PRAXIOLOGY AND SOCIOCYBERNETICS IN HUMAN INQUIRY

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Abstract

Praxiology emphasizes the study of the efficiency and effectiveness of research methodology in action, where sociocybernetics maps the interactive relationships among those active elements. As an avenue to advance systems research methodology and address claims of systems science to legitimacy as the science of complexity, the interface and complementarity of these perspectives toward human inquiry command our attention. The conduct of a single research project may be described in terms of a general feedforward loop that consists of several specific feedback loops. This general cycle typifies the process of inquiry situated within the larger context of the research community, which in turn is embedded within many scientific and societal interests and constraints. Careful consideration of effective practices and the prudent use of resources accompany ever grander projects to describe, explain, design, and steer complex human phenomena. The relations, practices, and embeddedness of human inquiry provide insights into the conceptual levels of cybernetics, the complexities of human phenomena and research processes, and the emergent research strategies scientists use to pursue their interests. The complexity of human inquiry as a social system is explored from the praxiological, sociocybernetic, and systemic points of view.

INTRODUCTION

In organizational contexts, cybernetics continues to provide a useful set of theoretical constructs to study, describe, evaluate, and treat a wide range of collective human phenomena. Applications of Stafford Beer's Viable Systems Model (Espejo, 1990), extensions of Jay Forrester's System Dynamics to notions of the learning organization (Senge, 1990), and research conferences that converge cybernetics and systems (Trappl, 1990-1994) are some examples that attest to this assertion. The great majority of these applications may be construed as research projects. As an ideal generic form of human activity, a research project may be described as a series of interconnected and interdependent activities of the researchers (*i.e.* a human activity system), who 1) adopt research aims to serve their research interests, 2) pose research questions that may also be expressed in the forms of hypotheses and objectives, 3) formulate a research design and a research plan, 4) implement their research method(ology) that usually entails making observations and collecting data, 5) analyze and synthesize data, 6) organize and interpret findings that may include recommendations, and 7) communicate their work in forms of a research report. These activities constitute much of the enterprise, as we have come to know it, of doing research.

I use the word "research" repeatedly as an adjective before key concepts, namely aim, interest, design, plan, and report, because research is only one of the several manifestations of these key constructs. My intent is to employ these constructs to provide denotative anchors for a general methodology (*i.e.* praxiology) of systems science, especially applied to the human realm. Of course, there are many decisions to be made in each phase of the research process highlighted above. While my formulation of human inquiry may be considered a praxiology, as I understand Kotarbinski (1965) would have it, my formulation attempts to incorporate not only contemporary developments in methodology since Kotarbinski's day, but also the increased complexity of conducting research today. My purpose here is to converge the praxiological perspective with the sociocybernetic and strategic perspectives applied to the research process (Collen, 1995), and thereby reach for a more systemic comprehension of the nature of human inquiry.

HUMAN INQUIRY AS A CYCLE AND SOCIOCYBERNETIC SYSTEM

A research project can best be conceptualized as cyclical. The model is an ideal form. An investigation (inquiry) consists of a general feedforward loop (cycle) with numerous feedback loops interconnecting its phases. I shall refer to this construction as the general research cycle (Collen, 1995, 1996). One idealized form of the cycle is shown in Figure 1, based on Collen (1996). The loops shown in the figure are representative not exhaustive.
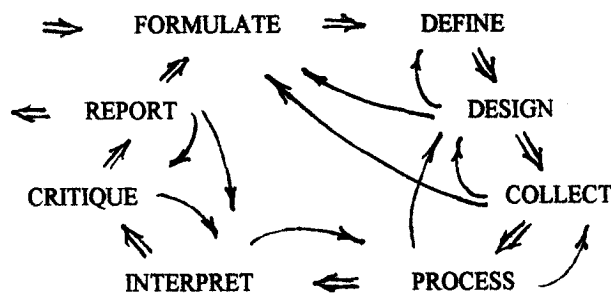

Figure 1. Feedback and feedforward loops of the general research cycle.

