users of research and university researchers is related to the acquisition efforts. Here, it is the professionals and the managers who have to make an effort by engaging resources in the acquisition of research knowledge, for instance, by organizing meetings to discuss the subject and scope of research projects with researchers, to discuss results with researchers, and to acquire research results from researchers.

Interaction Explanations

The interaction explanations focus on the role of social linkages between the users and the researchers. These explanations assume that the interaction between researchers and potential users is one of the most important predictors of research utilization (Anderson et al. 1999; Dunn, Holzner, and Zaltman 1980; Huberman and Thurler 1991; Landry, Amara, and Lamari 2001a, 2001b; Landry, Lamari, and Amara 2003; Leung 1992; Lomas 1997; Nyden and Wiewel 1992; Oh 1997; Oh and Rich 1996; Yin and Moore 1988). The hypothesis that is made by the supporters of the interaction explanations is that the more "sustained and intense the interaction between researchers and users, the more likely utilization will occur" (Landry, Lamari, and Amara 2003, 195). One of the variables that has been used to measure the intensity of the interaction between users and researchers is called "linkage mechanisms" (Huberman and Thurler 1991; Landry, Amara, and Lamari 2001a, 2001b; Landry, Lamari, and Amara 2003). The mechanisms considered in these studies include meetings with work colleagues, congresses, conferences, scientific seminars involving university researchers, e-mail, and the Internet.

In this article, we will test the prediction power of the four explanatory models for instrumental, conceptual, and symbolic use of research. Variables derived from the engineering, organizational interests, two communities, and interaction explanations are defined in Table 2.

Data

The data used in this study were collected using a mail survey during the winter of 1998. The respondents were professionals and managers in Canadian and provincial government agencies. The sample of the respondents was

TABLE 2
Operational Definitions of the Independent Variables Used in the Ordered Logit Models

Categories of Factors/Variables	*Variables' Definitions*	*Means* (SD)	*Cronbach's Alpha*
Engineering Factors			
Quantitative products (QUANP)	Concerning the university research work, studies, and reports that you have used during the past five years, would you say that the methodology used therein corresponds to . . . studies based on surveys and using correlation or multivariate techniques of analysis? *(1 = often, always and 0 = otherwise)*	—	—
Qualitative products (QUALP)	Concerning the university research work, studies, and reports that you have used during the past five years, would you say that the methodology used therein corresponds to . . . case studies using qualitative data? *(1 = often, always and 0 = otherwise)*	—	—
Focus on advancement of scholarly knowledge (KNOWF)	Please indicate your opinion regarding each of the following statements . . . In my field of work, university researchers are focused on the advancement of scientific knowledge. *(1 = often, always and 0 = otherwise)*	—	—
Organizational Factors			
Focus on users' needs (USERF)	Please indicate your opinion regarding each of the following statements . . . In my field of work, university researchers are focused on users' needs. *(1 = often, always and 0 = otherwise)*	—	—
Users' context	Concerning the particularities of the context in which you use university research in the social sciences, what is your opinion regarding each of the following statements . . . *(Items scores range from 1 = never to 5 = always; index scores range from 3 to 15)* • University research results used are considered pertinent by my workplace colleagues. • My colleagues' research work, studies, and reports are more useful to me than the research work, studies, and reports produced by university researchers. • University research work, studies, and reports have reached me at just the right moment to be used.	8.14 (2.75)	.63

(continued)

TABLE 2 (continued)

Categories of Factors/Variables	*Variables' Definitions*	*Means* (SD)	*Cronbach's Alpha*
Work relevance (WORREL)	I use university research information, studies, and reports in order to understand the workings of programs and policies in force in my field. *(1 = often, always and 0 = otherwise)*	—	—
Policy relevance (POLREL)	How important to you are university research information, studies, and reports in terms of improving policies and programs in your field? *(1 = often, always and 0 = otherwise)*	—	—
Federal or provincial administration (FEDPRO)	Federal or provincial administration (1 = respondents work in a federal agency and 0 = provincial) Number of employees (SIZE)	—	—
	Number of employees in government agencies of respondents	—	—
Two Communities' Factors			
Adaptation of products (ADAPP)	Please indicate the importance of the following factors in your decision to use or not use information provided by university researchers *(Items scores range from 1 = negligible to 5 = decisive; index scores range from 9 to 45)* • Ease of comprehension • Specific operational nature of conclusions and recommendations • Focus on variables for which user intervention is possible • Credibility and prestige of the source • Pertinence and applicability of information in relation to the objectives that I pursue in my work • Realism of both recommendations contained in the research and their implications • Capacity to verify the quality of research results • Capacity to control exclusivity of research results use • Appeal of reports (graphics, color, humor, packaging)	26.12 (9.30)	.91

Acquisition efforts (ACQUI)	Please indicate the importance of the following statements. *(Items scores range from 1 = never to 5 = always; index scores range from 2 to 10)* • I personally made efforts to establish relationships with university researchers. • My administrative unit reserves sufficient means for obtaining information resulting from university research work.	4.80 (2.28)	.64
Linkage Mechanisms			
Linkage mechanisms (LINKA)	Please indicate the importance you have accorded to the following means of obtaining information from university research carried out in your field. *(Items scores range from 1 = negligible to 5 = decisive; index scores range from 4 to 20.)* • Meetings with work colleagues in my field • Congresses, conferences, and scientific seminars involving university researchers • E-mail and the Internet • My ministry's reference library	10.70 (4.12)	.67
Individual Attributes			
Graduate studies (DIPLOM)	Level of education of respondents *(1 = master's degree or Ph.D. and 0 = otherwise)*	—	—
Function (FUNCT)	Type of positiion occupied by respondents *(1 = professionals and 0 = managers)*	—	—

