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Generalization in information systems research is important because of the highly applied and vocational nature of the field. However, the concept is often inappropriately and narrowly confined to one or two views of research. This paper develops the concept of generalizability as a two-stage process. The first stage involves creating a general case from a base case (or cases). The second stage involves applying the general case to a goal case. The predominant concern in the information systems literature regards only stage one generalization. This neglect of the stage two generalization process leads to oversights in the nature of qualitative generalization. These oversights include varying standards of criteria that apply to different classes of generalization.

1. Introduction

The term "generalizability" refers to the usefulness of a theoretical construct outside of its limited domain of known observations. The term refers to a concept that is laden with conflict for researchers in information systems (IS). In one sense, "strict generalizability" is used in statistic-based studies to indicate the probable mathematical relationships between observations of phenomena in a sample and the phenomena in the corresponding population. The term is also used in a broader sense as a reference to the "general case". The general case is an abstract conceptual phenomenon that shares certain defined characteristics with a bounded set of observed phenomena. The broad and strict sense of the term differ only in the importance of sta-

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tistical sampling for delineating the general case.

For IS research, the broad sense of generalizability is a key criterion for success. This is because the general case for any theory is closely related to relevance and practicability. Relevance regards the usefulness of research to its audience, which may include other researchers or other practitioners. This relevance is an important criterion for assessing IS research (Keen 1991). "Practicability" is the ability to place the theory into practice. This ability regards the practical usefulness of research findings in either day-to-day or strategic decision making by IS professionals. Research becomes generalizable because its usefulness is apparent (it is relevant), and the mechanics of using it are apparent (it is practicable). This link between generalizability, through relevance and practicability, is particularly important to IS research because the IS research field is highly applied, almost vocational in nature (Banville and Landrey 1989):

> Science aims at general understanding rather than at the explanation of individual events. . . . The utility of a social theory or social correlation is enhanced by its generalizability. The larger the scope of phenomena it explains, the more useful it is. (Babbie 1990, p. 13, 25)

Because IS is an applied, vocational research field, generalizability is a crucial aspect in assessing the impact of most IS research findings. Practitioners can adjust their decisions with regard to this general case (*cf.* Cooper 1988). Follow-on researchers can relate their discoveries to this general case.

Information systems practitioners generalize their experience intuitively. Like good consultants, they map their practical experiences onto any new settings in their search for solutions to their immediate problems. This map constitutes the characteristics selectively abstracted from previous experiments and is analogous to our concept of the "general case". This is a highly applied form of generalization.

Are all forms of research generalizable? For example, if one conducts a single experiment or an in-depth study of a single organizational experience, can this experience be generalized to new organizational settings? Practitioners are often forced to apply their experience in this way because a singular similar experience is all they have to drawn upon in some problem settings. Yet academic researchers seem to operate with more limited acceptance of generalizability:

> In other words, generalizability is a quality describing a theory that has been tested and confirmed in a variety of situations, whether such testing is conducted through case research, laboratory experiments, statistical experiments or natural experiments. (Lee 1989)

This limited acceptance seems to suggest that a valid mapping of previous experience onto new settings is only permissible when the previous experience represents a "variety of situations". This rules out the potential value of a "unique" experience, for example, when a particular problem setting has only occurred once before, as in case studies (*cf.* Benbasat *et al.* 1987). It also suggests that the findings of research approaches that focus on unique settings (*e.g.,* ethnographies, action research and interpretive case studies) cannot be applied to new problem settings. Yet practitioners seem to value case study research highly, and case studies are a popular pedagogical tool for

improving the practical grounding of business courses.

Clearly there is something faulty in our understanding of how our information systems research is generalized. The purpose of this paper is to explore the philosophical foundation for different forms of generalization in its broad sense. We will free the concept from its undue and improper binding to natural science research models, and explore the forms of generalization as they exist in other popular IS research models. To a large extent, this paper addresses a domain that is much broader than IS, and applies to the field of social enquiry as a whole. However, the vocational nature of IS makes it quite natural that this critical philosophical groundwork should emerge from the IS arena.

To accomplish this purpose, we will first consider the social science assumptions that confuse this issue. Following this discussion, in section three, we will discuss the characteristics of the generalization process. In section four, we will describe the four classes of generalization based on these characteristics. This will enable us to consider the various criteria for generalization in each of these classes (section five). The nature of these criteria are important for IS research because different research modes imply different standards by which the research can be measured with regard to these criteria. The paper will conclude with a discussion of the traditions and implications of such criteria and our four-class view of generalization.

2. Characteristics of Research Enquiries

In the natural sciences, the strongest generalizations are theoretical propositions that entail causal laws-of-nature. Such causal laws are impossible for the social sciences. The social sciences must depend on less powerful explanations, such as probabilistic, genetic and teleological explanations:

> To be sure, the laws or generalizations concerning social phenomena made available by current social inquiry are far more restricted in scope of application, are formulated far less precisely, and are acceptable as factually sound only if understood to be hedged in by a far larger number of tacit qualifications and exceptions, than are most of the commonly cited laws of the physical sciences. In this respect, however, the generalizations of social inquiry do not appear to differ radically from generalizations currently advanced in domains usually regarded as unquestionably respectable subdivisions of natural science C for example, in the study of turbulence phenomena and in embryology. (Nagel 1969, p. 449).

That is, "less powerful" generalization should not imply "inoperative" generalization. It is a fallacy to confine causality, explanation or generalization to a closely bounded set of scientific assumptions. The concepts apply quite broadly, and IS researchers should not dismiss these criteria out-of-hand. The appendix explores a number of fundamentally contrasting views of scientific enquiry, all of which, on both sides of their dichotomies, admit generalization.

The fundamentally problematic dichotomy lies between *nomothetic generalization* and *idiographic generalization*.

Nomothetic science involves the search for general laws of nature which hold with a necessity (cannot be broken) and permit no genuine exceptions. In contrast, idiographic science involves the study of particular cases. An idiographic theory is developed for one case; a nomothetic theory is developed for an entire class of cases. Clearly law-like nomothetic statements entail generalization. Nomothetic "science" like chemistry and physics is sometimes contrasted with idiographic "enquiry" such as history and geography. Idiographic social "science", entailed in the action research, the case studies and the ethnographies popular among IS researchers, is primarily questioned as science because these modes of enquiry do not emit law-like statements.