In the conduct of an investigation, the phase at hand preoccupies the researchers. Previous phases (feedback) serve the researchers to adjust (push) the process, while impending phases serve to draw (pull) the researchers to drive the process forward. Taken together, the push-and-pull enables the researchers to steer in the cybernetic sense the inquiry through the cycle. It is also these dynamics, the simultaneous push-and-pull, that brings past and future influences, respectively, into the process.

As researchers become more conscious of these dynamics and their ramifications through the research process, the complexificative as well as emergent aspects of human inquiry become more apparent. To cite one example of complexification, in attempting to bring about organizational change through participatory action research (Whyte, 1991), decisions on who in the human organization are to be selected to participate in the research project may impact on the generalizability of the findings and recommendations of change to the organization as a whole. What levels, branches, departments, subsidiaries, and locations are to provide the data of the inquiry? The initial decision on selection may not guarantee that the representativeness of the participants is known in advance, because disinterest, work responsibilities, and absenteeism may lead to attrition from the research project, such that the make-up of the final sample studied may not represent the views of the whole organization. In short, initial decisions concerning selection and sampling may require adjustments in selection and further sampling as the project progresses.

To follow further this example of complexification to point out one example of emergence, the researchers tapped to become the principal research team may come from very disparate areas of the organization. Personalities may clash at first and interdepartmental rivalries often slow the initial formulation of the research project. However, compelled to work together, there will emerge a coherent team that must supersede as a whole their individual differences. In fact, the diversity of talents and skills they bring to the team effort often contribute in a complementary fashion to the cooperative and collaborative teamwork required to move the inquiry forward. The research team soon becomes a viable human activity system, a newly recognized and respected entity in the organization.

The viewpoint being developed suggests that a research project may be perceived in terms of decisions to be made about the use of persons, resources, and time. Decisions mean actions, not only in the making of the decisions, but also in their ensuing implementation. It considers the efficiency, effectiveness, and efficacy of action. However, this viewpoint is not strictly utilitarian and functionalist, as a superficial reading of Kotarbinski (1965) might impress. Research decisions bring pragmatics to bear on the researcher's actions, which tend to emphasize the practical and consequential nature of action. And more recently, the rationality in the praxiology of decision-making has attracted more emphasis (Ulrich, 1998). The contemporary praxiological viewpoint also includes the ethicality of action, specifically, its ameliorative and detrimental impact on others and the environment (Collen, 1999). Finally, it includes the application of the traditional

constructs of praxiology (Gasparski, 1993)—the focus on the practicality of efficiency, effectiveness, and efficacy, of which I favor application to the contemporary problems of complexification in human inquiry.

Additional examples of complexification at each phase of the general cycle are shown in Table 1. They serve to illustrate as a set the implicit connections between the practical decision-making character of human inquiry rooted in praxiology, and the sociocybernetic nature of the conceptual relations that configure the research cycle.

FORMULATE
➲ Choice of problem area and focus within it.
➲ Choice of knowledge domains.
➲ Choice of level and perspectives of the subject matter within the problem area.
➲ Choice of several research questions and hypotheses, constituting a family of research aims, each of which may suggest a slightly different direction or emphasis for investigating the phenomenon.

DEFINE
➲ Choice of several viable and theoretically anchored definitions of the same hypothetical constructs.

DESIGN
➲ Choice of several valid and reliable instruments available to operationalize a hypothetical construct, thereby enabling the researcher to make observations and measure the phenomenon.
➲ Choice of several research designs to configure the persons, resources, and time required for conducting the inquiry.

COLLECT
➲ Choice of several plausible sampling plans to select the persons who manifest the phenomenon under study.
➲ Choice of multiple participants and repeated contact with the same participants.
➲ Choice of several times of the day, days of the month, and months of the year to make observations and collect data.
➲ Choice of several places to make observations and collect data.
➲ Choice of researchers, which considers their research competencies, research experience and proficiencies, familiarity with the phenomenon under study, familiarity with the methodology to be used, ethnicity, gender, epistemological orientation, and other personal characteristics relevant to the inquiry.