drawn following a two-stage process: at the first stage, we used the fall 1997 issue *Corpus Government Index* to identify government services having key words related to policy development, implementation, and evaluation. The listing of the key words used is the following: policy and research, policy analysts, program policy, policy development, policy and strategic direction, strategic policy branch, planning and policy, policy secretariat, program development and evaluation branch, projects and policy, resources management, planning services, social and fiscal policy, local government policy, public affairs, and communications. Two research assistants independently identified the pertinent government services using these key words. Then, these two lists were compared by the principal investigator to produce the final list of services to be used in the study. This selection process generated a list of 2,400 government services with their corresponding phone numbers. This task was completed in December 1997. At the second stage, we used the phone numbers collected at the first stage to obtain the names, professional titles, and full addresses of 2,400 potential respondents. A private survey firm, Infras Inc., from Quebec, accomplished the task of this second stage with the following guidelines: (1) for each province and territory, to randomly select a number of respondents corresponding to the demographic weight of the various provinces and territories of Canada; (2) to randomly select respondents with university degrees; (3) to randomly select 25 percent of the eligible respondents having a managerial position and 75 percent having positions as professionals; (4) and to produce a list of 2,400 labels with the names, professional titles, and full addresses of each potential respondent.

The mailing packets were prepared in January 1998. The mailing packet sent to each respondent included a cover letter, a questionnaire of twenty-three questions, and a preaddressed return envelope. The packets were mailed on March 6, 1998. A follow-up letter was sent two weeks later. A total of 988 questionnaires were returned, resulting in a gross return rate of 41 percent. Of these questionnaires, however, 105 were unusable for the following reasons: questionnaires were returned with mentions of wrong address (65), potential respondents were on vacation or out of town for more than 2 weeks (12), respondents had health problems (1), and refusals to participate in the study (reasons: no time, not the best person to answer, the topic of the survey is not pertinent to my job, or no reason provided) (27). Therefore, 833 of the questionnaires obtained were usable, indicating a net return rate of 35 percent. This return rate can be considered quite good. Such a data set composed

of respondents holding positions at different hierarchical levels and involved in various policy domains and many different departments in Canadian and provincial public administrations is especially appropriate to study the factors explaining the utilization of university research in federal and provincial government agencies.

Results

Sample Characteristics: Descriptive Statistics

Of the 833 respondents who participated in the survey, 10 percent hold a Ph.D. degree, 45 percent a master's degree, 37 percent a bachelor's degree, and 6 percent either a college degree (the equivalent of an associate's degree in the United States) or other degrees. The average respondent's age was 47.4 years, with a standard deviation of 7.1 years. On average, the respondents have 7.6 years of experience in their current position, with a standard deviation of 6.3 years. The average number of employees in the immediate administrative unit of the respondents is 66, with a standard deviation of 335 and a maximum of 7,000. As for the average number of employees in the ministry or governmental agency where the respondents work, it is 2,900 with a standard deviation of 6,147. Slightly more than one third of the respondents work in the western provinces, 17 percent in the Atlantic provinces, 26.4 percent in Ontario, and 21 percent in Quebec. One quarter of the respondents occupy positions in Canadian government agencies, while the remaining three quarters occupy positions in provincial government agencies. Finally, half of the respondents indicated that they occupy managerial positions, 38 percent occupy professional positions, and the remaining 11 percent occupy other types of positions.

These respondents are involved in a large variety of policy domains. Of the 833 respondents, 13 percent work in the domain of municipal and regional affairs, public works, and public infrastructures; 27 percent in the domain of economic development, public finance, and taxation; 9 percent in education, communication, and information technology; 11 percent in environment, forestry, fishing, and agriculture; 18 percent in social services, health, and social security; 9 percent in language, culture, immigration, justice, and native affairs; 11 percent in job creation and employment conditions, including labor relations; and 2 percent in other domains, such as leisure and intergovernmental affairs.

Extent and Differences of Use of the Three Types of University Research in Government Agencies

The results in Table 3 indicate that nearly 12 percent of the respondents reported that university research had had a *very important* or *decisive* impact that led to concrete actions in their field of work (instrumental use), 22 percent of the respondents indicated that university research had had a very important or decisive impact that served to shed light on situations and problems in their field of work (conceptual use), and 16 percent claimed that university research had had a very important or decisive impact that served to confirm choices already made in their field of work (symbolic use). At the other extreme, nearly 48 percent, 32 percent, and 37 percent of the respondents indicated that the use of university research led to *negligible* or *somewhat negligible* instrumental, conceptual, and symbolic utilization in their field of work, respectively. Finally, nearly 29 percent, 38 percent, and 35 percent of the respondents claimed that the use of university research led to *moderately important* instrumental, conceptual, and symbolic utilization in their fields of work, respectively.

To have a more direct indication of the level of importance of instrumental, conceptual, and symbolic utilization of university research by professionals and managers in government agencies, we have computed the average for each type of research use based on the importance of use such as measured on a five-point Likert-type scale (1 = *negligible importance* and 5 = *decisive importance*). The results reported in the last column of Table 3 indicate that, on average, the conceptual utilization of university research had been more important (2.80 on 5) than its symbolic utilization (2.67 on 5) and instrumental utilization (2.40 on 5).

We have also compared the level of the three types of research utilization across policy domains. To do so, we have used a one-way ANOVA, more specifically the Duncan's multiple range test, which compares the means for groups in homogeneous subsets. This test is appropriate to group the different policy domains into homogeneous subsets, that is, policy domains between which the differences of means are not statistically significant, and hence to compare the means of the different subsets. The null hypothesis tested is the equality of means for the variable types of research utilization (instrumental, conceptual, and symbolic) among the different policy domains. As indicated earlier, each type of research utilization was measured using the five-point Likert-type scale presented in Table 3.

