Replication

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ABSTRACT AND KEYWORDS	
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Free Keywords	theory-testing; case study research; necessary condition; sufficient condition; replication
Availability	
Classifications	

Replication

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Abstract

Replication is conducting a study in *another* case (or population) in order to assess whether a research finding from previous studies can be confirmed. The aim of replication is to assess the generalizability of a theoretical claim and the "research finding" that is (or is not) confirmed in the replication study is a claim that is derived from the previous studies.

Sometimes the term replication is also used for conducting a study in the *same* case (or population) in order to assess whether the finding from the previous study can be reproduced. To avoid confusion, the latter method of assessing the reliability of a study might better be called *duplication*. Duplication will not be discussed here.

Conceptual Overview and Discussion

The Concept of Replication

David Hume has formulated the general problem of induction stating that the fact that a claim has passed one test does not provide any evidence that it will pass other tests. This implies that it cannot be known for sure that a statement about a class of entities is true if it has not been tested in every instance of that class. Using a well known example of such a claim, "All swans are white", Hume's problem implies that we only know this for sure after we have observed the color of every single swan. Because this is usually not feasible, Hume concluded that induction is not possible. Karl Popper's conclusion was that such confirmatory certainty should not be sought and that, instead, one should attempt to achieve certainty about the incorrectness of the statement. A single counterexample (a non-white swan) would be sufficient for achieving this. Replication is the search for confirmations (Hume) or disconfirmations (Popper) of a claim about a domain of, in principle, an indefinite number of entities to which the claim applies.

Replication is the core procedure by which credible theoretical knowledge is generated. It is not a one-off activity but a strategy of subsequent tests in which the likelihood of the correctness of a claim for a domain increases with each failure to find a disconfirmation. The more different an entity (or a population of such entities) is from the ones in which earlier tests were conducted, the larger the contribution of that test to the confidence in the correctness of the claim. Replication is a general procedure that applies to all sciences and all research strategies. Its relevance and applicability are not confined to only some types of tests, such as case studies or experiments.

The Yin-Eisenhardt Approach to Replication

Robert Yin states that replication is the attempt to find support for a proposition in a number of single case studies, arranged effectively within a multiple-case design. He emphasizes the analogy between such a series of single case studies and multiple experiments, but does not mention the general principle of replication that applies to all other research strategies (including the survey) as well. Yin implicitly assumes that replication only applies to propositions about characteristics of single cases (see the discussion of types of proposition in the entry on Theory-testing with cases). Kathleen Eisenhardt, who proposed Yin's replication logic as the core procedure of her approach to theory-building, makes this assumption explicit by stating that, in

her approach to theory-building, each hypothesis is examined for each case, not for the aggregate cases (see the entry on Theory-testing with cases).

Applications

Replication strategy

In a replication strategy knowledge about the correctness of a claim is built up in a step-wise fashion. In general, the higher the number of tests that have been conducted, the lesser is the contribution of each next one. An implication of this phenomenon of diminishing returns is that, after a series of replication studies (if well designed), saturation will occur. At that point researchers will conclude that no further replication is needed and that more or less definitive conclusions can be drawn about the correctness of a claim for a specified domain.

A replication strategy should be designed such that the contribution made by each step, i.e. by each next replication study, is maximized. Two principles are used to achieve this:

(1) Because a disconfirmation of the claim is more informative (about its correctness) than a confirmation, serious attempts should be made to select "least likely" cases (or populations) for the test. These are cases and populations in which, for theoretical or practical reasons, it is considered relatively unlikely that the claim can be confirmed.

(2) Cases (or populations) should differ as much as possible because a confirmation in such cases tells us that the claim seems to hold *despite* these differences.

Confirmatory results increase the confidence in the correctness of the claim but do not allow researchers to learn new things about it. As long as saturation cannot be claimed to have been achieved, researchers need to continue replication studies in least likely cases that differ as much as possible from previous ones. Disconfirmations are potentially much more informative, but they require interpretation. A disconfirmation of claim in one test can mean at least three different things:

(1) A false negative. The studied case or population actually confirms the claim, but the study fails to generate this result, e.g., because of measurement error or some other error. Before concluding that the test result is a disconfirmation, the quality of the study needs to be evaluated. Replications in similar cases (or duplication) might shed light on this issue.

(2) The claim is correct for a smaller domain than was initially thought. The studied case or population might represent a part of the initial domain in which the claim is not true, whereas it (supposedly) is true in other parts of the domain. The test result is used as informative about the boundaries of the domain in which the claim is true. Replications on both sides of the apparent boundary could confirm or disconfirm the correctness of this interpretation of the test result.

(3) The claim is not correct for the whole domain or for a substantial part of it. If this possibility is taken seriously, replications in "most likely" cases could confirm it. If the claim cannot be sustained, it might be reformulated.

A replication strategy, therefore, is not designed beforehand. Every next move in a replication strategy takes all previous test results into account.

What is replicated?

What is replicated depends on the content of the theoretical claim. If the claim is modest as in "This operation generates a positive effect", then a replication should attempt to find a positive effect with the operation, and the replication could be deemed a confirmation if such a positive effect (irrespective of its size) is observed. If the claim is "This operation generates an effect size of at least d" (in which d is the effect size found in an earlier study), then replication involves finding out whether such a minimum effect is observed. Another candidate for replication would be "This operation generates an effect size within the confidence interval of d". Note that no null hypothesis statistical testing is involved in replicating claims about the size of an effect or of a relationship.

Critical Summary

A replication strategy is an iterative strategy of successive tests of a claim aimed at maximizing the chance of finding disconfirmations. If such disconfirmations occur, these need to be interpreted. This might result in a reformulation of either the claim or the boundaries of the domain in which it is supposed to be true. Replication is a general scientific strategy that is basically the same in all disciplines and is applicable to findings from studies in all research

strategies, such as in experimental designs as well as in survey research. Its application in case study research is not different from its use in any of these other research strategies (see the entry on Theory-testing with cases).

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