PROCESS
➲ Choice of several means to code, organize, and process the data collected.
➲ Choice of multiple qualitative and quantitative indices to analyze and synthesize the data, answer research questions, and test hypotheses.

INTERPRET
➲ Choice of multiple interpretations of the findings.

CRITIQUE
➲ Choice of multiple theories which seem to account for or refute the findings.

REPORT
➲ Choice of organizations and formats to place and present qualitative and quantitative indices and their associated findings in the report.
➲ Choice of several organizations and formats to describe and present the project.

Table 1. Examples of practical decisions to be made at each phase of the general research cycle.

Before moving to consider the contextualization of inquiry, it is important to indicate that one research project usually leads to another, and thereby research becomes programmatic (Collen, 1996). Where the feedforward loop of the general research cycle comes to completion by the assessment of gains from the start of the project, it is also this closure that sets the stage for commencement of the next cycle (Figure 2a).

a. Serial validation and replication.

Research Team A

Research Team B

Research Team C

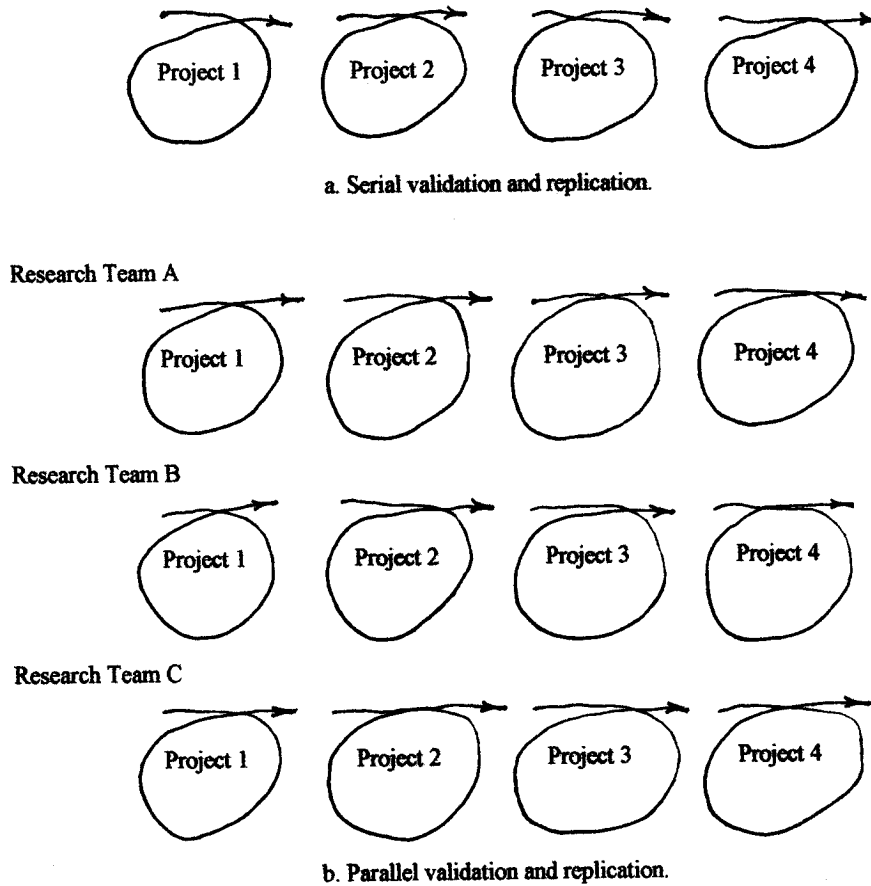b. Parallel validation and replication.

Figure 2. Programmatic research as a feedforward cycle.