The results of the Duncan test are reported in Table 4. They indicate that, for instrumental utilization of university research, there are four homogeneous subsets of policy domains among which there is no significant statisti-

TABLE 3
Distribution According to Importance of the Instrumental, Conceptual, and Symbolic Utilization of University Research

Type of Utilization	*Does Not Apply and Does Not Know (0)*	*Negligible (1)*	*Somewhat Negligible (2)*	*Moderately Important (3)*	*Very Important (4)*	*Decisive (5)*	*Total*	*Average on 1-5 Scale* (SD)
Instrumental								
"The use of university research led to concrete action in my field of work."	11.3	17.0	31.3	28.9	10.0	1.5	100.0	2.40 (.97)
Conceptual								
"The use of university research served to shed light on situations and problems in my field of work."	8.7	9.5	22.3	37.5	20.8	1.2	100.0	2.80 (.95)
Symbolic								
"The use of university research served to confirm choices already made in my field of work."	11.4	10.0	26.8	35.7	15.0	1.1	100.0	2.67 (.93)

NOTE: SD = standard deviation. Number in parentheses indicate percentage of users.

TABLE 4
Means of Instrumental, Conceptual, and Symbolic Utilization of University Research for Domains of Public Policies in Homogeneous Subsets (Duncan's Test)

Domain	*Number of Cases*	*Subset for Alpha = .05*			
		1	*2*	*3*	*4*
Instrumental utilization					
Language, culture and immigration, justice, and native affairs	64	2.16			
Job creation and employment standards	81	2.21	2.21		
Municipal and regional affairs, public works, and public infrastructures	89	2.26	2.26		
Economic development, finance, and fiscal laws	198	2.31	2.31		
Environment, forest, fishing, and agriculture	88		2.48	2.48	
Social services, health, and social security	135			2.70	2.70
Education and information technology	65				2.78
Significance[a]		.340	.088	.126	.537
Conceptual utilization					
Job creation and employment standards	87	2.59			
Language, culture and immigration, justice, and native affairs	65	2.66			
Municipal and regional affairs, public works, and public infrastructures	91	2.72	2.72		
Economic development, finance, and fiscal laws	204	2.76	2.76		
Environment, forest, fishing, and agriculture	89	2.88	2.88	2.88	
Social services, health, and social security	138		3.00	3.00	
Education and information technology	68			3.09	
Significance[a]		.061	.062	.150	
Symbolic utilization					
Job creation and employment standards	82	2.49			
Language, culture and immigration, justice, and native affairs	64	2.55			
Economic development, finance, and fiscal laws	198	2.56			
Municipal and regional affairs, public works, and public infrastructures	87	2.57			
Environment, forest, fishing, and agriculture	87	2.63			
Social services, health, and social security	134		2.95		
Education and information technology	67		2.98		
Significance[a]		.355	.784		

a. When the significance test is above the threshold alpha = .05, the null hypothesis cannot be rejected.

cal difference. The level of instrumental utilization of university research, with a score of 2.16 out of a possible maximum score of 5, is at its lowest in the policy domains of language, culture and immigration, justice, and native affairs. With a score of 2.78, the level of instrumental utilization of university research reaches its highest level in the policy domains of education and information technology. The policy domains of social services, health, and social security also score very well with a mean score of 2.70. As shown in Table 3, there is no significant statistical difference among the following four groups of policy domains in the matter of instrumental utilization of university research: (1) job creation and employment standards; (2) municipal and regional affairs, public works, and public infrastructure; and (3) economic development, finance, and fiscal laws; and (4) environment, forestry, fishing, and agriculture.

As for conceptual utilization of university research, the results of the Duncan test reported in Table 4 indicate that there are three homogeneous subsets of policy domains among which there is no significant statistical difference. The level of conceptual utilization of university research is at its lowest in the policy domain of job creation and employment standards, and at its highest in the policy domains of education and information technology. There is no significant statistical difference between the five other policy domains.

Finally, the results of Duncan tests reported in Table 4 show that in the matter of symbolic utilization of university research, there are two distinct homogeneous subsets of policy domains between which there is no significant statistical difference. These results also show that the level of symbolic utilization of university research is statistically higher in social services, health, and social security policy domains and in education and information technology policy domains than in five other policy domains. Overall, these results confirm that policy domains matter and that professionals and managers involved in certain policy domains make higher use of university research than professionals and managers involved in other policy domains. The results of the tests of differences also indicate that the means of the scores of instrumental, conceptual, and symbolic use of university research follow a pattern that is linked to the policy domains in which the professionals and managers operate. Hence, the policy domains of education and information technology, social services, health, and social security get the highest scores in the matter of research utilization regardless of the type of utilization, be it instrumental, conceptual, or symbolic. At the other extreme, the policy domain regarding language, culture, immigration, justice, and native affairs stands out in the lowest group of research utilization when one considers the instrumental and conceptual utilization of research.

The remainder of this article will introduce the econometric models predicting instrumental, conceptual, and symbolic utilization of university research as well as the regression results stemming from these models.

Model

The research utilization process is modeled as three ordered logit models, one for each type of research use. The concept underlying this type of model is to use an intermediate continuous variable Y^* (qualifications made by users regarding the three types of research utilization: instrumental, conceptual, and symbolic) in a latent regression with a set of independent variables X_i. The range of this unobserved Y is subdivided in adjacent intervals representing the classes (1 = *negligible*, 2 = *somewhat negligible*, 3 = *moderately important*, 4 = *very important*, 5 = *decisive*) of an observed variable, Z. Thus, the ordered logit models assume a continuous process relating an unknown variable Y to independent variables X_i by some function. More specifically, we assume that the respondent constructs an index (Y^*) by weighting the various factors influencing the level of importance he or she accords to three types of research utilization in his or her field of work. In addition, it is assumed that Y^* includes a random error term that accounts for the effects of measurement errors or random behavior. Thus, the outcome of respondent i is represented by the latent index:

$$Y_i^* = \beta_1 X_{1i} + ... + \beta_k X_{ki} + \varepsilon_i = \beta X + \varepsilon \qquad (1)$$

where

Y_i^* = the value of the index to the observation i
X = a vector of independent variables
β = the vector of parameters to be estimated
ε = the error term.