Much of the work below is concerned with explicating the manifestation and nature of this idiographic generalizability. However, before proceeding to this discussion, it may be useful to examine the nomothetic dismissal of idiographic social science, and the corresponding resignation of the modern scientific claim by some social inquirers.

Most idiographic methods of enquiry also tend to fail some of the criteria of the "normal" or "received" dichotomous positions described in the appendix, such as objectivism and reductionism. However, it is the lack of nomothetical findings that most strongly denies the scientific nature of idiographic enquiry:

> Much of the 'social theory' that has emerged from [the study of human society], in the past as well as the present, is social and moral philosophy rather than social science. . . . In consequence, the property of designating any extant branch of social inquiry as a 'real science' has been repeatedly challenged C commonly on the ground that, although such inquiries have contributed large quantities of frequently reliable information about social matters, these contributions are primarily descriptive studies of special social facts in certain historically situated human groups, and supply no strictly universal laws about social phenomena. (Nagel 1969, p. 447-449).

Among social scientists, there is a certain amount of fratricide over the issue of nomothetic generalization. Advocates of specific forms of social enquiry dismiss the scientific nature of other forms because these other forms lack law-like generalizability:

> Although case studies are conducted in such a way as to provide detailed information about social units, they are often criticized as being limited in scope and not sufficient for meaningful generalizations to be made to larger social aggregates. Again we encounter the problem of the representativeness of the case. (Black and Champion 1976, p. 92).

This fratricidal rhetoric can sometimes lead to narrow, chauvinistic statements that broadly dismiss much of the body of social enquiry from any claim to the stature of "science":

> The term 'truth' is red meat for philosophers and they are welcome to it. Science prefers to operate in the less lofty region of falsifiable statements that can be tested by evidence, and verifiable observations that can be checked by someone else. (Hoover 1976, p.40)

Some social researchers have chosen to leave the generalizability debate by exiting from their claims to any scientific stature for their social enquiries. At the extreme position of this idiographic enquiry viewpoint, this equally strident

contingent is prepared to (rather thankfully) leave behind the "grand narrative" of science. This postmodern view of non-scientific social enquiry as a preferred position over the shackles of modern science is itself varied. The two extreme postmodern positions are known as the "affirmatives" and the "skeptics" (Rosenau 1992). These two extreme positions differ in their viewpoints on generalization. The affirmatives still hold causality, explanation and generalization in limited value. This value is limited by the multiplicity of truth and local narratives. The skeptics acknowledge complete relativism and no longer regard constructs like generalization as useful.

We will discuss generalization in terms that apply to a broad view of social enquiry. These terms will regard the value of generalization to social enquiry as part of the grand narrative of science. These terms will also stretch to regard the value of generalization for local narratives and multiple readings of the text of the enquiry. That is, these terms are relevant to affirmative postmodern science. Our scope reaches its limit at this boundary. This discussion will have only limited use in the sense of skeptical postmodernism.

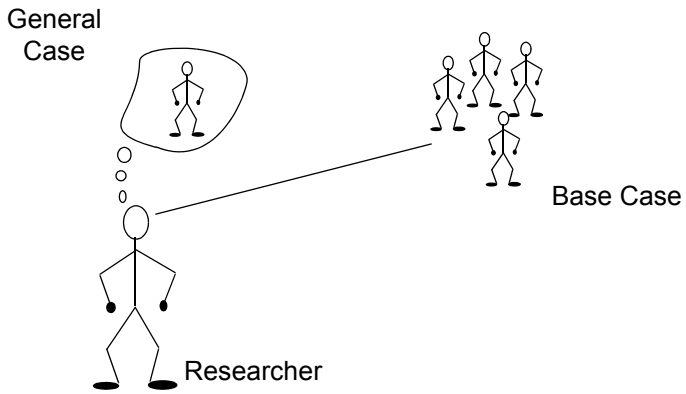
3. Characteristics of Generalization

Typically, we distinguish between two types of "cases" in the generalization process. A *base case* is the setting, or groups of settings that were the basis for the research. For example, if a case study is made in the wire room of Brinks Bank, the wire room of Brinks Bank at that time is the base case. If a survey is taken of 100 Indian IS managers, the 100 Indian IS managers at that time represent the 100 base cases. A *general case* is an abstract, theoretical case that manifests a relevant subset of the characteristics of the base case (or shared characteristics of the base cases). For example, we might construct a general case as an imaginary "typical" Indian IS manager based on our survey, or an imaginary "typical" wire room based on our Brinks case study.

This two-case view of generalization disregards idiographic research because it is incomplete. The complete process involves a third case. This third case, the *goal case*, is the application of the general case in some new setting. The goal case is the application setting for the research findings. For example, we create a goal case if we predict the behavior of the IS manager of a New Delhi water pump distributor based on the general case in our survey. Likewise, if we redesign the Barclays Bank wire room based on the general case discovered in the study of the Brinks wire room, the Barclays wire room is the goal case. The *generalization process* implies the creation of at least one chain of all three types of cases, not just the first two types.