Research becomes a series of cycles, typified as more general feedforward; however, this general feedforward may also be evidenced through parallel efforts within and among competing research groups working on the same problem (Figure 2b). In regard to the latter, I am reminded especially of contemporary programmatic research efforts for the Nobel Prizes in the biological sciences and medicine.

SITUATING HUMAN INQUIRY IN ITS SOCIAL CONTEXTS

As within the phases of a research project, the sociocybernetic nature of human inquiry may be similarly conveyed through an examination of the web of human relationships that surround and embed it. The general research cycle should be viewed within its broadening contexts to appreciate more fully its sociocybernetics.

Although greatly simplified to make my basic point, broadening contexts may be schematically represented in the form of concentric circles of embeddedness (Figure 3). These larger areas represent the fields in which inquiry is situated. Primarily, we consider only the feedback and feedforward loops of the phases of the cycle in relation to each other (Figure 1). However, in regard to these first order aspects, researchers have reciprocal relations with others immediately outside the phases of the cycle. They depend on these others to traverse from one phase to the next. Secondarily, there are connections between the phases and many contextualizing sources that directly impinge on the course of the project. These second

order relations constitute, for example, the sociocultural, economic, and political embeddedness of the research project. At a tertiary level, there are broader often more amorphous science and societal influences which bear on the conduct of the project. Although less visible in the conduct of inquiry these third order relations are increasingly considered inclusive to a vital and sustainable research cycle.
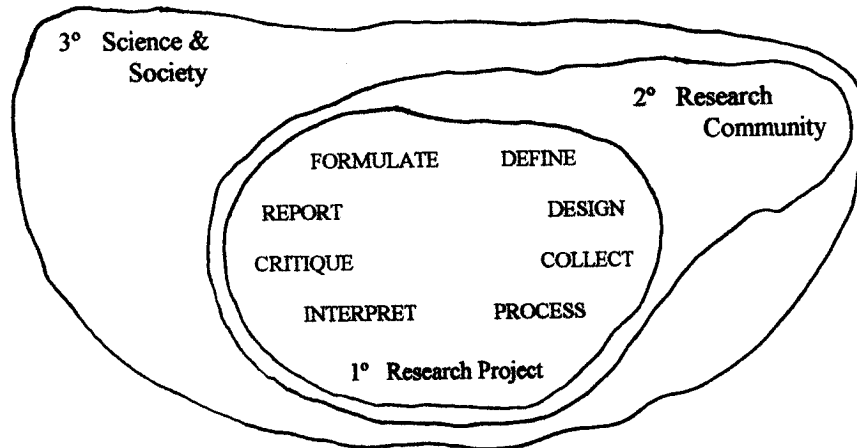

Figure 3. Contextual embeddedness that bear on human inquiry.

It can be noted in other words, the centrality of the human relationships that the researchers have to one another and perhaps their participants over the course of the inquiry. But it takes a group of persons, well beyond the research principals and their assistants to make research projects possible. The researchers are surrounded in their relationships with others immediately outside the conduct of the inquiry itself, yet these relations affect the project in critical ways. Even farther removed is a third concentric circle of relationships with those who communicate science and societal influences. Some specific examples of the interdependency of the research team with those comprising the contexts of their research are shown in the primary, secondary, and tertiary levels of Table 2.

Level	Situatedness	Human relations	Examples
1°	Phases of the research cycle	Within the research team	● Expertise among members are complementary ● Division of labor among data collectors ● Responsibilities of principals, assistants, and staff prescribed
2°	Research project in relation to its place of operation	Within the research community	● Employer distribution of funds to researchers ● Researcher progress reports to employer ● Selection of participants
3°	Research project in relation to domains of knowledge and application	Within the public domain and society	● Media coverage of the research results ● Foundation support for the research ● Researcher testimony to a government committee

Table 2. Human relationships in human inquiry illustrating three levels of contextual embeddedness.