A more detailed statistical description of the ordered logit models is presented in Appendix 1.

The Measures of the Independent Variables

The definitions of dependent and independent variables included in the explanatory model are presented in Table 2. Cronbach's α for all the independent variables based on multiple items are also reported in Table 2. The values of the α coefficients indicate that all the multiple-items scales used in this study are reliable.

Regression Results

To enhance the classification accuracy of the three models, we have collapsed Categories 1 and 2 (*negligible* and *somewhat negligible*) of each dependent variable (now Category 1) as well as Categories 4 and 5 (*very important* and *decisive*) (now Category 3). The estimations of the original models with the five initial categories exhibited lower classification accuracy than models with three categories (see Appendixes 1 and 2). It should be noted that the initial model based on five categories performed poorly in distinguishing and ultimately in classifying correctly Categories 1 and 2 (*negligible* and *somewhat negligible*) as well as Categories 4 and 5 (*very important* and *decisive*).

The results of estimating the three ordered logit models using the variables defined above with three categories of outcomes are presented in Table 5. The average weights of the independent variables are the logit estimates. The threshold variables (α) are also estimated.

It must be pointed out that one cannot interpret the β coefficients in ordered logit models as one does with β coefficients in regression analysis. In the regression model, the β represents the amount of change in the observed value of the dependent variable that is brought about by a unit change in the independent variable. Because the coding of the (ordinal level) dependent variable is arbitrary, this value will depend on the particular coding that is chosen. In the logit analysis, on the other hand, β represents the amount of change in the dependent variable on its (hypothesized) scale that is brought about by a unit change in the independent variable. In terms of the observed data, this translates into the increment in probability of being in a higher response category brought about by a unit change in the independent variable (McKelvey and Zavoina 1975).

There is no widely agreed-on measure of "goodness of fit" for these types of models. Three measures are presented. The first, the chi-square, is like the *F* statistics in the OLS regression, which test the joint hypothesis that all the coefficients of the explanatory variables are zero, with higher chi-square statistics indicating better overall model fits. The second is the table of observed and predicted outcomes (Appendix 3). This measure must be treated with caution because there is always a tendency to have higher success rates in larger cells (Kramer 1996). The third measure, the Nagelkerke R^2 (pseudo R^2), which is not directly comparable to the R^2 derived in conventional OLS regression, indicates the variance in the type of choice of scale explained by the predictor model (Aldrich and Nelson 1984). In common with the conventional R^2, the pseudo R^2 varies between zero and one, with higher values

TABLE 5
Estimated Ordered Logit Models of Factors Affecting the Instrumental, Conceptual, and Symbolic Utilization of University Research

	Dependent Variables		
Independent Variable	*Instrumental Utilization*	*Conceptual Utilization*	*Symbolic Utilization*
Engineering factors			
Quantitative products (QUANP)	.439 (.010)***	.644 (.000)***	.372 (.023)**
Qualitative products (QUALP)	–.095 (.608)	.308 (.083)**	.271 (.125)*
Focus on advancement of scholarly knowledge (KNOWF)	.259 (.125)*	.159 (.314)	–.058 (.717)
Organizational factors			
Focus on users' needs (USERF)	.403 (.035)**	.570 (.002)***	.553 (.003)***
Users' context (USERC)	.124 (.002)***	.076 (.092)**	.125 (.008)***
Work relevance (WORREL)	.443 (.026)**	.769 (.000)***	.805 (.000)***
Policy relevance (POLREL)	1.442 (.000)***	1.042 (.000)***	.836 (.000)***
Federal or provincial administration (FEDPRO)	–1.675 (.930)	.099 (.567)	–.379 (.035)**
Number of employees (SIZE)	–.0004(.875)	–.0001(.614)	.0002 (.328)
Two communities' factors			
Adaptation of products (ADAPP)	.022 (.168)*	.005 (.731)	.037 (.011)***
Acquisition efforts (ACQUI)	.177 (.001)***	.185 (.000)***	.089 (.063)**
Linkage mechanisms			
Linkage mechanisms (LINKA)	.105 (.002)***	.136 (.000)***	.093 (.002)***
Individual attributes			
Graduate studies (DIPLOM)	.125 (.476)	.275 (.088)**	.115 (.479)
Function (FUNCT)	–.182 (.292)	–.049 (.759)	.069 (.667)
Ancillary parameters			
Threshold 1	2.730 (.002)***	.285 (.002)**	1.860 (.019)***
Threshold 2	5.016 (.000)***	2.880 (.000)***	4.313 (.000)***
Measures of fit			
Sample size	732	754	731
Likelihood ratio chi-square ($df = 14$)	289.226	371.999	272.112
Nagelkerke R^2 (pseudo R^2)	.383	.441	.355
Percentage of correct predictions	67.21	60.21	60.33

NOTE: Numbers in parentheses indicate p value.
*p significant at .10. **p significant at .05. ***p significant at .01.

indicating higher explanatory power, and goodness of fit, of the specified models.

The computation of these measures of goodness of fit leads one to conclude that the three models are well behaved. This is firstly indicated in that, for the three types of utilization, the thresholds α_1 and α_2 are all significant

and, in the three models, $\alpha_1 < \alpha_2$. This is also indicated by the fact that, for the three models, the chi-square statistics reject the restricted (constant-only) model and by the fact that all signs are intuitively correct. In addition, the *predictive power* of the model appears to be acceptable (67.21 percent, 60.21 percent, and 60.33 percent, respectively, for the instrumental utilization, conceptual utilization, and symbolic utilization). Finally, the Nagelkerke R^2 (pseudo R^2) varies between .311 and .389, which is quite acceptable for models with qualitative dependent variables.

As the estimated alphas in Table 5 indicate, when the index of research utilization becomes greater than 2.73, a case moves from the *negligible* or *somewhat negligible* categories to the *moderately important* category. A further increase to 5.01 will result in a move to the *very important* or *decisive* categories.