Because the chain involves three types of case, the generalization process takes place in two (possibly iterative) stages. *Stage One Generalization* involves the creation of the general case out of the base case (or cases). See 1. This process could be deductive or inductive. In a deductive model, the general case constructed before the base case is observed (along with the theory), and the base case observations are confirmatory. In an inductive model, the base case is analyzed for relevant characteristics, perhaps discovered as shared character-

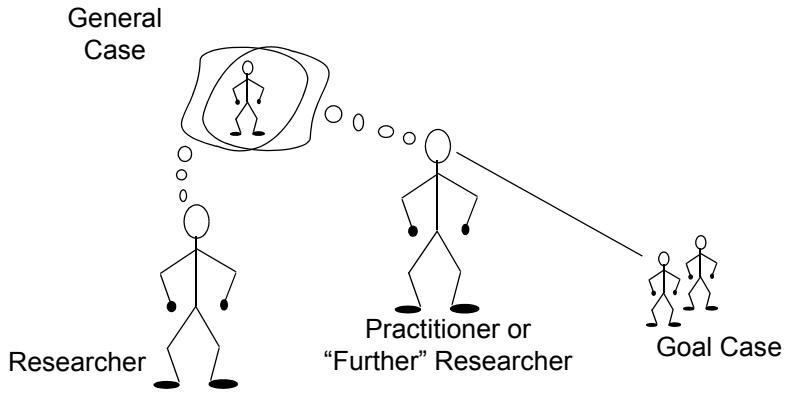
FIGURE 1. Stage One Generalization



istics among several base cases. The general case is created from this analysis. *Stage Two Generalization* involves estimating the behavior of the goal case (or cases) given the general case, and will sometimes involve sharing the general case concepts between the original researchers and other reseachers or practitioners. Even if the original researchers are also estimating the behavior of the goal case, this will sometimes involve a lapse of time and their own shifts in viewpoint. See 1. In a practical sense, stage two generalization completes the mapping process of the practitioner from experience onto new problem settings. The general case is embodied in the characteristic-bearing map. The emphasis is on the goal case, and the general case is often framed in the context of this goal case. This is opposite for the original researcher. Researchers usually frame the general case in the context of the base case.

This generalization process may be iterative in that, for stage two generalization to be "successful", the goal case must consistently share the characteristics predicated on the general case. This success effectively converts the goal case into a base case, and reinforces beliefs in the generalized characteristics of the general case. However, successful stage two generalization may suggest refinements or adjustments to the general case because of slight differences between the experiences of the goal case and the expected experiences based on the general case. This precipitates a new round of stage one generalization, as the general case is modified based on the newly expanded set of base cases. This full generalization process is similar in nature to the double-loop model of organizational learning (Argyris and Schön 1978). This two-stage process does not mean that generalizable research requires multiple studies in order to achieve generalization, any more than the creation of theory requires theory evolution (*i.e.,* theory-building studies followed by theory-testing studies). Al-

FIGURE 2. Stage two generalization



though an evolving theory implies an evolving general case, a general case is implied by any newly created and untested theory. Stage two generalization does not require a follow-up study (but would certainly be a component in the conception of a follow-up study). A full generalization does require that the general case becomes useful. A generalization is an empirical implication of theorizing about base cases (stage one), and an inspiration in theorizing about goal cases (stage two). The general case is negotiated between the two "theorizers".

There is a close relationship between the underlying theory and the general case. From certain viewpoints, the general case *is* the theory, to the extent that theory is comprised by covering laws that describe ordinary linear reality (DiMaggio 1995). For example, a typical goal in systems science is an abstract systemic model of related phenomena. This abstract model can be defined as the general case. Sutton and Staw (1995) argue that such a covering-law viewpoint is too weak to constitute theory because these provide no supporting narrative that explain exactly why the general case appears (*cf.* Weick 1995). A weak theory setting may conflate the general case and theory. In a strong theory setting, the general case becomes the central empirical implication or projection inferred from the theory.

A strictly orthodox view of generalization leaves these empirical projects hanging in space, potentially unwanted and pragmatically useless. This view holds that stage one generalization is the complete process. Such a narrow view would be inconsistent with the relevance criterion important to a vocational field such as information systems. In the IS field, generalization must entail the second stage, projecting the general case (*e.g.,* a systemic model) onto goal cases.

There are two dichotomies that characterize a broad view of generalization. The two dichotomies involve the contrasting positions regarding the basis for discovering the general case and the goal

case: universal or idiographic settings. In a universal setting, the general case is related to a universe of base or goal cases (or both). In an idiographic setting, the general case is related only to one particular base or goal case.[1]

3.1. Universal and Idiographic Stage One Generalization

The difference between universal and idiographic stage one generalization regards the cardinality between the general case and the base case population. A one-to-one relationship between the base case and the general case (*i.e.* a single base case is abstracted to form the general case) is an idiographic stage one generalization. A one-to-many relationship between the general case and the base cases is a universal stage one generalization.

Universal stage one generalizations are made on the foundations of multiple observations of phenomena. To some degree the general case represents a uniting or merging of the shared, common characteristics of all of the base cases.

Idiographic stage one generalizations may represent an abstraction of certain characteristics of the single base case and the positing of these as the general case. On the other hand, idiographic stage one generalization may suggest that the base is itself a general case. That is, there may not only be a one-to-one relationship between the base case and the general case, the two cases may be viewed as exactly the same (as in the systems science modelling example mentioned in section two).

3.2. Universal and Idiographic Stage Two Generalization

The difference between idiographic and universal stage two generalization regards the cardinality between the general case and the goal case population. A one-to-one relationship between the base case and goal case (*i.e.*, the general case is transformed to suit a single goal case) is an idiographic stage two generalization. A one-to-many relationship between the general case and the goal cases is a universal stage two generalization.

Universal stage two generalizations are made on the assumption that the general case will apply to some bounded universe of multiple goal cases. The important element here is the presence of some predefinition of the set of goal cases to which the general case can be applied. A key element in universal stage two generalization is the description, specification or delineation of the characteristics of the set of the goal cases. Usually the goal cases will share all of the characteristics defined by the general case, and very little interpretation is necessary by the receiver of the research findings. In statistical surveys, for example, this element would regard the delineation of the population for which the sample is purported to represent.

Idiographic stage two generalizations imply that the second stage of the generalization process is unique to the goal case. In published research studies, such idiographic generalization depends on the reader to interpret the characteristics of the general case in the context of the goal case. This is a much more practitioner-oriented mode of generalization. The researcher to defers the definition of the goal case to the reader. The important element here is the lack of any predefini-

TABLE 3. Four classes of generalization and the cardinality between base, general and goal cases

Stage Two Generalization	*Stage One Generalization*	
	Universal	*Idiographic*
Universal	Nomothetic Universal (NU) base *C general C+ goal	Provisional Universal (PU) base CC general C+ goal
Idiographic	Deductive Idiographic (DI) base *C general CC goal	Inductive Idiographic (II) base CC general CC goal

"CC" symbolizes one-to-one cardinality, "C+" symbolizes one-to-many cardinality.

tion of the set of goal cases to which the general case can be applied. The researcher will bring out the characteristics of the general case, but not all of these characteristics will apply to any particular goal case. The receiver of the research will have to interpret the general case for each particular goal case. Such research findings do not deny intrinsically that stage two generalization can take place, but this stage is deferred to the receiver of the research findings.