For a given research project, mapping out such relationships helps to make visible the embedded and interdependent nature of research activity during the course of a research project. At the primary level, I concentrate on the psychosocial relationships among the researchers and their participants. These bear directly on the conduct of the inquiry. Researcher bias, for example, and the mutual influences of personal demographics, such as gender, ethnicity, political beliefs, temperament, and attitudes come into play in understanding the validity of the methodology used. At the secondary level, I focus on the social, cultural, and political web of relationships in the setting in which the researchers operate; these relationships usually involve their friends, family members, employers, human subject review boards, and interested colleagues. Finally, at the tertiary level, I look at broadest context, which involves those persons the researchers have to deal with remotely and periodically in the course of their research, such as the media journalists, equipment suppliers, colleagues of professional societies, lawyers, and politicians.

SOCIOCYBERNETIC HIERARCHIES

There are several hierarchies that help to organize our thinking about the sociocybernetics of human inquiry. This part of the paper describes three of them and provides an example of each.

First, the interests of the researchers require specification, organization, and prioritization. A single research investigation today often attempts to reach more than one aim and satisfy a variety of human interests. Typically, researchers are more ambitious and full of expectations for their project usually with an insufficiency of resources to fulfill them. Whether expressed in the form of aims, goals, research questions, hypotheses, and/or objectives, the researchers must be able to communicate and maintain a clear perspective on their research priorities. By specifying their priorities in an hierarchical form, the perspective can set the stage for the productive and efficient use of the resources allocated. For example, if the project is to test a theory primarily via an hypothesis, and secondarily change the beliefs of the participants toward a healthier life style, then this framework is expected by all to guide the inquiry. If it should happen that attitude change is consequential and theory remains controversial, fine; it is a secondary gain from the inquiry, which might suggest more substantive and subsequent investigation on attitude change. However, the chief focus remains on the test of the theory. It is what the project is about foremost in the eyes of its creators and funders. Should priorities not be maintained, researchers too easily become vulnerable to accusations of abuse and negligence in the use of their resources.

Second, there is the action of being engaged in and conducting the inquiry itself, the supervision and management of the research process, and the reflection upon both the action and the supervision in relation to the research program. This social hierarchy focuses on the immediate organization and dynamics of the human beings undertaking the project. There are primary, secondary, and tertiary persons who must coordinate their efforts and work as a team, else little progress can occur through the research cycle. Figure 4 represents the social hierarchy common to many research projects, but cast as it might apply to ethnography.

RESEARCH PROGRAM DIRECTOR

PRINCIPAL SUPERVISING RESEARCH OBSERVER

RESEARCH ASSISTANT OBSERVERS
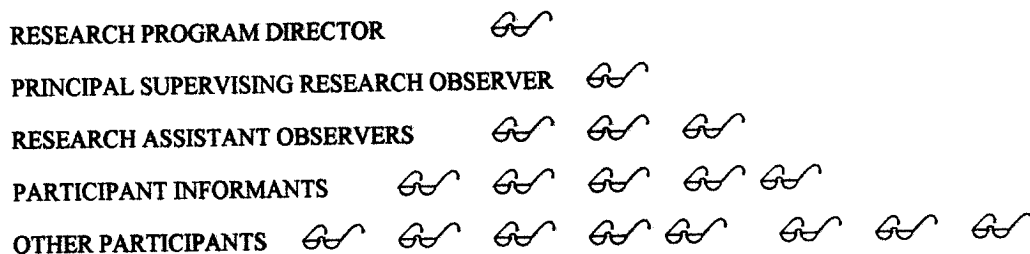
PARTICIPANT INFORMANTS

OTHER PARTICIPANTS

Figure 4. A social hierarchy implicit in human inquiry, hypothetically illustrated in regard to ethnography.

Third, there is the general research cycle of a given project, which through programmatic research becomes situated within a series of projects that constitute the program. This project, as well as the program, may be compared and contrasted with others from within as well as outside the program (Figure 2). This hierarchy also makes reference to the relations discussed earlier in regard to Figure 3.