Ordered logit regression models were estimated for the three types of research utilization (instrumental, conceptual, and symbolic). The three sets of results are shown in Table 5 and are discussed below. No variables were removed from the models on the basis of low statistical significance. All the variables were maintained in the models because they were assumed to be of theoretical interest and expected to have some effect on each type of research utilization.

The estimated coefficients, for instance β, are interpreted as follows: for a continuous variable, for example the linkage mechanisms between researchers and users (LINKA), if the coefficient is positive, the latent variable index, $Y^* = \beta X + \varepsilon$, goes up with an increase in linkage index. If, however, the coefficient is negative, the latent variable index goes down with an increase in linkage index.

For a binary variable, for example the type of position occupied by respondents (FUNCTION), the estimated coefficient β is the log-odds ratios of having each of the three outcomes versus having any of the previous ones between professionals and managers.

The results suggest, for all three models, that the production of quantitative reports, focus of research on users' needs, users' context, relevance of university research for the field of work of the respondents, importance of university research in the field of the respondents, acquisition efforts made by professionals and managers in government agencies, and linkages between researchers and professionals and managers in government agencies are all positively (and significantly) associated with higher instrumental, conceptual, and symbolic use of university research in government agencies. The production of qualitative reports is positively and significantly associated with the higher use of university research in the models explaining, respectively, conceptual and symbolic utilization. As for the adaptation of

research for users, the results of the estimation show that higher values in the index of adaptation are associated with higher instrumental and symbolic utilization of university research in government agencies.

The negative relation between federal/provincial government agencies and the index of symbolic utilization of university research suggests that the professionals and managers in provincial government agencies generally are more likely to use university research to confirm decisions already made (symbolic utilization) than is the case for respondents operating in federal government agencies.

The results also indicate that university research focused on the advancement of science is associated with a higher level of instrumental use of university research. Finally, the results also suggest that professionals and managers with graduate studies are more likely than others to be associated with a higher level of conceptual utilization of university research.

Discussion and Policy Implications

This article contributes to the advancement of knowledge by revisiting, with the data of a large survey, three questions that are addressed on a recurring basis by researchers in the field of research utilization: What is the extent of instrumental, conceptual, and symbolic use of university research in government agencies? Are there differences between the policy domains in regard to the extent of each type of use? What are the determinants of instrumental, conceptual, and symbolic use of university research?

With respect to the first question, the results presented in this article support the assumption that conceptual use of research is more frequent than instrumental use. More precisely, the conceptual use of research is more important in the day-to-day professional activity of professionals and managers in government agencies than symbolic utilization, which, in turn, is more important than instrumental utilization. Furthermore, the results of this article show that when professionals and managers in government agencies are asked, not about the use of specific research reports but more generally about the use of university research in their day-to-day professional activity, as was the case in this study, the use of university research has had a very important or decisive impact that has led to concrete action (instrumental use) in the field of work of nearly 12 percent of the respondents. By comparison, the use of research has had a very important or decisive impact that has led to conceptual utilization for 22 percent of the respondents, and to symbolic utilization for 16 percent of the respondents. Taken together, these results suggest that the differences among the extent of instrumental, concep-

tual, and symbolic utilization of research are large, but not as large as is generally assumed in the literature on research utilization. Considering that professionals and managers in government agencies are exposed to a large variety of sources of information, these results suggest that the three types of use of research play simultaneously a significant role in government agencies.

As for the second question concerning the differences between the policy domains with respect to the extent of instrumental, conceptual, and symbolic utilization of university research, the results support, as suggested in prior studies, that the policy domains in which the professionals and managers of government agencies operate matter (Landry, Lamari, and Amara 2003; Oh and Rich 1996). Policy domains like education, health, and social services rely more intensively on conceptual, symbolic, and instrumental use of university research than the other policy domains. More generally, the results of the tests of differences of means suggest that policy domains tend to score similarly across the three types of research utilization: high scores on one type of research utilization are matched with high scores on the other two types of research utilization; low scores on one type of research utilization are matched with low scores on the other two types of research utilization; and, finally, average scores on one type of research utilization are matched with average scores on the other two types of research utilization. Clearly, it suggests that relying on one type of research utilization does not exclude relying on the other types of research utilization. More concretely, it suggests that professionals and managers in government agencies consider the instrumental, conceptual, and symbolic utilization of university research as complementary in their day-to-day field of work. The differences between the various policy domains regarding the extent of use of the three types of research utilization suggest that the professionals and managers in government agencies operate in highly diversified contexts, while the complementary roles played by the three types of research utilization suggest that professionals and managers operate in complex decision-making contexts requiring complementary research perspectives.

The third question addressed in this article was about the determinants of instrumental, conceptual, and symbolic use of university research. The issue here was to try to see whether the same determinants explain the instrumental, conceptual, and symbolic utilization of research. The results of the regression models point to the fact that many of the determinants of research utilization that have been discussed in the literature significantly explain the instrumental, conceptual, and symbolic utilization of research. These results carry many implications for policy making. Hence, simultaneous increases in instrumental, conceptual, and symbolic utilization of university research could be achieved by inducing researchers to increase their production of

quantitative studies, to focus their research more intensively on the needs of government agencies, to pay more attention to the context in which government agencies operate, to pay more attention to the relevance of their research in relation to the fields of work and policy domains in which the professionals and managers of government agencies operate, and to intensify their interactions with professionals and managers in government agencies. Similarly, simultaneous increases in instrumental, conceptual, and symbolic utilization of university research could be achieved by inducing professionals and managers in government agencies to increase their efforts in matters of acquisition and appropriation of research knowledge.