Idiographic stage two generalization is postmodern in the sense that the "reader" is drawn into the hermeneutic interpretation of the general case. Idiographic stage two generalization implies that the "meaning" of the general case is deferred to the audience of the research. The research defines the base case (or cases) and the general case, but does not define the goal case (thus completing the stage one generalization but not the stage two generalization). The reader contributes the stage two generalization and establishes the goal case. We will use the term "*deferred generalizability*" to refer to this postponement of the definition of a goal case. Idiographic stage two generalizations imply deferred generalizability.

4. Four Classes of Generalization

These two dichotomies of idiographic and universal concepts applied in the two stages of generalization can be used to define a four class model of generalization. This model is shown in Table 3. The horizontal axis of this table is divided into universal and idiographic stage one generalization. The vertical axis of this table is divided into universal and idiographic stage two generalization. These axes form a four-quadrant classification system for generalization. Each quadrant is named in terms of its stage two generalizability, implying the practical relevance and the critical importance of the second stage in the generalization process. Each of these classes is discussed briefly below.

4.1. Nomothetic Universal (NU) Generalization

NU generalization is based on universal stage one generalization and universal stage two generalization. The general case actually defines a many-to-many correspondence between the base cases and the goal cases. Social enquiry research that makes such generalizations

depends on law-like statements that have carefully defined base cases and goal cases. These statements are typically very formal, quantitative and probabilistic. The primary methods in information systems that lead to these generalizations are surveys (Baroudi and Orlikowski 1989) and laboratory experiments (Jarvenpaa *et al.* 1985) that claim representative samples in a defined population.

The mode of NU generalizations is the probable determinism in statements about the goal cases. Error rates are predetermined in the sense that the research can define its mathematical accuracy in determining the goal cases. These generalizations are typified by questionnaire surveys in which a substantial number of base cases are projected on a population of goal cases. One example of such studies in IS is published by Igbaria and Baroudi (1995), who surveyed 127 IS development professionals to determine if women received lower average job performance ratings than men. Their findings are generalized to all women and men in the IS field (the goal cases), positing the general case the "women experience more restricted career advancement than men" (p. 117).

4.2. Provisional Universal (PU) Generalization

PU generalization is based on idiographic stage one generalization and universal stage two generalization. The general case actually defines a one-to-many correspondence between a single base case and a population of goal cases. Social enquiry research that makes such generalizations will depend on a single base case which is carefully selected on the basis of its representative characteristics. Methods that can lead to such generalizations include field experiments, natural experiments and case studies. For example, one natural experiment compared civilian moral in a heavily-bombed city with an unbombed city to determine the effect of blanket civilian bombing in warfare. The result (no effective difference) is generalized in a PU sense to the universal population of all civilian populations in all cities.

The mode of PU generalizations is the provisional nature in statements about the goal cases. Error rates in defining the goal cases and the defining characteristics of the goal cases are virtually unknown. The generalization is highly provisional and tentative, posited almost "temporarily" until further research more clearly sets the bounds on the population of goal cases. One example of IS research that adopts such a mode of generalization is the widely-cited case study published by Orlikowski (1992) in which she studied the organizational issues raised by a Lotus Notes implementation. The findings are generalized to all organizations whose groupware premises are incongruent with the culture and structure (p. 368, the goal cases). Although characterized as exploratory, it is posited that these elements have significant effects on the early use of the technology (the general case, p. 367).

4.3. Deductive Idiographic (DI) Generalization

DI generalization is based on universal stage one generalization and idiographic stage two generalization. The general case actually defines a many-to-one correspondence between multiple base cases and a single goal case. Social enquiry research that makes such generalizations will depend on multiple base cases that

are selected opportunistically rather than on any basis of representative characteristics. These studies will avoid delineations or characterizations of the population of goal cases. Methods that can typically lead to such generalizations include multiple case studies (that lack selective criteria), comparative ethnographies, and grounded theory. For example, grounded theory uses "theoretical sampling" to guide the selection of observations as the research emerges. Multiple base cases are selected purely on the basis of internal consistency in the general case, with no real regard for any relationship between the goal cases and either the base and general cases.

The mode of DI generalizations is the importance of the correspondence between the general case and the base cases. No claims are made about the usefulness of the general case for goal cases. DI generalizations entail deferred generalizability. However, the mode of DI generalizations is theoretical validity, and suggest that the theory can be adapted (rather than directly applied) in goal cases. That is, DI generalizations expect that the general case must be interpreted (modified) before it can be useful for any goal case. Consequently, at the deferred point of any stage two DI generalization, the general case has to be corrected or changed, thus creating a one-to-one correspondence between the general case and the goal case. Each usable general case must be deduced from two premises. The first premise is the posited general case in the research. The second premise is the particular, unique situation of the goal case.

An example of research assuming this mode of generalization was published by Applegate (1994). This work reports a longitudinal, multiple case study research design involving three cases (base cases) and describing in some detail the patterns of change within the three firms (general case). This pattern included the initiation of structural change, followed by destabilization and confrontation, followed by evolutionary role changes and information systems changes. However, Applegate defers the goal case to the reader, allowing the details to "inform" future decisions.

4.4. Inductive Idiographic Generalization

II generalization is based on idiographic stage one generalization and idiographic stage two generalization. The general case actually defines a one-to-one correspondence between the base case and a single goal case. Social enquiry research that leads to such generalizations will depend on a single in-depth base case that is selected opportunistically rather than on any basis of representative characteristics. Like DI generalization, these studies will avoid delineations or characterizations of the population of goal cases. Methods that can typically lead to such generalizations include immersive cultural ethnographies, action research and case studies based on participant observation. For example, action research evolves its theory through a cycle of organizational stimulation, observation and evaluation. The theory is highly localized to the unique organizational setting, but implies that the knowledge (the final theory) might form the basis for commencing further action research in other organizations. In action research, the emerging theory suggests, but does not prescribe the general case.