Taking these three hierarchies as exemplary, even though a few of the many reciprocal relations among the levels of the hierarchies are depicted (Table 2), it seems fair to state that sociocybernetics provides an informative conceptual tool for the articulation of various orders of relationship in human inquiry. Further, a hierarchy may be considered the embodiment of a perspective that the researchers possess in reflecting upon their inquiry process, in order to make sense of their process of doing research. These hierarchies, or perspectives let us call them, shed some light on the interests of the praxiologist, who reaches to envision the practical and more generic aspects of a general methodology inherent, evident, and applicable to every research project. To the extent that various perspectives become visible and meaningful brings some confirmation---a methodology validity---to the inquiry, for it means that the process is as it is intended to be. This feedback to the researchers is reassuring, and it builds confidence that the general research cyle is progressing forward as it should. And thereby, it gives the researchers their anticipated opportunity to fulfill their interests from the inquiry.

Overall, hierarchies, such as those described and shown previously, may generate informative schema to communicate and discuss the contemporary realities of doing human science research. As one takes each hierarchy to represent a perspective, in the tradition of the perspectivism of a general theory of systems (Bertalanffy, 1968), converging these perspectives helps researchers to attain a more holistic comprehension of the process of human inquiry as well as a respectful appreciation of its complexifications.

PROBLEMS OF COMPLEXITY AND EMERGENCE

Mapping the sociocybernetic relations of human inquiry quickly makes evident numerous complexities of the inquiry process. The human activity system, that is the team of researchers and their participants who carry out the project, becomes an emergent reality. The feedforward movement of the research process from one phase to the next may also be viewed as emergent phenomena.

Given the presence of the highly regulated usage of human subjects in research, as well as the accountability demanded of funding and legislative bodies, the case can be readily made that the conduct of human inquiry has become more complex as the century has progressed, and research now requires more justification on ethical and praxiological grounds than in past decades. Researchers must present a sound rationale for their expenditure of resources, time, and money. And for these expenditures, they are held accountable to their parent organizations, sponsors, funding agencies, and legislative and legal bodies. Their administration of procedures that impact human beings must not place their participants in harm's way, particularly in regard to physical and psychological impact, and most recently, environmental impact. If such risks are probable, researchers must document informed consent and have prepared for what they will do should their research have a detrimental effect.

Although we know more about doing research and have a more sophisticated arsenal of methodologies and technologies at our disposal, the praxiological aspects of inquiry are more critical today. Table 3 presents one example of the complexity of making what might at first appear to be a simple decision pertinent to survey research. From a praxiological point of view, we can ill afford to waste key resources (namely, people, material, money, and time) in human inquiry, even such research projects as public opinion, marketing, census, and attitude surveys. Efficient and effective research practices are essential. In addition to fiscal accountability and research ethics, the choices researchers make (*e.g.* Tables 1 and 3) must carefully consider the efficacy of their practices to amply justify their consumption of resources. In this line of thinking for the future (Collen, 1998), environmental and ecological impact of a proposed human research project has become a factor in judging its acceptability.

Importantly, the dramatic advancements in technology have made it possible to extend research methodology. Our eyes, ears, and fingers can receive overwhelming arrays of information to be sifted, sorted, and organized to make greater sense of our world. Communication technologies have brought forms of observational research, for example, to voluminous levels of data collection. Software advances have enabled researchers to process numerical, textual, and pictorial forms of data within hours to days that formerly took days to months to process. These advances demand more training and sophistication to be able to use these human extensions with skill, competence, and responsibility. Like the financial, ethical, and praxiological sides of inquiry, advances in methodology increase the complexity of doing human inquiry.

Finally, as we are coming to view problems and issues more systemically and globally, expectations tend to rise that those who assert systemic methodology to address the complex problems and issues of humanity may be called forth to serve and be held to account for their assertions. Systemic methodologies certainly appear to advocate and pursue such matters as the study of complexity and the change and amelioration of human organizations; see for examples, Flood and Jackson (1991) and Jackson (1991). As expectations of systems and cybernetic approaches to inquiry heighten, their applications to human inquiry make research more complex.

