Issues and Opinions

A Replication Manifesto

Alan R. Dennis

Indiana University

ardennis@indiana.edu

Joseph S. Valacich

University of Arizona

valacich@email.arizona.edu

Abstract:

Replication is one of the main principles of the scientific method. The social sciences, and in particular the information systems discipline, has lagged behind the physical sciences which have more established traditions of independently replicating studies from other labs. In this essay, we outline the need for replication in the information systems discipline, identifying three possible approaches for executing such studies. There are numerous benefits to the discipline from embracing and valuing replication research. Replication will either improve confidence in our research findings or identify important boundary conditions. Replications also enhance various scientific processes and offer methodical and educational improvements. Collectively, these benefits will help the information systems discipline mature and prosper.

Keywords: Replication, Manifesto

1   Introduction

In the physical sciences, new knowledge is often not considered valid until the original study has been replicated in other labs and the original results are not refuted. This replication by different labs and different researchers enables scientific consensus to emerge because we become more confident that subsequent research examining the same question will not refute the findings [1]. This independent validation is seen as crucial to the advancement of science, yet the social sciences traditionally have not followed this approach. Journals in the social sciences (and Information Systems in particular) have not been interested in publishing replications of prior studies, thus discouraging this valuable scientific activity (interestingly, the same bias to original research also holds in the physical sciences (Collins, 1992)). Unfortunately, if any research could truly benefit from additional validation it is the social sciences, where the object of study, humans, have free will and a diversity of automatic subconscious responses which is unlike the natural sciences where, for example, if a chemical reaction occurs in one lab, it is very likely to reoccur under the same conditions in another lab.

In September 2012, Nobel Laureate Daniel Kahneman of Princeton ignited a wave of comment with an open letter to psychology researchers investigating priming (Kahneman, 2012). This letter, which was widely reported (e.g., Bartlett, 2012, Economist, 2013, Yong, 2012b) predicted a coming "train wreck" that would damage the careers of young scholars. His concern was that when researchers attempted to replicate priming studies, they sometimes found different results; yet these different results were not acknowledged or published, creating a backlash of mistrust and skepticism about all priming research, not just the studies whose replications found different results.

Unfortunately, this issue is not just limited to priming research. Labs that have attempted to replicate classic psychology studies have found results different from the original studies [2]. Estimates are that 30% or more of published social science research results cannot be replicated, simply because of the way we do statistical analyses (Economist, 2103; Ioannidis, 2005). These conclusions do not take into account errors, academic misconduct, publication bias (the bias against publishing nonsignificant results), or positivity bias (the quality of a manuscript is assessed by the number of hypotheses supported so manuscripts with only a few supported hypotheses are not published) (Alexander, 2013; Economist, 2103; Ioannidis, 2005, Yong, 2012a).

We believe that replication is important to the future of information systems research whether it is laboratory, survey, field, qualitative or quantitative. Yet no current information systems journal seeks to publish replications nor do we have a culture that encourages replication research.

Our colleagues in Marketing are one step ahead of us and have already launched a special section in the International Journal of Research in Marketing that only publishes replications (Goldenberg and Muller, 2013). In pyschology, the Journal of Personality and Social Psychology has just launched a replication section (Journal of Personality and Social Psychology, 2014) Medical researchers have also expressed similar concerns about the inability to replicate results (Goldacre, 2012) and a major replication initiative has just been launched (Couzin-Frankel, 2013).

We believe a major cultural shift toward replication is starting in the social sciences and it is now time for information systems researchers to also embrace a research culture that values replication. Much like the physical sciences, we too should replicate prior studies to in order to be more confident and reach scientific consensus on the validity of our knowledge contributions. We believe that this is a normal progression as a discipline matures.

Past research offers several views on the different types of replication (Berthon, et al., 2002; Tsang and Kwan, 1999). We view replication as falling into one of three fundamental categories:

- **Exact Replications**: These articles are exact copies of the original article in terms of method and context. All measures, treatments statistical analyses, etc. are identical to those of the original study. The context will also be the same, so if the original study used US undergraduate business

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[1] Because first discovery is often more highly valued, replication is less common than conventional wisdom would believe (see Collins, 1992); disciplines need to find mechanisms to encourage and value replication research.
[2] Collins (1992) suggests that there are two possible explanation for the failure of a replication study; i.e., that the original theory is wrong or that there was an as yet undetected flaw with the procedures that explains why the expected results were not obtained. Of course, without further investigation, there is no way of knowing which explanation applies.

students, Mechanical Turk, employees of a Finnish telecom company, and so on, so too will the replication study.