The mode of II generalizations is the indistinct nature of the general case. That is, the mode of II generalizations involves a dependence on holistic consistency between the base case and an emerging theory. The general case is largely ignored. II generalization must be devised almost entirely from the base case to the goal case. Sometimes the general case is only an implication of the way that the goal case is being treated under the light of the base case learning. That is, at the deferred point of any II generalization, the general case has to be holistically created from the base case. This means that both stages of generalization are deferred. It also means that there is a strong one-to-one correspondence between the general case and the goal case. This correspondence may be so strong that the two cases are effectively the same.

An example of IS research in this mode is published in Berg *et al.* (1995). This is a single case study using participant observation that explored the experiences of IBM in developing an object-oriented architecture for one of its products (the base case). The general case is drawn in terms of "management lessons" (like organizational structure) and "technical lessons" (like code bloating). The goal case is only discussed in terms of "relevance" to other projects (p. 56), and this is entirely couched in terms of the base case characteristics (like developer and manager experience). It is left entirely to the reader to distinguish between the base case and the goal case, and determine the relevance of the general case characteristics to the goal case.

4.5. Four Generalization Classes

The four classes of generalization thus correspond to the Cartesian product of two parallel types of two stages of generalization. Universal stage one generalization typically means that the researchers are basing their model on the shared characteristics of their study subjects, for example, they may be counting fleas on dogs. Idiographic stage one generalization means that the researchers are basing their model on one particular subject. For example, the relationship between a dog named rover and its fleas (or between a particular flea and its dogs). Universal stage two generalization means that the researchers are populating their model with unexamined subjects, for example, suggesting that all dogs have fleas, or a certain number of fleas, or have a particular relationship with its fleas. Idiographic stage two generalization means that the researcher's model must be specialized for each unexamined subject, for example, suggesting that a cow named bossy will have a relationship with its parasites in some ways similar, but in other ways different, to that of dog rover and its fleas.

5. Criteria for Generalizability

The acceptance of generalizability in alternative forms of social enquiry does not imply that researchers become unbounded in their generalizations. The research audience must have a means for evaluating the effectiveness of any general case posited by researchers. Such evaluation can be demonstrated by reviewing the traditional mainstream criteria for generalizability of knowledge in terms of the four classes of generaliza-

tion. These criteria are reliability and validity (Kirk & Miller 1986). We will center our discussion on these two rational sets of criteria because these dominate the objective view of science and social enquiry.[2] These criteria are often narrowly defined for the domain of NU generalizability, as in Straub (1989), that describes a model for validating experimental and survey IS research instruments according to their internal validity and reliability. In this section we will demonstrate the extension of these criteria that broadly applies to all four classes of generalization.

5.1. Reliability

Reliability regards the extent to which observations by multiple researchers studying the same phenomenon with similar purposes will yield approximately the same results (Gummesson 1988). The concept of reliability is closely related to universality, repeatability, and consequently falsifiability. Reliability is a characteristic that can be attached to observations of goal cases as well as base cases. Consequently, reliability is a factor in both generalization stages, although each stage may invoke different types of reliability. There are three types of reliability: quixotic, diachronic and synchronic (Kirk and Miller 1986).

Quixotic reliability is the extent to which a particular method of observation yields an unvarying measurement. For example, a broken thermometer is highly reliable: it always reads the same. A more qualitative example might be an organization's policy-defined response (immediately lowering prices to match competition) which is always the same.

In a practical sense, deferred generalizability could be wrongly accused of quixotic reliability on the basis of the research findings, because generalization is not completed. However, this entails a narrow view that the generalization process actually excludes the second stage, and the argument becomes recursively applicable to all forms of generalization. It could also be argued that almost any base or general case could prove of some value in an organization facing a crisis, and that any tool of discovery and analysis might prove equally valuable. However, this argument also applies to all forms of generalization, whether deferred or not. The degree to which generalizations might embody quixotic reliability is a criterion that applies equally to all classes of generalization.

Synchronic reliability is the extent to which observations within the same time frame are similar. For example, two or more observers using the same method of observation of the same phenomenon would record the same result. This type of reliability is especially interesting when it fails because researchers must discover how multiple, somehow different measures might be simultaneously true.

Synchronic reliability regards mostly the stage one generalization process, since it involves the agreement of several measures on the strength of the relationship between the base case and the general case. Because each generalization class handles stage one generalization somewhat differently, this criterion does not equally apply to all classes. For example, multiple chains of evidence could be used in case studies or experiments to link the base case or base cases to the general case. This suggests that this criterion would be strongest in, and could

be equally applied to, the PU and DI classes. Synchronic reliability is a practical problem in the NU class because there are typically observations of a large number of base cases required by the probability statistics to underwrite the nomothetic generalization. Synchronic reliability is also a problem in stage II generalizations because the stage one generalization is deferred, and the authors of the enquiry do not draw out the general case at the time of the study. Consequently, NU and II classes must be held to a lower standard of synchronic reliability than PU and DI classes.

Diachronic reliability is the extent to which a particular method of observation yields the same measurement when exposed to a particular phenomenon at different points in time. This regards stability of an observation through time (similarity of measurements or findings taken at different times). This is the typical quantitative sense of the term reliability. It implies that an instrument given to the same population with no intervening variables will yield the same results (*i.e.*, a test-retest correlation coefficient).

Diachronic reliability regards only the stage two generalization process in the sense that the interpretation of the goal case must occur under the light of the general case. Consequently, universal stage two generalizations should have strengths under this criterion owing to the large population of goal cases. For example, hypothetico-deductive research methods provide formal evidence of reliable stage two generalization. However, even this diachronic reliability is couched in probability arithmetic, and any stage two generalization is somewhat tentative. On the other hand, diachronic reliability is even more tentative in idiographic stage two generalizations where diachronic reliability is deferred along with generalizability. Regarding application of this criterion, NU and PU forms of generalization can be expected to have less tentative diachronic reliability (i.e. held to a higher standard) than DI or II forms of generalization.