Over and above these tools that increase the three types of research utilization, the results of the regression models suggest that policy makers aiming specifically to increase the level of instrumental utilization of university research should consider providing researchers with additional incentives regarding the adaptation of university research for professionals and managers operating in government agencies. The results also suggest that to increase specifically the conceptual utilization of university research, policy makers should foster the circulation of qualitative research reports and involve more professionals and managers who have completed graduate studies in research utilization. Finally, to specifically increase the symbolic utilization of university research, as well as to increase the likelihood that professionals and managers in government agencies have access to pertinent qualitative research studies, policy makers should again provide additional incentives for professionals and managers in government agencies in the matter of adaptation of research results.

The results and the implications of our study make sense theoretically, statistically, and intuitively. Furthermore, they shed new light on factors contributing to an explanation of the instrumental, conceptual, and symbolic utilization of university research. The limits of the findings of this study, however, reside in the fact that we still know little about the complementary roles played by the instrumental, conceptual, and symbolic use of research in decision making; about why some determinants explain one type of research utilization but not others; as well as about how professionals and managers in government agencies combine the instrumental, conceptual, and symbolic utilization of university research with other sources of information. Future research should therefore focus on these knowledge deficits.

APPENDIX 1
Statistical Description of the Ordered Logit Models Used in This Study

The equation (1) $Y_i^* = \beta_1 X_{1i} + \ldots\ldots\ldots\ldots + \beta_k X_{ki} + \varepsilon_i = \beta X + \varepsilon$ cannot be estimated because Y^* is unobserved (latent index). We do, however, observe the decision made by the researcher (the five outcomes discussed above) as well as the X-vector. Thus, to estimate the model, the following assumptions are made:

$$
\begin{aligned}
&Z_i = 1 \text{ (negligible)} && \text{if } Y^* < \alpha_1 \\
&Z_i = 2 \text{ (somewhat negligible)} && \text{if } \alpha_1 \le Y^* < \alpha_2 \\
&Z_i = 3 \text{ (moderately important)} && \text{if } \alpha_2 \le Y^* < \alpha_3 \\
&Z_i = 4 \text{ (very important)} && \text{if } \alpha_3 \le Y^* < \alpha_4 \\
&Z_i = 5 \text{ (decisive)} && \text{if } Y^* \ge \alpha_4
\end{aligned} \qquad (2)
$$

The ordering requires the thresholds (α_1, α_2, α_3, and α_4) to satisfy $\alpha_1 < \alpha_2 < \alpha_3 < \alpha_4$. Parameters β and the thresholds (α_1, α_2, α_3, and α_4) are simultaneously estimated using the maximum likelihood method, which maximizes the probability of correct classifications.

Therefore, the probability (Pr) that $Z_i = 1$ is calculated by the following:

$$\Pr(Z_i = 1) = \Pr(Y_i^* < \alpha_1) = \Pr(\varepsilon_i < \alpha_1 - \beta' X_i) = F(\alpha_1 - \beta' X_i)\ . \qquad (3)$$

The probability that $Z_i = 2$ is

$$
\begin{aligned}
\Pr(Z_i = 2) &= \Pr(\alpha_1 \le Y_i^* < \alpha_2) \\
&= \Pr(\alpha_1 \le \beta' X_i + \varepsilon_i < \alpha_2) \\
&= \Pr(\varepsilon_i < \alpha_2 - \beta' X_i) - \Pr(\varepsilon_i \le \alpha_1 - \beta' X_i) \\
&= F(\alpha_2 - \beta' X_i) - F(\alpha_1 - \beta' X_i)
\end{aligned} \qquad (4)
$$

and the probability that $Z_i = n$ is

$$\Pr(Z_i = n) = \Pr(Y_i^* \ge \alpha_{n-1}) = \Pr(\varepsilon_i \ge \alpha_{n-1} - \beta' X_i) = F(\beta' X_i - \alpha_{n-1}). \qquad (5)$$

To meet the requirements of the probability model (monotonic increasing CDF and results lie between zero and one), we assume that the disturbances ε_i possess a standard logistic distribution with a variance of σ^2. Under this assumption, ε_i / σ is logistic with unit variance. The cumulative logistic transformation function Λ of this logistic distribution maps the admissible area of Y_i^* $(-\infty, +\infty)$ to $[0,1]$ with a first derivative that is always positive. Thus, the likelihood function for the ordered logit model that consists of (1) and (2) for $n = 5$ is given by the following:

$$L = (\beta, \alpha_1, \alpha_2, \alpha_3, \alpha_4) = \Pi\Lambda(\alpha_1 - \beta' X_i) \bullet$$

$$Y_i^* = 1$$

$$\Pi\Lambda(\alpha_2 - \beta' X_i) - \Lambda(\alpha_1 - \beta' X_i) \bullet$$

$$Y_i^* = 2$$

$$\Pi\Lambda(\alpha_3 - \beta' X_i) - \Lambda(\alpha_2 - \beta' X_i) \bullet$$

$$Y_i^* = 3$$

$$\Pi\Lambda(\alpha_4 - \beta' X_i) - \Lambda(\alpha_3 - \beta' X_i) \bullet$$

$$Y_i^* = 4$$

$$\Pi\Lambda(\alpha_2 - \beta' X_i) - \alpha_4 \bullet$$

$$Y_i^* = 5 \qquad (6)$$

The parameters β and the thresholds α_1, α_2, α_3, and α_4 are estimated in minimizing the function *L* given by Equation 6.