- **Methodological Replications**: These articles use exactly the same methods as the original study (i.e., measures, treatments, statistics etc.) but are conducted in a different context. For example, if the original study used US undergraduate business students, the replication might use US graduate humanities students, undergraduates from Hong Kong, professionals from Brazil, and so on.
- **Conceptual Replications**: These articles test exactly the same research questions or hypotheses, but use different measures, treatments, analyses and/or context. For example, replications might alter the wording of items used to measure key constructs or use different software to implement a treatment in an experiment. Likewise, studies that attempt to test the boundaries of the theory and the strength of a relationship using explained variance and effect sizes fit this category.

All replications are valuable in advancing science. Conceptual replications are the strongest form of replication because they ensure that there is nothing idiosyncratic about the wording of items, the execution of treatments, or the culture of the original context that would limit the research conclusions.

Replication articles will either support the findings of the original article or provide results that do not support the original article (e.g., nonsignificant). Either outcome will advance science. If the original article results are replicated, then the replication provides external third-party validation of the results and offer a generalization of the original contribution into a new context and/or measures/treatments/analyses (in the case of methodological or theoretical replications). If the replication article fails to replicate the original results, this doesn't necessarily mean the original results are "wrong" (i.e., that the results have been refuted—see Popper, 1963); it could be that they don't generalize to the new context or that findings are closely tied to the original measures, treatments, analysis, etc. and don't generalize beyond them. Such findings should trigger additional replication activities and new follow-on research in other journals that seek to understand in what contexts and with what methods the theory applies and why the original findings are only generalizable to those contexts and/or methods.

We believe that a culture of replication will provide five important benefits to the field:

- It will provide validation of articles published in other journals so as a field we can be more confident in the advancement of science;
- It will encourage better reporting of methodological details so that studies can be replicated with ease;
- It will increase the body of studies to enable better quality meta-analyses;
- It will provide a vehicle for improving the methodological education of PhD students; and
- It will provide an additional research venue for scholars not seeking to publish original research.

We call on our colleagues to join us in this quest for scientific advancement. We invite those who are new and old to the field to embrace a culture in which replication of prior research is valued and expected as a normal part of science.

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About the Authors

Alan R. Dennis (**http://www.kelley.iu.edu/ardennis/**) is Professor of Information Systems and holds the John T. Chambers Chair of Internet Systems in the Kelley School of Business at Indiana University. Prof. Dennis has written more than 150 research papers, and has won numerous awards for his theoretical and applied research. His research focuses on three main themes: the use of computer technologies to support team creativity and decision making; IS for the subconscious; and digital innovation. He was named a Fellow of the AIS in 2012. He is Editor-in-Chief of *Foundations and Trends in Information Systems*, and the Publisher of *MIS Quarterly Executive*. Prof. Dennis also has written four books, two on data communications and networking, and two on systems analysis and design.

Joseph S. Valacich (**http://mis.eller.arizona.edu/faculty/jvalacich.asp**) is an Eller Professor of MIS in the Eller College of Management at the University of Arizona and a Fellow of the Association for Information Systems. He received his Ph.D. degree from the University of Arizona (MIS) (1989), and M.B.A., and B.S. (computer science) degrees from the University of Montana. His primary research interests include human–computer interaction, cyber security, deception detection, technology-mediated collaboration, individual and group decision making, and e-business. His prior work has been published in numerous prestigious journals, including MIS Quarterly, Information Systems Research, Management Science, Academy of Management Journal, Journal of MIS, Decision Sciences, Journal of the AIS, Communications of the ACM, Organizational Behavior and Human Decision Processes, Journal of Applied Psychology, and many others. He is a coauthor of several leading textbooks, including Modern Systems Analysis and Design (7th ed.), Information Systems Today (6th ed.), and Essentials of Systems Analysis and Design (5th ed.), all published by Prentice Hall.