5.2. Validity

Validity regards the extent to which an observation measures what it purports to measure. Validity means that a theory, model, or concept accurately describes reality. Validity is closely related to generalization because it deals with the semantics of the theory. The close relationship between the semantics of the theory and the semantics of the general case to both base case and goal case implies that validity regards both stage one and stage two generalization.

The concept of validity is easily conflated with the concept of *representativeness* in survey samples, experimental subjects and objective case studies. Representativeness is usually couched in terms of the characteristic similarity of the base cases to the goal cases. However, this overlooks the intermediary role of the general case in the process of two-stage generalization. The defined effect is that the general case should be representative of *both* the base case(s) and the goal case(s).

Validity can be analyzed using different taxonomies. One taxonomy deals typically with the semantics of the observational data. There are three types of validity with regard to the semantics of the data: criterion validity, content validity and construct validity (Babbie 1983, Carmines and Zeller 1979). Another taxonomy deals with the causal inferences

and correlations of the elements of the theory. This second taxonomy is most commonly considered in the negative sense of the failures in the social enquiry: internal and external invalidity (*e.g.*, Campbell and Stanley 1963, Cook and Campbell 1979).

From our perspective on generalization, these taxonomies overlap because the semantics of the data and the integrity of the causal inferences are all part of the process of creating and applying the general case. To maintain consistency in our discussion, we will consider the second taxonomy in its positive inverse, and relate this to the first taxonomy. The two types of validity that are concerned with the causal inferences of theory are internal and external validity.

Internal validity is the extent to which the causal analysis and explanations offered by the theory reflect the reality at the moment of the observations. Internal validity regards the degree to which the general case is representative of the base case(s). Internal validity is often established by exhaustive rejection of competing or alternative theories and hypotheses. Internal validity is primarily a criterion for stage one generalization: the correspondence of the base case(s) and the general case. Internal validity entails both content and construct validity.

Content validity is the extent to which the data from the base case(s) reflect the domain that is intended to be measured. This regards the fit between the observations of the social enquiry and the reality in the base case. Content validity is also called "apparent" or "face" validity. For example, a maths skills test that only covers addition would lack content validity because subtraction, multiplication & division are ignored. Stage one generalization that lacks strong content validity would yield an incomplete and inaccurate general case. This implies that stage two generalization would eventually fail.

Construct validity is the extent to which the data from the base case(s) is related to the theory-under-test. This is also known as "theoretical validity", and "instrumental validity." Instrumental validity also suggests an indirect observation (an alternative phenomenon) is used to predict the core phenomenon under study. Construct validity is critically important when criterion or content validity cannot be established (often meaning indirect measurement or instruments must be used). For example, a researcher might measure participation in school-related activities as an indication of high levels of self-esteem. Construct validity also underpins the creation of a correct general case. If the social enquiry lacks construct validity, it will produce a general case that is more-or-less unrelated to the base case(s).

External validity is the extent to which the causal analysis and explanations offered by the theory may be applied to similar phenomena. External validity is primarily concerned with the correspondence between the general case and the goal case. Thus external validity is concerned with the "representativeness" of the general case in terms of the goal case(s). External validity primarily entails criterion validity, but it may also imply reliability in objective research since an observation must first be reliable before external validity can be shown.

Criterion validity is the extent to which the data from the base case(s) will predict some important form of behavior

(criterion). This definition is also the common meaning of the term validity, and is also called "predictive validity". Criterion validity is highly achievable when the observation will be used for aptitude or qualification (for example, a drivers test is used for predicting driving skills).

Internal validity is primarily a criterion for stage one generalization, while external validity is primarily a criterion for stage two generalization. Internal validity is confounded by the conceptual distance between the base case(s) and the general case. That is, internal validity is most easily established when there is a one-to-one correspondence between the base and general case. When multiple base cases are introduced, the general case must be abstracted on shared characteristics raising complications with regard to both construct and content validity. As a result, generalization classes with idiographic stage one generalization (PU and II generalization) should be held to a high standard of internal validity. Generalization classes with universal stage one generalization can typically only meet lower standards of internal validity.

External validity is primarily a criterion for stage two generalization. External validity is confounded by the conceptual distance between the general case and the goal case. That is, external validity is most easily established when there is a one-to-one correspondence between the general and goal case. When multiple goal cases are predefined, the general case must be abstract enough to apply to all goal cases in the population. This abstraction brings on problems with criterion (predictive) validity. As a result, generalization classes with idiographic stage two generalization (DI and II generalization) should be held to a high standard of external validity. Generalization classes with universal stage two (NU and PU) generalization can typically only meet lower standards of internal validity.

5.3. Summary: Standards and Application of Generalization Criteria

Table 4 summarizes the varied criteria standards for the four classes of generalization. "Hi Std" represents the a high standard of this criterion (*i.e.* highly achievable) for this class of method. "Lo Std" represents a low standard of this criterion (i.e. less achievable) for this class of method. This figure captures the implication that no single class of generalization holds an ideal solution to this important process in social enquiry. This analysis contradicts the commonly held perception that NU generalizations (*e.g.*, representative-sample statistical questionnaire surveys) provide ideally generalizable research findings, and qualitative forms of research (e.g., action research or case studies) do not provide generalizable findings at all. To the contrary, NU class generalizations have the narrowest criteria standards of all four classes. PU class generalizations, which include in-depth case studies as well as experiments, have the broadest criteria standards for generalizations. To be fair, no single class can lay claim to offering the "only" or "best" generalization mode, but each class has a different intent for its generalizations, and appeals to different criteria.