APPENDIX 2
Table of Observed and Predicted Outcomes (Dependent Variable with Five Categories)

	Predicted					
Observed	*Negligible*	*Somewhat Negligible*	*Moderately Important*	*Very Important*	*Decisive*	*Total*
Instrumental utilization						
Negligible	**69**	63	9	0	0	141
Somewhat negligible	34	**141**	84	0	0	259
Moderately important	5	60	**173**	1	0	239
Very important	1	15	61	**6**	0	83
Decisive	0	1	7	2	**0**	10
Total	109	280	334	9	0	732
Overall accuracy			389/732 = 53.14%			
Conceptual utilization						
Negligible	**31**		12	0	0	78
Somewhat negligible	8	**83**	89	6	0	186
Moderately important	5	51	**202**	49	0	307
Very important	0	2	85	**86**	0	173
Decisive	0	1	2	7	**0**	10
Total	44	172	390	148	0	754
Overall accuracy			402/754 = 53.31%			
Negligible	**23**	51	8	0	0	82
Somewhat negligible	8	**113**	98	2	0	221
Moderately important	3	67	**213**	13	0	296
Very important	0	8	89	**26**	0	123
Decisive	0	1	6	2	**0**	9
Total	34	240	414	43	0	731
Overall accuracy			375/731 = 51.30%			

APPENDIX 3
Table of Observed and Predicted Outcomes (Dependent Variable with Three Categories)

	Predicted			
Observed	*Negligible/ Somewhat Negligible*	*Moderately Important*	*Very Important/ Decisive*	*Total*
Instrumental utilization				
Negligible/somewhat negligible	**320**	80	0	400
Moderately important	75	**161**	3	239
Very important/decisive	20	62	**11**	93
Total	415	303	14	732
Overall accuracy		492/732 = 67.21%		
Conceptual utilization				
Negligible/somewhat negligible	**168**	88	8	264
Moderately important	68	**190**	49	307
Very important/decisive	4	83	**96**	183
Total	240	361	153	754
Overall accuracy		454/754 = 60.21%		
Symbolic utilization				
Negligible/somewhat negligible	**206**	96	1	303
Moderately important	79	**201**	16	296
Very important/decisive	13	85	**34**	132
Total	298	382	51	731
Overall accuracy		441/731 = 60.33%		

References

Albaek, E. 1995. Between knowledge and power: Utilization of social science in public policy making. *Policy Sciences* 28:79-100.

Aldrich, J. H., and F. D. Nelson. 1984. *Linear probability, logit, and probit models*. Sage University Paper, no. 45. Beverly Hills, CA: Sage.

Anderson, M., J. Cosby, B. Swan, H. Moore, and M. Broekhoven. 1999. The use of research in local health service agencies. *Social Science & Medicine* 49 (8): 1007-19.

Berridge, V., and J. Stanton. 1999. Science and policy: Historical insights. *Social Science & Medicine* 49:1133-38.

Beyer, J. M. 1997. Research utilization: Bridging the gap between communities. *Journal of Management Inquiry* 6 (1): 17-22.

Beyer, J. M., and H. M. Trice. 1982. The utilization process. A conceptual framework and synthesis of empirical findings. *Administrative Science Quarterly* 27:591-622.

Caplan, N. 1979. The two communities theory and knowledge utilization. *American Behavioral Scientist* 22:459-70.

———. 1980. What do we know about knowledge utilization? In *Utilization of evaluative information*, edited by L. A. Braskamp and R. D. Brown, 1-10. San Francisco: Jossey-Bass.

Caplan, N., A. Morrison, and R. J. Stambaugh. 1975. *The use of social science knowledge in policy decisions at the national level: A report to respondents*. Ann Arbor: University of Michigan.

Chelimsky, E. 1997. The coming transformation in evaluation. In *Evaluation for the 21st century*, edited by E. Chelimsky and W. R. Shadish, 1-27. Thousand Oaks, CA: Sage.

Cohen, D. K., and M. S. Garet. 1975. Reforming educational policy with applied social research. *Harvard Educational Review* 45:17-43.

Cohen, M., J. March, and J. Olsen. 1972. A garbage can model of organizational choice. *Administrative Science Quarterly* 17:1-25.

Corpus government index. 1997. Don Mills, ON, Canada: Southam Information Products.

Dearing, J. W., G. Meyer, and J. Kazmierczak. 1994. Portraying the new: Communication between university innovators and potential users. *Science Communication* 16:11-42.

Deshpande, R. 1983. Patterns of research use in private and public sectors. *Knowledge* 4:561-75.

Dunn, W. N., B. Holzner, and G. Zaltman. 1980. The two communities metaphor and models of knowledge use. *Knowledge: Creation, Diffusion, Utilization* 1:515-36.

Edwards, L. A. 1991. *Using knowledge and technology to improve the quality of life of people who have disabilities: A prosumer approach.* Philadelphia: College of Optometry.

Feldman, M. S., and J. G. March. 1981. Information in organizations as signal and symbol. Administrative Science Quarterly 26:171-86.

Frenk, J. 1992. Balancing relevance and excellence: Organizational response to link research with decision making. *Social Science and Medicine* 35:1397-1404.

Gibbons, M., C. Limoges, H. Nowotny, S. Schwartzman, P. Scott, and M. Trow. 1994. *The new production of knowledge*. London: Sage.

Guston, D. H., and K. Keniston. 1994. Introduction: The social contract for science. In *The fragile contract*, edited by D. H. Guston and K. Keniston, 1-41. Cambridge, MA: MIT Press.

Huberman, M., and G. Thurler. 1991. *De la recherche à la pratique: Éléments de base*. Bern, Switzerland: Peter Lang.

Innvaer, S., G. Vist, M. Trommald, and A. Oxman. 2002. Health policy-makers' perceptions of their use of evidence: A systematic review. *Journal of Health Services Research and Policy* 7 (4): 239-44.

Knorr, K. D. 1977. Policymaker's use of social sciences knowledge: Symbolic or instrumental? In *Using social research in public policy making*, edited by C. H. Weiss, 165-82. Lexington, MA: Lexington Books.

Kramer, B. 1996. An ordered logit model for the evaluation of Dutch non-life insurance companies. *De Economist* 144 (1): 79-91.

Landry, R., N. Amara, and M. Lamari. 2001a. Utilization of social science research knowledge in Canada. *Research Policy* 30:333-49.

———. 2001b. Climbing the ladder of research utilization: Evidence from social science research. *Science Communication* 22 (4): 396-422.