<u>To mail, phone, or interview?</u>

MAIL
Fixed item sequence
Mailing the survey, a very low rate (1-3%) of return.
High waste of materials
Perceived by most as junk mail
Production costs to produce surveys
Less time to complete
Cost to collect data per participant low
No opportunity to steer and guide course of survey
No access to participant's context and presence

PHONE
Semi-fixed item sequence possible
Conducting the survey by telephone, higher than 50% compliance
Low level of material waste
Training the researcher to conduct the phone survey
Moderate time to complete
When to call the participant
Cost to collect data per participant moderate
Can steer and guide course of survey
No access to participant's context
Indirect access to participant's presence

INTERVIEW
Flexible item sequence possible
Collecting the survey in person, higher than 90% completed
Low level of material waste
Training the researcher to conduct the interview
More time to complete
Where and when to meet the participant
Cost to collect data per participant high
Can steer and guide course of survey
Direct access to participant's context and presence

Table 3. A example of complexity in human inquiry from a praxiological point of view.

The context is elaborate, the inquiry is intricate, the methodology and technology are variegated, and human problems are going global. These developments over the century serve like four barrels of gunshot coming at researchers who must face these growing complexities to conduct human inquiry.

TWO IMPLICATIONS FOR THE CONDUCT OF HUMAN INQUIRY

As we open the next century, I think we face a much more sophisticated challenge for the conduct of human inquiry than we have seen in the past. Expectations of science are growing. If the progenitors of systems science methodology make any claims to be able to study, describe, comprehend, and ameliorate the complex array of human problems and issues from the local to global levels, then the sociocybernetics of human inquiry will require much more attention and a deeper understanding of the intricacies of human

activity. In addition to established studies of the history, philosophy, and sociology of science, the praxiology of the human oriented sciences---the study of the methods, conduct, and practices of these sciences---must emerge in my opinion as a more important part of methodology than it currently seems to be. But the focus here is also a systems science applied to the human realm. Therefore, the first implication I wish to stress is upon the praxiology of human inquiry.

Research strategy in science may be defined as a primary methodological construct for maximizing the advance of knowledge and human betterment, theory construction and revision, and research methodology and technology, while using resources prudently (Collen, 1996). A few examples of research strategy are (1) to sketch a plan for a series of investigations interlocked through the replication of former findings coupled with subsequent extensions for the generalization of findings to broader ranges of persons, circumstances, and situations; and (2) to combine compatible components from three methods, such as psychophysiological measurement, psychological self-report, and naturalistic observation, to construct a methodology, so that as a set the components, the methodology provides opportunity for the researchers to obtain a multi-dimensional view of the phenomenon studied. The strategies researchers find efficacious will require greater sophistication than simple experiments, for example. Already the case, researchers are working together in transdisciplinary teams. It has become more permissible to transgress paradigmatic boundaries, which tend to favor the exclusive use of one approach to human inquiry. It is encouraging when researchers are willing to look for ways to work cooperatively across knowledge domains, in order to conduct human inquiry on system-wide problems that are viewed as complex and increasingly global. Hence, the second implication I wish to come to is the advantageous execution of effective research strategies through transdisciplinary teamwork.

CONCLUSION

This brief discussion contains the rudiments of the interface of praxiology with sociocybernetics, research strategy and systemic research methodology. The general research cycle as a model serves as a conduit to explore methodology in terms of the practical matters and business of human inquiry. It has been the contention of the paper that human inquiry has become more complex as researchers expect more of it. On the one hand, advancements in science methodology and technology have fed these rising expectations. On the other hand, trends toward globalization have brought to the foreground a larger scope and scale to consider human problems and issues. Complexification and emergent phenomena of the process of doing research suggest that human inquiry is not as easy and as simple as it used to be. But researchers are pushing clear avenues to cope with complexification, namely research teams, research strategy, praxiologically-based decision-making, and systemic research methodology.

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