These standards are applicable during the evaluation of various forms of social enquiry. For example, a one-shot survey questionnaire research project, which examines a random sample of IS

TABLE 4. Criteria standards for classes of generalization

Stage Two Generalization	*Stage One Generalization*	
	Universal	*Idiographic*
Universal	Nomothetic Universal (NU) Quixotic Reliability: Hi Std Synchronic Reliability: Lo Std Diachronic Reliability: Hi Std Internal Validity: Lo Std External Validity: Lo Std	Provisional Universal (PU) Quixotic Reliability: Hi Std Synchronic Reliability: Hi Std Diachronic Reliability: Hi Std Internal Validity: Hi Std External Validity: Lo Std
Idiographic	Deductive Idiographic (DI) Quixotic Reliability: Hi Std Synchronic Reliability: Hi Std Diachronic Reliability: Lo Std Internal Validity: Lo Std External Validity: Hi Std	Inductive Idiographic (II) Quixotic Reliability: Hi Std Synchronic Reliability: Lo Std Diachronic Reliability: Lo Std Internal Validity: Hi Std External Validity: Hi Std

organizations in Denmark regarding the type of development method used in the organization, might enable the researchers to make probabilistic statements about development methods in all Danish IS organizations. The criteria for judging the generalizable knowledge in such a NU study should conform to the upper left-hand quadrant of Table 4. The most important criteria are non-quixotic reliability and diachronic reliability. These criteria are typically addressed by pre-testing the instruments and statistically evaluating the sampling error (statistical significance). However, a longitudinal study would improve the quality considerably on both criteria. The nature of the research is such that it would be inappropriate to heavily criticize such studies on the basis of their synchronic reliability (it is impractical to make multiple simultaneous measures of a large number of subjects with any meaningfulness) or their validity (it is very difficult to certify exactly how each of a large number of diverse subjects interpreted each survey item). These particular criteria are not the basis from which the researchers are accrediting the generalizability of their findings.

As another example, a laboratory experiment in which student subjects are tested for comprehension after reading video screen information in particular color combinations might be used to suggest ideal default screen colors for all software products. The criteria for judging the generalizability of such a PU study should conform to the upper right-hand quadrant of Table 4. Such studies should meet high quality standards for all forms of reliability and validity except external validity. In other words, it would be reasonable to expect careful validation of measurement instruments to eliminate quixotic reliability and establish both content and construct validity in the observations. Multiple simulta-

neous measures and repetitive experimentation are also reasonable expectations. However, it is unreasonable to attack this research on the basis of its external and criterion validity, for example, by positing that students in laboratory settings will behave differently than professionals in office settings. This is unreasonable because this kind of criteria is not the basis for the generalizability of knowledge in this class of study.

A third example might be a multiple case study in which managers and programmers in several software companies are interviewed about the practical importance of object-oriented system development techniques. The study would no doubt analyze general differences between the companies (size, organization, corporate culture, products, *etc.*) along with the analysis of differences and similarities in interview contents. One would expect to hold this kind of DI study to the criteria pattern found in the lower left-hand quadrant of Table 4. For example, the interview contents should be not be quixotic, there should be multiple chains of evidence (for example, several confirmational programmer interviews with each subject company) for synchronic reliability, and the general analysis should make external and criterion validity clear (what kinds of companies are involved). Strongly criticizing such studies on the basis of their diachronic reliability (case studies cannot be repeated because of the changing nature of organizations and their actors), or internal validity (the interpretive nature of observations in multiple case studies make this construct very difficult to prove) amounts to an attack on these kinds of studies in general, rather than the particular study in question.

A fourth example might be an action research study in which a collaborative team studies administrative congestion problems in a multi-organizational bridge-construction project, ultimately developing a document tracking system as the solution. This kind of II study should be held to the criteria pattern found in the lower right-hand quadrant of Table 4. This work may be judged strongly on its validity, both internal and external. For example, convincing evidence should be presented that the team was engaged in the stated problem, that the theoretical elements were actually in use, and that enough details are provided about the subject organization such that readers can confidently project the learning into another, quite dissimilar problem setting. Holding such studies up to high standards of synchronic reliability (the participative nature of action research obstructs the verification of objective observations) or diachronic reliability (neither the organization nor any particular set of its contemporary problems can be repeated) would be quite irrelevant to the class of generalization that underlies this study.

The correlation between these classes of generalization and specific methods of social enquiry is somewhat idealized. While we may discuss idealized forms research methods (*e.g.*, "the" case study research method or "the" sampling survey method), these often vary in practice. Data collection or analytical techniques normally associated with one idealized method may be correctly used within another idealized method (e.g., using participant observation to collect survey data, or using questionnaires to collect case study data). In practice, ground-breaking research can be a

messy, unstructured process (Root-Bernstein 1989). Applying these generalization criteria may require examining the underlying claims for validity and reliability in cases where the exact method of enquiry is atypical.

6. Discussion

Qualitative social science has bristled over the generalization issue for some time. Our understanding of generalizability has not been helped by the narrow view of social scientific enquiry adopted by many textbooks. For example, Black and Champion (1976) premised that "research should suggest a general set of phenomena to which the theory applies. This enables falsifiability by proposing cases which provide subsequent observations." This viewpoint admits only the Popperian view of social scientific enquiry and leads to an unsound dismissal of the practical value of qualitative research.

The opposing views in the qualitative science "camp" have appeared in the literature, but these have not been as collectively coherent as the critics. Yin, for example, suggests that case studies are generalizable, but like experiments are generalizable: to theory, not to a population:

> This analogy to samples and universes is incorrect when dealing with case studies. … A common complaint about case studies is that it is difficult to generalize from one case to another. Thus analysts fall into the trap of trying to select a 'representative' case or set of cases. Yet no set of cases, no matter how large, is likely to deal satisfactorily with the complaint. The problem lies in the very notion of generalizing to other case studies. Instead, an analyst should try to generalize findings to 'theory,' analogous to the way a scientist generalizes from experimental results to theory. (Note that the scientist does not attempt to select 'representative' experiments.) (Yin 1989, p.43-44)

Yin goes on to discuss an example of this generalization to theory, citing Jacobs (1961) as an illustration. Jacobs' book developed a theory of urban planning by organizing cases into categories like the role of sidewalks, the role of neighborhood parks, etc.