Landry, R., M. Lamari, and N. Amara. 2003. Extent and determinants of utilization of university research in public administration. *Public Administration Review* 63 (2): 191-204.

Lavis, J. N., D. Robertson, J. M. Woodside, C. B. McLeod, and J. Abelson. 2003. How can research organizations more effectively transfer research knowledge to decision makers? *Milbank Quarterly* 81 (2): 221-48.

Leung, P. 1992. Translation of knowledge into practice. In *NIDRR national CRP panel final report*, edited by W. A. Associates, 287-306. Washington, DC: Walcott and Associates.

Lindblom, C. E., and D. K. Cohen. 1979. *Usable knowledge: Social science and social problem solving*. New Haven, CT: Yale University Press.

Lomas, J. 1993. Diffusion, dissemination, and implementation: Who should do what? *Annals of the New York Academy of Sciences* 703:226-35.

———. 1997. Research and evidence-based decision making. *Australian and New Zealand Journal of Public Health* 21:439-41.

Machlup, F. 1980. *Knowledge: Its creation, distribution and economic significance*, vol. 1. Princeton, NJ: Princeton University Press.

Martin, B. R. 2003. The changing social contract for science and the evolution of the university. In *Science and innovation: Rethinking the rationales for funding and governance*, edited by A. Geuna, A. J. Salter, and W. E. Steinmueller, 7-29. Cheltenham, UK: Edward Elgar.

McKelvey, R. D., and W. Zavoina. 1975. A statistical model for the analysis of ordinal level dependent variables. *Journal of Mathematical Sociology* 4:103-20.

Merton, R. K. 1949. The role of applied social science in the formation of policy: A research memorandum. *Philosophy of Science* 16:161-81.

Nyden, P., and W. Wiewel. 1992. Collaborative research: Harnessing the tensions between researchers and practitioners. *American Sociologist* (Winter): 43-55.

Oh, C. H. 1997. Issues for new thinking of knowledge utilization: Introductory remarks. *Knowledge and Policy: The International Journal of Knowledge Transfer and Utilization*, 10:3-10.

Oh, C. H., and R. F. Rich. 1996. Explaining use of information in public policymaking. *Knowledge and Policy: The International Journal of Knowledge Transfer and Utilization* 9:3-35.

Orlandi, M. A. 1996. Health promotion technology transfer: Organizational perspectives. *Canadian Journal of Public Health* 87:28-33.

Patton, M. Q., P. S. Grimes, K. M. Guthrie, N. J. Brennan, B. D. French, and D. A. Blyth. 1977. In search of impact: An analysis of the utilization of federal health evaluation research. In *Using social research in public policy making*, edited by C. H. Weiss, 141-63. Lexington, MA: Lexington Books.

Pelz, D. P. 1978. Some expanded perspectives on use of social science in public policy. In *Major social issues: A multidisciplinary view*, edited by J. M. Yinger and S. J. Cutler, 346-57. New York: Free Press.

Rich, R. F. 1975. Selective utilization of social science related information by federal policy makers. *Inquiry* 13:239-45.

———. 1977. Uses of social science information by federal bureaucrats: Knowledge for action versus knowledge for understanding. In *Using social research in public policy making*, edited by C. H. Weiss, 199-211. Lexington, MA: Lexington Books.

———. 1979. The pursuit of knowledge. *Knowledge: Creation, Diffusion, Utilization* 1:6-30.

———. 1997. Measuring knowledge utilization process and outcomes. *Knowledge and Policy: The International Journal of Knowledge Transfer and Utilization* 10:3-10.

———. 2002. The knowledge inquiry system: Critical issues and perspectives. Keynote address for the Champions, Opinion Leaders and Knowledge Brokers: Linkages between Researchers and Policy Makers conference, May 6, Center for Knowledge Transfer, Edmonton, Canada.

Rich, R. F., and C. H. Oh. 1993. The utilization of policy research. In *Encyclopaedia of policy studies*, edited by S. Nagel, 93-111. New York: Marcel Dekkar.

Silversides, A. 1997. Dissemination of research results to clinicians: An art in itself. *Canadian Medical Association Journal* 156:1746-47.

Souchon, A. L., and A. Dianmantopoulos. 1994. A conceptual framework of export marketing information use: Key issues and research propositions. *Journal of International Marketing* 4:49-71.

Sunesson, S., K. Nilsson, B. Ericson, and B.-M. Johansson. 1989. Intervening factors in the utilization of social research. *Knowledge in Society: The International Journal of Knowledge Transfer* 2:42-56.

Van de Vall, M., and C. Bolas. 1982. Using social policy research for reducing social problems: An empirical analysis of structure and function. *Journal of Applied Behavioral Scientist* 18:49-67.

Webber, D. J. 1987. Legislators' use of policy information. *American Behavioral Scientist* 30:612-31.

Weiss, C. H. 1973. The politics of impact measurement. *Political Studies* 1:179-83.

———. 1979. The many meanings of research utilization. *Public Administration Review* 29: 426-31.

———. 1980. Knowledge creep and decision accretion. *Knowledge: Creation, Diffusion, Utilization* 1:381-404.

———. 1986. Research and policy-making: A limited partnership. In *The Use and Abuse of Social Science*, edited by F. Heller, 214-35. London: Sage.

Weiss, C. H., and M. J. Bucuvalas. 1980. Truth tests and utility tests: Decision-makers' frames of reference for social science research. *American Sociological Review* 45:302-13.

Whiteman, D. 1985. Reaffirming the importance of strategic use: A two-dimensional perspective on policy analysis in Congress. *Knowledge* 6:203-24.

Williams, R. M. 1953. Application of research to practice in intergroup relations. *American Sociological Review* 18:78-83.

Yin, R. K., and G. B. Moore. 1988. Lessons on the utilization of research from nine case experiences in the natural hazards field. *Knowledge in Society: The International Journal of Knowledge Transfer* 1:25-44.

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