Gummesson (1988) provided an analysis that noted different standards of criteria for qualitative versus quantitative research. He found that reliability is the favorite criterion of quantitative science because it fulfills three roles: curb erroneous research, make the logic explicit, and form a "validity crutch" (replace validity with reliability when the former is beyond reach). He also noticed that reliability is problematic in qualitative studies because it is impossible to replicate rich, multivariate social events that form the subject of the observations. Diachronic reliability is unreachable, since events cannot be repeated. Synchronic reliability, however, is possible in two senses. First, multiple observers can be used to triangulate on the meaning in the observation. Second, the "observation" can be removed from the social event. The observation can be made regarding the raw documentation taken from the event (transcripts, audio tapes, diaries).

Gummesson also noticed that validity is the favorite criterion of qualitative science because the limited number of observations permit more detailed link-

ages between the theory and a particular phenomenon. The direct, interpretive observation techniques eliminate problems of instrumental validity. Most qualitative research infers the theory directly from the observed data (ex post facto hypothesizing) which means that construct and content validity are almost automatically present. Further, the language of the theory is often freed from mathematics. This can promote external validity by allowing broader conceptual descriptions or "useful ambiguity" that permit slightly differing phenomena to be grouped into one analytical class.

Gummesson noted that validity is problematic for quantitative studies, particularly when the underlying subject of study may be undergoing transformational processes. That is, the subject of study may be a social process, and social processes continually change in nature. This means validation must be a continuing process and diachronic reliability is problematic. Since validity may have to be reestablished with each observation, the theoretical constructs may change with each observation.

The problem with all of these views has been the failure in considering the complete generalization process. Generalization has heretofore been deemed as only the process of creating the general case. As argued here, however, this is only the first stage of the generalization process. The complete process of generalization must include the projection of the general case into a goal case. When this complete process is considered, a more balanced view of social enquiry takes shape. In this view, the practical sense of generalization becomes universal across the full range of social scientific methodology. Importantly, by using this view, we can describe the appropriate criteria by which to judge the generalizability of differing classes of social enquiry.

Notes

[1]A strict dichotomy between idiographic and universal settings is conceptual to a large degree. Most research can be interpreted as occupying some position along a continuum from conceptually ideal idiography to conceptually ideal universality.

[2]There are also naturalistic criteria for generalizations, such as credibility, transferability, dependability, and confirmability.

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Appendix

There are various fundamental dichotomies in the philosophy of science that affect how the scientist discovers causal relationships, explanations, and as a consequence, the general cases. However, few of these dichotomies involve any argument on either side that denies causality, explanation or generalization. It is fallacious to assume that generalization is a concept that is peculiar to certain narrow scientific viewpoints. This appendix explores and supports our assumption that generalization is a relevant

criterion in both aspects of many scientific dichotomies. Basing the definitions of these dichotomous positions on Flew (1979) and Bullock and Stallybrass (1977), we will consider some examples below:

Objective and Subjective Generalization
Objective science regards a scientific theory as one that takes shared experience to be the sole foundation of factual knowledge. Subjective science is a contrasting position that regards a scientific theory as one that takes private experience to be the sole foundation of factual knowledge. Neither position actually denies causal relationships or explanation and general cases exist in both modes of thinking.

Empirical and Rational Generalization
Empirical science assumes that all knowledge is derived from experience; and that a linguistic expression is significant only if associated by rule with something that can be experienced. Rational science assumes that our knowledge of the nature of what exists may be obtained by reason alone; and that everything is explicable in a single system of knowledge. Neither position involves any denial of causality, explanatory expressions or generalization.

Realist and Idealist Generalization
Realist science, in the sense that physical objects exist independently of being perceived, can be contrasted with idealist science. Idealism assumes that the external world is somehow created by the mind. Certainly realist science entails causality and generalization. In idealist science, the discovery of co-related phenomena (or appearances), and consequently generalization are allowed under Hegel's objective Idealism (the monistic, absolute mind), Kant's transcendental idealism, and especially under Berkeley's monistic "mind-of-God" view.

Realist and Nominalist Generalization
Realist science also typically assumes that universals have a real substantial existence independently of being thought. This also contrasts with nominalist science which assumes that universals are merely names and have no existence independently of being thought. In this case both positions actually seek to define the nature of generalization, and differ only in their opinion of its nature. That is, realist science assumes the general case is a set of cases with an independent existence. Nominalist science assumes the general case is merely an idea that we have attached to some of our impressions.

Reductionist and Holist Generalization
Reductionist science regards a doctrine that claims to reduce the apparently more sophisticated and complex to the less so. Holist science holds that some wholes are more than the sum of their parts. Reductionist science seeks explanations and generalization through a systematic practice whereby concepts are redefined or analyzed in terms of more elementary or basic concepts. Holist science explains parts only in terms of their functions in the whole, and wholes necessarily have characteristics that cannot be explained by the properties and relations of their constituents. This view defines its generalizations in terms of this parts-whole relationship.

Inductive and Deductive Generalization

Inductive science involves a method of reasoning by which a general law or principle is inferred from observed particular instances. Deductive science assumes that all valid arguments are those in which it is impossible to assert the premises and deny the conclusion without contradicting oneself. Deductive science establishes an hypothesis, which can be expressed with deductive logic and then tested against observations in reality. Inductive science derives the hypothesis from observations in reality. Both settings seek relationships between variable elements, implying causality and the search for generalization.

Positivist and Interpretivist Generalization

Positivism and interpretivism are terms that are often used very broadly. In one sense, positivism implies that all true knowledge is scientific C describing the coexistence and succession of observable phenomena. In contrast, interpretivism assumes that all observable phenomena are subjectively interpreted in a cognitive process beyond the control of the observer. Positivist generalizations emerge from the observations, and philosophy is limited to explaining the scope and methods of making positive observations. Interpretivist generalizations emerge from agreements about observations. These agreements represent contemporary linguistic conventions about the meaning of the observation. Interpretivist philosophy offers means for obtaining generalizations that are not available to science from direct observations. However, both positions adopt generalizations

Positivist and Relativist Generalization

Positivist science also holds that knowledge must be accepted as we find it, and is not further explicable. This position contrasts with relativist science, which holds that beliefs and principles have no universal or timeless validity; that is, there is no such thing as objective knowledge independent of the knower. Positivist science poses generalizations that are held to a certain permanence. Relativist generalizations are limited to the particular age, social group, or individual holding such beliefs. However, both positions admit generalization.

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